

*A step toward the
Theory of Everything*

The Spacetime Model

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Part 3

Quarks and Antimatter

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Cover: On the left of the photo of Einstein: Maxwell, Feynman, Max Planck, Schrödinger
On the right: Pauli, Niels Bohr, Marie Curie, De Broglie, Dirac, Heisenberg

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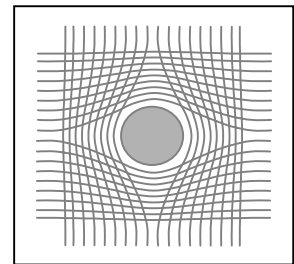
Before reading...

To fully understand this part, the reader must be familiar with the deductions and results developed in Parts 1 and 2. These results are summarized below:

The curvature of spacetime (Part 1)

Let's fill up a container with water. We drop a billiard ball into the container. The volume of the ball produces a displacement of water.

The same phenomenon applies to spacetime. Contrary to generally accepted ideas, it is not mass which deforms spacetime, but volume, more exactly "closed volume".

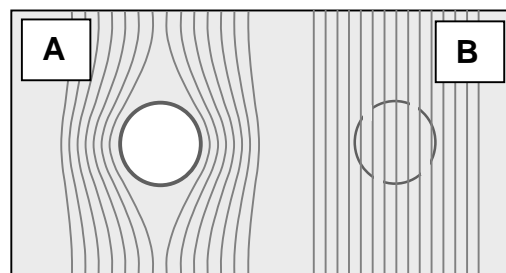


Mass = Volume? (Part 1)

In our world, mass and volume seem to be two different quantities because in atoms, the mass is not proportional to the volume. So, we have a large range of atoms with different masses and volumes. However, at the particle level, mass = volume (with some reservations explained in Part 1).

In reality, we have two main classes of volumes:

- **Closed volumes (A):** These volumes make a displacement of spacetime. Thus, a pressure force appears on the surface of the volume. This pressure produces a "mass effect", an effect having all mass characteristics. Nucleons and electrons are examples of closed volumes.
- **Open volumes (B):** These volumes exist but do not produce any displacement of spacetime. If there is no curvature, there is no mass effect either. Orbitals of electrons in atoms are examples of open volumes.



Each atom has a particular proportion of open and closed volume. This is why mass and volume give us the illusion of being two different quantities.

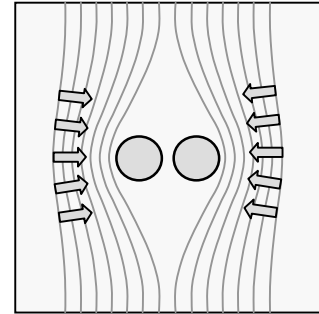
What is Gravity? (Part 1)

Two volumes inserted into spacetime curve it. Since spacetime is elastic, its curvature produces pressures on these two volumes. This tends to bring them closer to each other. So, contrary to what we think:

Gravity is not an attractive force between masses but a pressure force exerted by spacetime on closed volumes.

Since a pressure force is the inverse of an attractive force, there is no difference between the current theory and this new explanation of mass and gravity:

$$\begin{aligned} \text{Attractive force (Newton)} + \text{Concave curvature of spacetime (Einstein)} \\ = \text{Pressure force} + \text{Convex curvature of spacetime} \end{aligned}$$



Validations (Part 1)

This part describes a simple experimentation, which highlights a black hole behavior when $R = R_s$. The Schwarzschild Metric and Newton Law are also calculated using this new explanation of Mass and Gravity, from the Hooke Law. Moreover, the proposed theory is in perfect accordance with the Von Laue Diagram.

Wave-Particle duality (Part 2)

Since 1905, the wave-particle duality has been one of the greatest enigmas of physics. Indeed, nobody can explain this phenomenon, but there is one particular case where wave-particle duality becomes logical and rational. That is *when waves and particles are of identical constitution.*

*For example, a drop of water (corpuscle) and a water wave are of **identical matter**. Water has either a corpuscle behavior or a wave behavior.*



This explanation of wave-particle duality leads to a major deduction: when the particle is motionless, it remains in a corpuscular state, and when it is moving, it becomes a wave.

Matter and charge (Part 2)

Parts 2 and 4 cover explanation of EM waves, which are nothing but spacetime vibrations. Linking this discovery, the wave-particle duality explanation, and experimentations like the 511 KeV production from e^+e^- annihilations, we deduce that matter is made of spacetime. More exactly, what we call "matter" is areas of low (electrons) and high (positrons) densities of spacetime. So:

$$\begin{aligned} \text{Waves} &= \text{Matter} \\ (\text{Spacetime variations}) & \quad (\text{Spacetime areas}) \end{aligned}$$

1 MicroDomains

It seems that spacetime would be parcelled out in a kind of "neutral electrons" called μ Domains in this document.

When Pasteur discovered invisible microorganisms, no one believed him. Like microorganisms, μ Domains are invisible since they have no charge. Therefore, like neutrinos, they can't be moved. Is that a reason to reject this concept? Of course not. So, instead of saying "Since I don't see μ Domains, they don't exist...", it is wise to say "Why not? Let's study this possibility..."

This chapter covers the μ Domains concept and gives arguments in their favour: why they are necessary, their use, how to verify their existence etc...

1.1 The basic particles

At the origin of the universe, what were the basic particles? Physicists consider that electrons and u/d quarks, from the Standard Model, are the basic building blocks of the universe.

It is impossible, or highly improbable, that the universe was created at an intermediate stage with so many different charges: - 1, - 2/3, -1/3, 0, +1/3, +2/3 and +1, taking into account both particles and antiparticles of the Standard Model, including the three neutrinos.

Seven different charges are too many to make this point of view credible

It is obvious that the universe was created in a very simple state. It is a necessary condition. The simplest is the best. Its symmetry was elementary, probably originating with only one particle.

The original particle remains to be determined. If physicists were to choose a particle among the 300 known, it would almost certainly be the electron. It is a logical choice.

Since the electron charge is - 1, we need at least an opposite charge of +1 to preserve the symmetry. Moreover, it is not possible to build anything with only one charge. Thus, the second particle to be considered is, of necessity, the positron, with a charge of +1. It is, therefore, logical to think that the creation of the universe required only two particles, the electron and the positron.

This means that **ALL PARTICLES are made up with Electrons and Positrons**. The reader will have confirmation of this assumption in the following chapters.

1.2 μ Domains

The physicist Pierre Weiss discovered the existence of microscopic magnetic fields, called "Weiss Domains". Later, Felix Bloch (Nobel Prize - 1952) discovered that walls, called "Bloch Walls", surrounded the Weiss Domains.

It would seem that global spacetime¹ of the universe is divided into quanta called "microdomains", analogous with the Weiss Domains. These μ Domains are electrons (or positrons) without charge. Each μ Domain could thus have an mass of 511 KeV.

*Wouldn't spacetime also be made of μ Domains,
possibly surrounded of μ Walls?*

It is a simple assumption but we will see that it can be verified, at least for the μ Domains, (possibly not for the walls). This leads to interesting conclusions. In particular, μ Domains explain perfectly the Coulomb Force, magnetism, quarks, antimatter etc....

Let's examine the following table 1-1, which summarizes the well-known particles. In this table, the muon and tau are missing since they are some kind of electron.

	Charge		
Positron/ --- /Electron	+		-
Proton/neutron/antiproton	+	0	-
$\pi^+/\pi^0/\pi^-$	+	0	-
$K^+/K^0/K^-$	+	0	-
$B^+/B^0/B^-$	+	0	-
$D^+/D^0/D^-$	+	0	-
$\Delta^+/\Delta^0/\Delta^-$	+	0	-
$\Sigma^+/\Sigma^0/\Sigma^-$	+	0	-
$\Xi^+/\Xi^0/\Xi^-$	+	0	-

Fig. 1-1

¹ For a definition of "Global Spacetime", please see Part 2 "Constitution of Matter", paragraph 2.5, footnote #2

We note that a particle is missing, the neutral electron.

With this neutral electron, or " μ Domain", the table is complete and homogeneous

All the particles are grouped in three's. It should be noted that a similar approach has already been used in physics with Lie Groups.

1.3 Existence of μ Domains

The existence of μ Domain seems be confirmed in multiple ways:

- In the particle table (fig. 1-1), the "neutral electron" is missing.
- The process of the creation of the universe is, necessarily, very simple. The most simple is the best. However, we already know two structures of 511 KeV: the electron and the positron. A third neutral structure is necessary to fill the empty space of the universe. The immediate idea is that this unknown structure also be of 511 KeV. It is not credible to think that the universe has been created with two different structures, one concerning the electrons and positrons (511 KeV), and another one, a neutral structure, with a different volume, or built on a continuum basis.
- According to Max Planck (Nobel Prize 1918), all components of the universe could be quantified. It doesn't mean that spacetime is also quantified, but it is an interesting indication.
- It is impossible to build particles having a fractional charge of 1/3 or 2/3 with integers charges of -1 (electrons) and $+1$ (positrons). μ Domains are a necessity (see chapter 4).
- μ Domains are also a necessity in cosmology (see Part 5 "Forces, the Universe"). Many enigmas of astrophysics are fully explained by μ Domains.
- μ Domains are the basis of the EM field, and probably of the spin too (Part 4 "Electromagnetism").
- μ Domains explain the "distributed charge" model (chapter 2).
- This leads us to the explanation of quantum levels in atoms (chapter 3).
- μ Domains also explain the significance of the Schrödinger Model (chapter 3).
- μ Domains explains the muon and pion masses (see paragraph 1.6).
- This leads us to the quark model (chapter 2).
- This new quark model gives the solution to one of the greatest enigmas of physics: where is the antimatter in the universe? (chapter 5)
- The quark model also explains one of the major enigmas of physics: why the proton has exactly the opposite charge of the electron? (chapter 6).
- μ Domains explain the E_0 energy level in atoms (chapter 3, paragraph 3.2).
- μ Domains fully explain the paradox of photons and EM waves when they decrease in $1/r^2$ (Part 4 "Electromagnetism").
- μ Domains also explain the non-linearity of time in general relativity¹,
- The resolution of some enigmas like EPR (Part 4 "Electromagnetism"),
- Or the Heisenberg Uncertainty Relation (Part 4 "Electromagnetism"),
- Or Young Slits (Part 4 "Electromagnetism") etc...

¹ Paragraph 3.7 in Part 1 "Mass and Gravity" explains the deviation of light thank to μ Domains which are the support to this phenomenon.

We may reasonably consider that:

If μ Domains solve so many enigmas of physics (quarks, orbitals, antimatter etc...), it can't be merely a simple coincidence.

At the present time, μ Domains have never been detected because, like neutrinos, they have no charge¹. The existence of the neutrino is obvious when we examine the conservation laws of momentum. This is not the case with μ Domains. That is the difficulty.

1.4 Properties of μ Domains

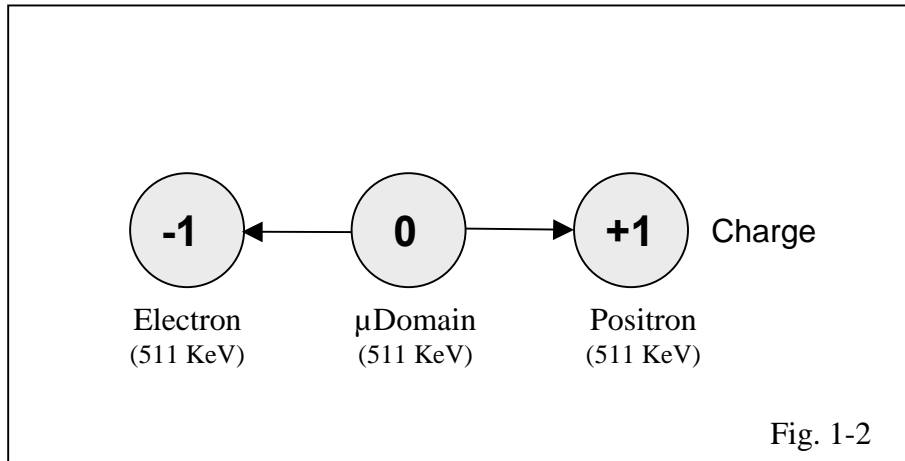
Since the existence of the neutral electron must not be excluded, we will suppose that it exists. Further, we will have confirmation of its existence. For the moment, let's imagine its assumed properties:

- Its mass (or its closed volume), must be 511 KeV.
- Its relative density of spacetime, i.e. its charge, must be that of its environment. It is regarded as having a null relative density of spacetime (see Part 2 "Constitution of Matter").
- A μ Domain can be charged or not. If it has a low density of spacetime, it becomes an electron, and if it has a high density of spacetime, it becomes a positron. Let's remember that this choice is arbitrary, the reverse being possible.
- Since a μ Domain doesn't have any charge, it is not possible to move it or to detect it. We have the same problem with neutrinos and any neutral particles.
- If one or more μ Domains are included in a particle, the volume of the particle increases. The latter gets more mass. Therefore, the enclosed μ Domains are considered as closed volumes. See Part 1.
- Free μ Domains have a volume of 511 KeV each but, since they can't be moved, they don't curve spacetime to make room. They are massless. See Part 1.

1.5 Basic components of the universe

The basic components of the universe could be those of the following figure 1-2. We will also see that it is possible to build any particles with only these three particles.

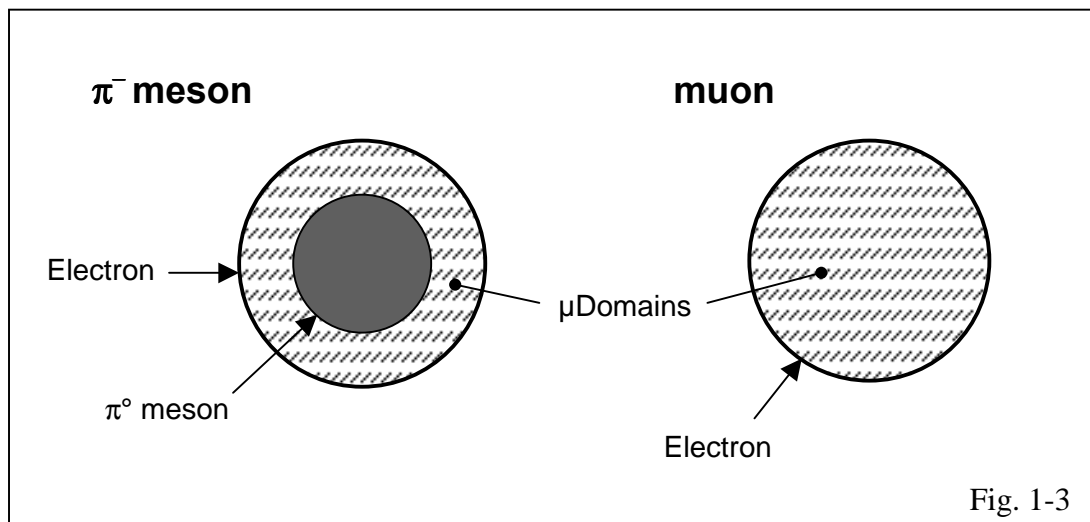
¹ Not exactly. The Spacetime Model predicts that the neutrino has a very little charge. See § 8.2.



Note: We will see, in Part 5 "Forces, the Universe", that the charge of a μ Domain may shift to another μ Domain making electron-positron or matter-antimatter pairs.

1.6 Example of verification

It is impossible to prominently display free μ Domains since they are neutral. However, it is possible to detect them when they are included in some particles. For this purpose, the following example is proposed.



The central particle is the π^0 meson. An electron surrounds it in order to build a π^- meson¹. The outer-shell electron charge is distributed in μ Domains surrounding the central π^0 meson. Some μ Domains are locked up in the mass difference $\pi^- - \pi^0$.

¹ See the following chapter. For the rule of addition of spins, please see paragraph 2-6, Part 4 "Electromagnetism".

It would seem that the μ Domains, electrons and positrons, gather in multiples of 3 or 9^1 . The following calculation (data from PDG) is based on groups of 9 μ Domains. The abbreviated form below is μ D for one μ Domain and μ D9 for 9 μ Domains.

- The muon, including the outer-shell electron, consists of 23 μ D9. Each μ D9 has a volume, i.e. mass, of $105.658369/23 = \mathbf{4.5938 \text{ MeV}}$.
- The difference between the $\pi^{+/-}$ and π^0 meson is $\mathbf{4.5936 \text{ MeV}}$. This difference seems to be equal to one μ D9 calculated from the muon.

The tau would have 387 μ D9. Each μ D9 of the tau has a volume of $1776.99/387 = 4.5917 \text{ MeV}$. We can note that 387 is also a multiple of 9. However, the tau volume (mass) is 17 times more important than the muon mass. An adjustment of the μ Domains according to the volume may be necessary².

The following table summarize the calculation. The CL between the muon and the pion, and the tau and the pion, are:

	μ D9	μ D	CL
π meson	4.5936 MeV	510.400 KeV	(reference)
Muon	4.5938 MeV	510.427 KeV	99.9948%
Tau (adjusted)	4.5937 MeV	510.412 KeV	99.9972%
Tau (not adjusted)	4.5917 MeV	510.189 KeV	Not relevant

As follows:

- The theory predicts that a μ Domain has a volume close to 511 KeV. Calculations give 510,4 KeV for these three particles. It is a normal result since the volume (the mass) of each particle is compressed due to the curvature of spacetime (see Part 2 "Mass and Gravity").
- The CL of correlations obtained is very interesting:
 - Between the muon and the pion: **99.9948 %**
 - Between the adjusted tau and the muon: **99.9972 %**, with a measurement error of **0.0309%**.

At last, these results are close to the center of tolerance of each particle.

¹ This is not a rule but only a simple remark by the author.

² This calculation isn't described in this document but the Author can send his study by email upon request.

2 The "Distributed Charge" Model

Contrary to a preconceived idea, in atoms, the electron is not moving around the nucleus as a punctual particle. Its charge is distributed into quanta, making a kind of "cloud of charges" around the nucleus. This is a consequence of wave-particle duality.

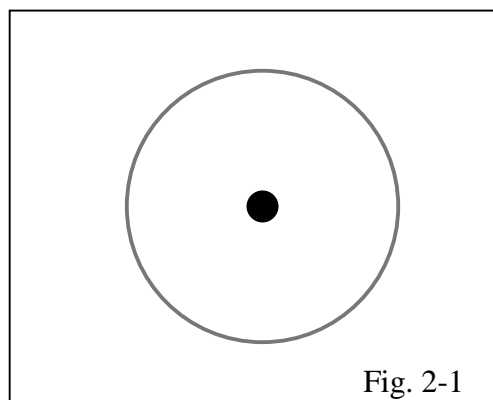
This new model can also be applied to composite particles such as neutrons or mesons and its application is of considerable interest.

2.1 Electron in the atom

Let's imagine a drop of oil on the top of an eggshell. What happens? This drop of oil spreads over the eggshell.

We have seen, in Part 2 chapter 1, that the electron is not moving as a punctual particle but rather as a wave. Its charge is distributed in several μ Domains.

When the wave, i.e. the electron, approaches the nucleus, it takes the form that any polymorphic object, in similar circumstances, does: it spreads out over its orbital, like a drop of oil does over the eggshell. Its form will resemble a thin shell of spacetime density surrounding the nucleus (fig. 2-1).



2.2 The "distributed charge" model

In reality, we don't have a "thin shell" but rather a "*distribution of spacetime density*". The charge of the electron is distributed inside μ Domains (fig. 2-2). This is confirmed by experimentations, in particular that of the electron diffusion by a neutron (see paragraph 6-3).

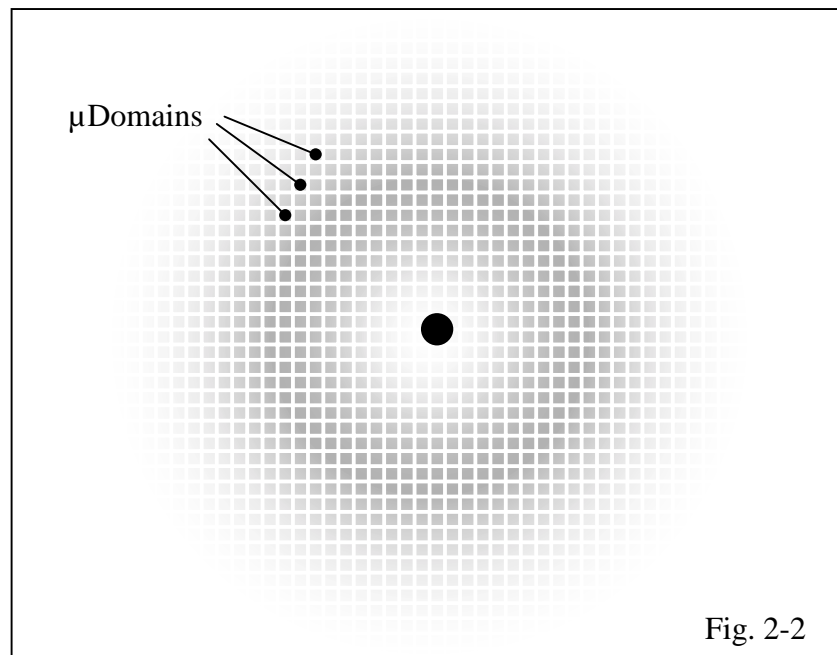


Fig. 2-2

2.3 The Schrödinger Model

Let's imagine, for example, that the electron wraps up the nucleus in 50 μ Domains. Instead of having a continuous moving electron around the nucleus with a charge of -1 , we will have 50 μ Domains with a charge of -0.02 each. This is what is called the "distributed charges" model or, in other words, a sort of "spacetime distribution", since charge is spacetime.

Current theory

The Schrödinger Equation could say that the probability of finding the electron at a given position and at a given time, in this example, is 0.02 . Since, around the nucleus, we have 50 μ Domains, the total probability of finding the electron on its orbital is $0.02 \times 50 = 1$.

Proposed theory

In the Spacetime Model, the measurement¹ does not relate to the electron as a particle, but to a negligible part of its charge. The probability of finding the electron is always 1 (100%) in each μ Domain, but the charge measured is -0.02 instead of -1 . Since we have 50 μ Domains, we obtain the same result.

As we see, from a mathematical point of view, nothing is changed. However, the explanation of this phenomenon is different. In both cases, the whole probability is 1 . Therefore, the Schrödinger Equation can continue to be used, but it would be more correct to replace "probability density" with "charge distribution".

¹ We mention "measurement" making the theory comprehensible, but it is obvious that a real measurement of the electron under the above conditions must be in accordance with the Heisenberg Uncertainty Relation.

Note: Einstein never agreed with this probabilistic explanation posed by Max Born (Nobel prize – 1954). All things considered, the Spacetime Model is more close to Einstein's view than to its opposite Max Born's and Schrödinger's view.

2.4 The vacuum enigma

No one is able to explain why 99,999% of matter is a vacuum. However, this enigma becomes very simple to understand if we consider that electrons, in atoms, follow the distributed charge model.

For example, let's consider a "ball pit", also known as "ball pool" (fig. 2-3).



Fig. 2-3

Each ball is empty. Therefore, the amount of PVC in each ball is very small, so small that we can consider that 99% of the pit is a vacuum.

In atoms, the phenomenon is the same. If the electron is that particle moving around the nucleus, no one can explain why 99.999% of the atom is a vacuum (fig. 2-4A).

If electrons are distributed in μ Domains as figure 2-2 shows, the amount of "matter" (0.001%) is the same but we have the perception that "matter" exists (fig. 2-4B).

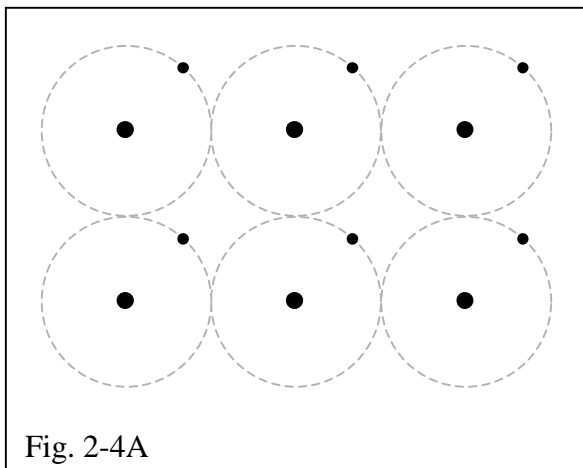


Fig. 2-4A

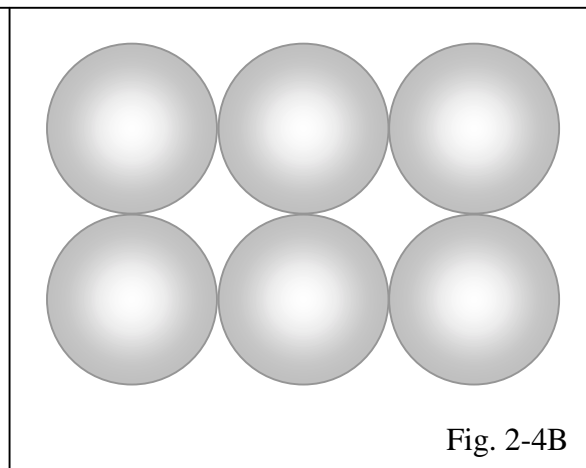


Fig. 2-4B

2.5 The PE effect

The PE effect offers additional proof.

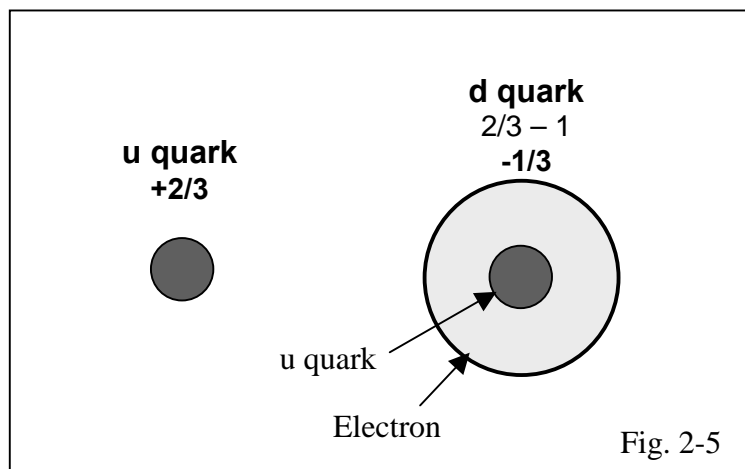
If the electron is that particle moving around the nucleus at a great distance from it (fig. 2-4A), the probability that a photon has to meet the electron is practically zero. Today, under these circumstances, why does the PE yield reach 95%?

If the electron is distributed in μ Domains all around the nucleus (fig. 2-4B), this enigma becomes clear. In such a case, the PE yield may reach 100%.

Note: the footnote of paragraph 3.1, in Part 4, offers more information concerning this enigma.

2.6 U and d quarks

If quarks are built according to the "distributed charge" model, we could have the following scheme (fig. 2-5)¹. This model is confirmed in chapter 5 by a formula that calculates the antimatter in the universe.



Note: The peripheral electron may not be spherical and homogenous.

For the moment, let's say that the central charge of both quarks is $+2/3$. The outer-shell electron of the d quark has a double effect: it decreases the charge from $+2/3$ (u quark) to $-1/3$ (d quark), and it increases the volume, i.e. the mass (see Part 2 "Constitution of Matter"). This explains the mass difference between the d and u quarks.

It should be noted that the volume of the d quark is considerably smaller than that of any atom; it is a closed volume. Since this overall volume is hermetic to spacetime, it is mass-like.

¹ The rule of addition of spins is discussed in chapter 2-6, Part 4 "Electromagnetism".

3 Atom

*Niels Bohr (Nobel Prize - 1922) thought that electrons were continually moving around the nucleus inside the atom. Around 1930, Schrödinger (Nobel Prize - 1933) created another concept: "probability density". In this concept, the electron is a particle, as the third postulate of quantum mechanics indicates: "the probability of locating the **particle** is described by the wavefunction...". The word "particle" is not ambiguous and doesn't mean a wave or anything else. This new concept was an improvement on Bohr's idea but did not solve the enigma of the quantification of orbitals.*

Since atoms are built according to the "distributed charge" model", this chapter is the continuation of the preceding one which covers this subject. We will try to bring logical answers to those questions that are mathematically verified but, so far, remain unanswered.

3.1 Energy levels of orbitals

The Schrödinger Equation gives the mathematical solutions to orbitals with great accuracy but no one can rationally explain this principle. We can take the example of satellites orbiting around Earth. Of course, many satellites may share the same orbit. Why, in quantum mechanics, would it be different? If the electron is a particle which "is moving in all directions" around the nucleus, the quantification of orbitals can't be explained.

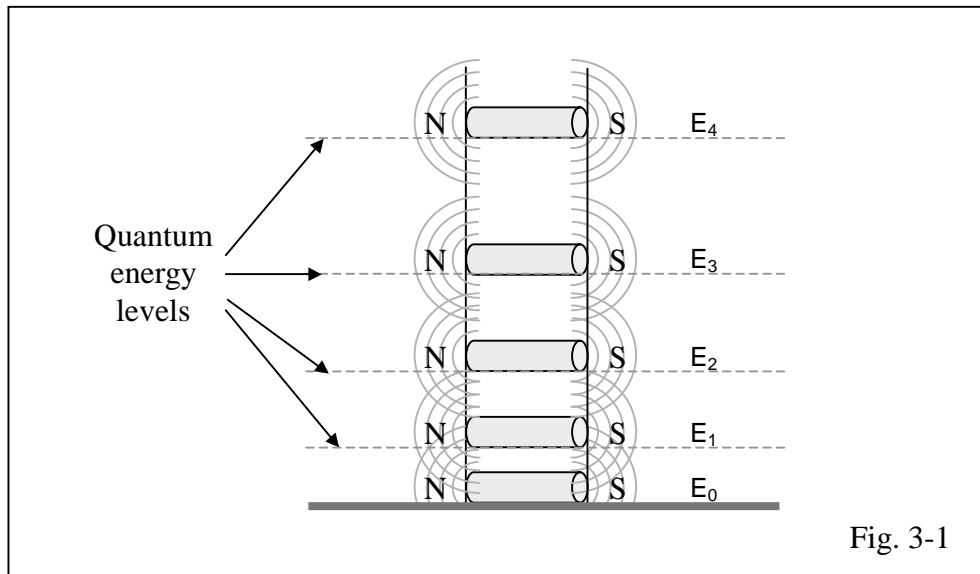
Moreover, if the electron is a punctual particle, the Pauli Principle also can't be explained.

If the charge of the electron is distributed in several μ Domains around the nucleus, according to the "Distributed Charge Model", the quantification of orbitals becomes obvious. The following example explains this phenomenon.

Let's place five magnets, all oriented in the same direction (fig. 3-1), in a vertical rail. Each magnet is subject to gravity, which attracts it toward Earth, and to a repulsive force due to the adjacent magnets.

The lower magnets carry the total weight of the upper ones. This is why spaces between magnets are not equally drawn. The levels $E_1, E_2, E_3...$ are, thus, dynamically built.

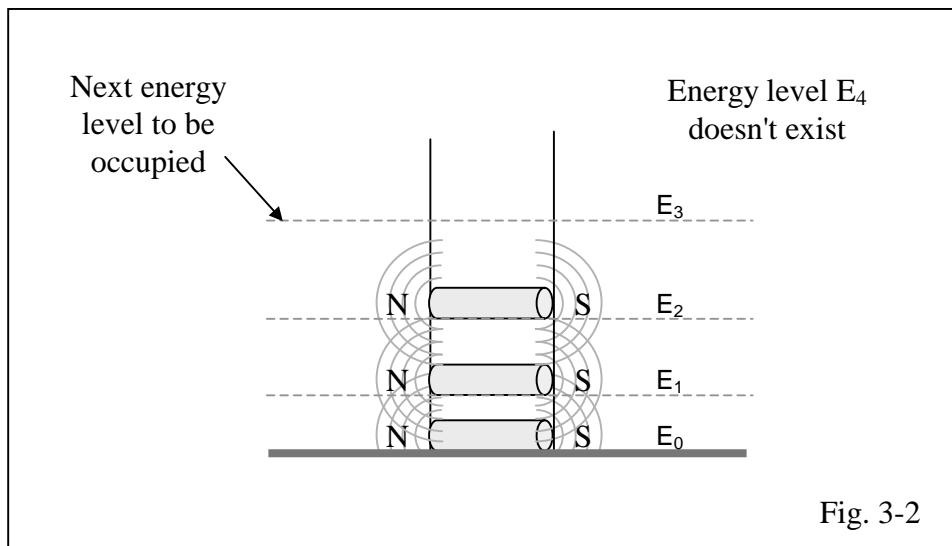
By repeating the same experiment any number of times and under the same conditions, we will always find the same spaces $E_1, E_2, E_3...$. We could think that these magnets are systematically placed on imaginary rails, or "quantum rails", $E_1, E_2, E_3...$. In other words, we could think that the position of each magnet $E_1, E_2, E_3...$ is "quantified".



This example explains the origin of the quantification of orbitals in atoms¹.

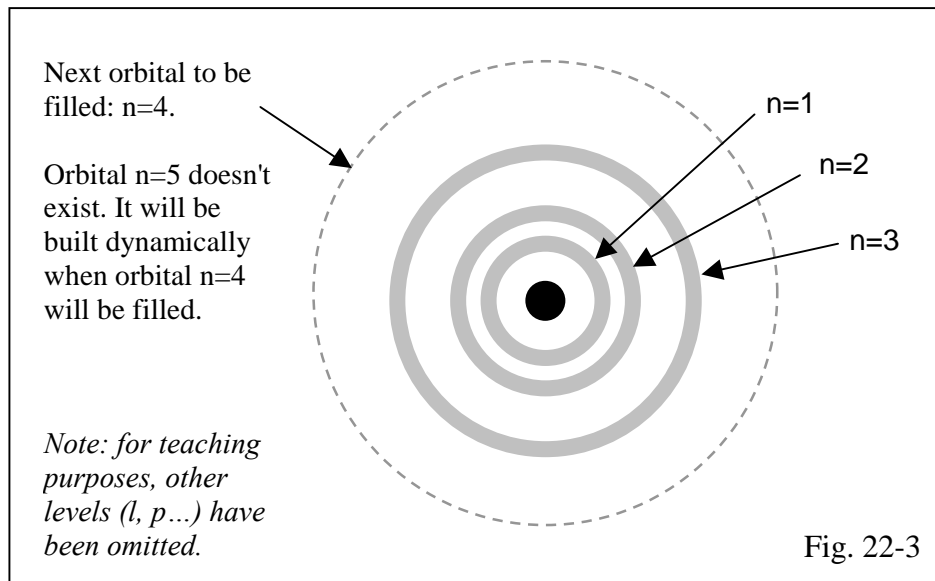
If the electron is distributed in the μ Domains surrounding the nucleus, according to our "distributed charges" model, this enigma no longer exists. The above example explains the construction of orbitals inside the atom. In particular, we must note that the orbitals are **dynamically** built.

In the example, if the magnet E₁ is removed, the magnet E₂ drops down and takes the empty place of the removed magnet (fig. 3-2).



¹ In quantum mechanics, there is often confusion between "discrete" and "quantified". In the Schrödinger Equation, we have both definitions. On one hand, the Laguerre Polynomials are discrete and, on the other hand, the Planck Constant is quantified. In this document, when the two concepts are simultaneously present, we will use the qualifier of "quantified", even if this word is not entirely correct.

Fig. 3-3 shows the principle of the “distributed charge” model inside the atom. This diagram is only for illustration since, as we know, orbitals are not spherical.



To summarize, we can state:

- Levels are **dynamically built**, one after the other.
- An atom cannot have high-level orbitals if low-level ones do not exist. There are, however, a few exceptions¹.
- Since the levels are dynamically built, electrons always tend to fill empty layers.
- If an external disturbance occurs, it modifies the overall magnetic field. In such a case, all the levels may be displaced (level degeneration).

To sum up, the quantification of orbitals is a mathematical illusion. Orbitals are not quantified but are dynamically built taking into account electrons that are still in place. New electrons, distributed in several μ Domains, take their natural place on orbitals having the most favourable Coulomb Force.

3.2 The E_0 energy level

In quantum mechanics, we have another enigma regarding the atom: why doesn't the electron drop on the nucleus yielding its energy? If the electron was a punctual particle moving around the nucleus, this enigma exists and can't be solved. The E_0 energy level was imagined to solve such a phenomenon, but this theory is only a theory, nothing more.

In the Spacetime Model, since the charge is distributed in many μ Domains, the overall charge surrounding the nucleus is stable. This problem doesn't exist.

¹ Sometimes, some orbitals are far from each other. This is the case of the "p" layer orbitals. We can also have coinciding energy levels of layers, like "s" and "p" for example (layers known as "sp").

3.3 Schrödinger Equation

The Schrödinger Equation introduces another enigma: the probability of the presence of electrons is maximal at the center of the nucleus. Why does this curiosity exist?

In the Spacetime Model, the Schrödinger Equation doesn't relate to a probability but to a charge. Since the nucleus (the main charge) is precisely located in the center of the atom, the maximum charge is obviously focused in the center.

That is the explanation of this enigma.

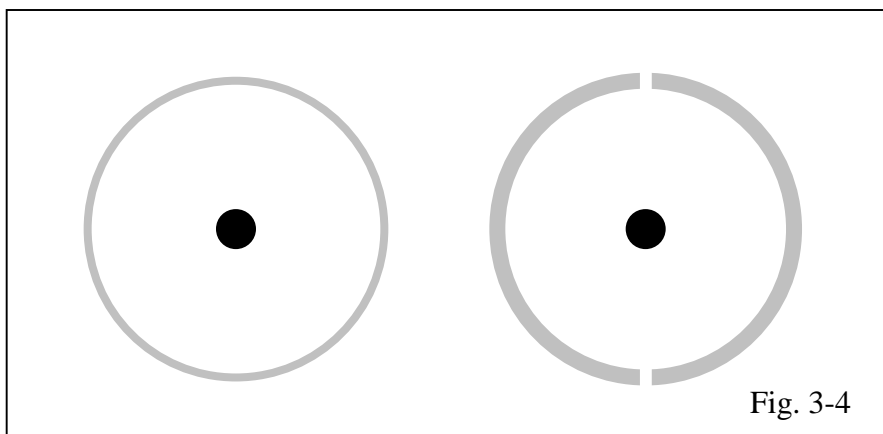
3.4 The Pauli Principle (proposal)

The Pauli Principle is fully demonstrated but no one can explain it. Indeed, if electrons are those punctual particles moving around the nucleus, the Pauli Principle remains a true enigma. For example, would it not be logical to consider that more than two satellites may share the same orbit around Earth. Why would it be different in quantum mechanics?

Around the nucleus, we can have either one or two electrons distributed in several μ Domains (fig. 3-4). If two electrons fill the orbital, the spin locks them up¹.

However, a more accurate explanation of the spin is necessary to fully understand this enigma, but it is obvious that the current model, which is based on a punctual particle moving around the nucleus, is far from reality.

Important note: The following explanation is only a suggestion and must be taken with great care.



¹ Chapters 2-6, Part 4 "Electromagnetism" cover the spin.

4 U and d quarks

We saw that electrons and positrons are charged μ Domains, i.e. μ Domains containing a spacetime density higher and lower than the average density (see Part 2 "Constitution of Matter"). Would u and d quarks follow the same model?

This chapter covers the constitution of u and d quarks. In particular, it proposes a logical explanation of the mysterious charge of $2/3$ and $-1/3$. Applying our "distributed charge" model to the quarks, we obtain relevant conclusions.

4.1 Starting points

The starting points of our quark theory are:

- The universe is made of spacetime. It has only four dimensions. Not one more.
- μ Domains include various relative densities of spacetime: the negative densities, by convention, are electrons, and the positive ones are positrons (see Part 1).
- These electrons, positrons and μ Domains make up quarks
- The "distributed charge" model also applies to quarks.

It is interesting to see that we have two means by which to verify this theory:

1. If this theory is correct, we should find as many electrons as positrons in the universe. This leads to the resolution of the antimatter enigma.
2. If this theory is correct, it should also solve the enigma of the proton's charge. Indeed, the proton's and electron's charges are both strictly equivalent, with a remarkable accuracy of 10^{-21} . This is a true mystery for physicists.

4.2 U and d quarks construction (proposal)

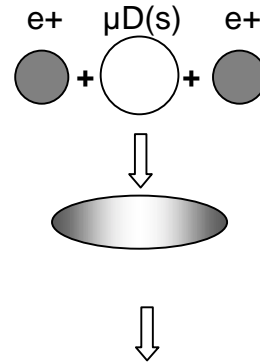
A suggestion of the construction of u and d quarks is represented in figure 4-1. The following sequence is detailed for teaching purposes. This sequence may not be exact. We will see, in chapter 6, that protons, neutrons and hydrogen atoms have a simpler construction.

At last, it should be noted that a confirmation of this quark model is done in the following chapters, in particular concerning the proton enigma and location of antimatter.

Phase 1: Fusion

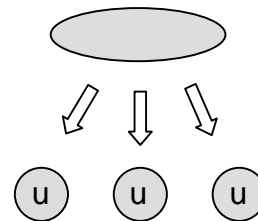
Two positrons merge with one or many $\mu D(s)$ to make a three-particle group. The $\mu D(s)$ is(are) necessary to bind the two positrons, to avoid the Coulomb Repulsion.

The result is an intermediate particle having a charge of +2.



Phase 2: Separation

The charge of +2 tends to be uniformly distributed. When the Coulomb Repulsion appears, the particle decays into three sub-particles. The charge of +2 is then divided into three parts. Each sub-particle, therefore, has a charge of +2/3. These sub-particles are u quarks.



Phase 3: d quarks

When a free electron, in its waveform, meets a u quark, it surrounds the quark according to the “distributed charge” model. The electron closes up one or many μ Domains. Thus, we obtain a charge of $+2/3 - 1 = -1/3$. The volume, or the mass, of the d quark is necessarily larger than that of the u quark. Please note that the fermions/bosons law of addition is covered in paragraph 2-6, Part 4.

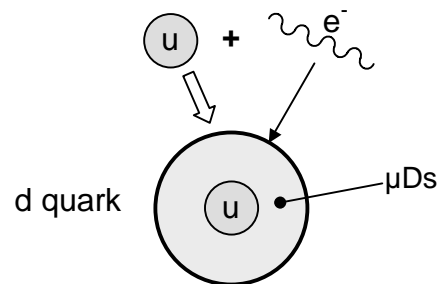


Fig. 13-1

Note 1

Experimentation gives a value different from 511 KeV for a u quark. Several explanations are possible. For example, the two positrons may merge with a $\mu D10$, that is to say a group of 10 μ Domains. In this case, the overall volume will be equal to 12 μD ($\mu D10 +$ two positrons), and each u quark would have a volume, or a mass, of $(12 \times 511 \text{ KeV})/3 = 2\,044 \text{ KeV}$.

It is possible that the volume (the mass) of the u quark is:

$$(n \times 511\text{KeV})/3, \text{ with } n = \text{integer value } \geq 3.$$

It would be premature trying to solve this problem because it is impossible to isolate quarks and, therefore, results of experimentations (from 1.5 MeV to 3 MeV for the u quark) are inaccurate..

Note 2

The scheme of figure 13-1 is probably not exact and needs some adjustments, but there is no longer any doubt about the construction of the u and d quarks from electrons and positrons. If this quark configuration solves so many enigmas, it is not a simple matter of chance.

4.3 Conclusions

We think having:	
<i>(matter)</i>	<i>(antimatter)</i>
electron	positron
u quark	antiquark
d quark	d antiquark
neutrino	antineutrino
muon	antimuon
tau	antitau
etc.	

**Nature is not so complicated.
In reality, we have:**

<i>(matter)</i>	<i>(antimatter)</i>
electron	positron

All particles are combinations of electrons, positrons and empty space (μ Domains)

*What gets us into trouble is not what we don't know.
It's what we know for sure that just ain't so.*

Mark Twain

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5 Antimatter

If the Quark Model previously described is correct, it must provide the solution to one of the greatest enigmas of physics: where is the antimatter in the universe?

Initially, from the Quark Model, we will calculate the quantity of antimatter inside atoms. Then, we will extend this calculation to the antimatter in the universe

5.1 Starting points

If we consider that the basic universe is composed of electron-positron pairs, which are the two basic particles, we may state the two following remarks.

1/ Location in atoms

- If electron-positron pairs were created at the same time and in the same place, positrons are, necessarily, close to electrons.
- We already know where the electrons are.
- Since the atoms are neutral, the positrons we are looking for are probably in the positive part of the atom, the nucleus. That these positrons are associated in quarks or in one form or in another does not matter. One thing is sure, positrons are not far from electrons. In other words, we can say: *Search the electron, and you will find its companion, the positron¹, which, by necessity, is close to it (probably in the positive part of the atom).*

It is obvious that, if at a given time, an electron was created in the universe, its counterpart, the positron, is certainly not 14 billion light-years from the event.

2/ β^+ radioactivity

Let's imagine that each nucleus is a type of balloon filled with helium. We know that, in the universe, we must have a large amount of helium, but we don't know where it is. At the bottom of universe? In extra-dimensions (string theory)? In SUSY? ...

¹ As on Earth: "Search the woman, and you will find her companion, the man"... It is obvious that women and men, necessarily, live on the same planet. It would be strange to consider that women live on Earth, whereas men live on a planet located 14 billion light-years away from Earth.

After accurate investigations, we note that one part per million of helium flows out of each balloon. What should we think? Of course, the immediate thought is: "The little amount of helium that flows out of the balloons leads us to suppose that the balloons are filled with the helium for which we are searching". It is obvious.

In physics, we are faced with the same problem.

We know that a very small amount of antimatter flows out of the nucleus by way of β^+ radioactivity. Whatever the name given to the internal particles, bosons, gluons, X, Y or Z... we can strongly suppose that antimatter is enclosed inside the nucleus. This means that we must undertake our investigations to find antimatter starting with the nucleus¹.

To summarize, these two starting points let's consider that **we have a strong probability of finding antimatter inside the nucleus, and not 14 billion light-years from Earth.**

5.2 Homogeneity of the atom

It has been pointed out that we need two positrons to make three u quarks. We saw also that a d quark is made up of a u quark and an electron. It is, therefore, easy to calculate the number of electrons and positrons inside any atom. The calculation is done in the flowchart (fig. 5-1) on the following page.

Whatever the chemical element is, this calculation indicates that, in any atom, we have exactly the same number of positrons as electrons. Therefore, the antimatter, i.e. positrons, is strictly equal to the matter, i.e. electrons.

This conclusion is in accordance with Feynman's Formalism (Nobel Prize 1965) and QED in which the electron and positron have symmetrical roles in quantum mechanics.

Inside any atom, the number of electrons is strictly equal to the number of positrons

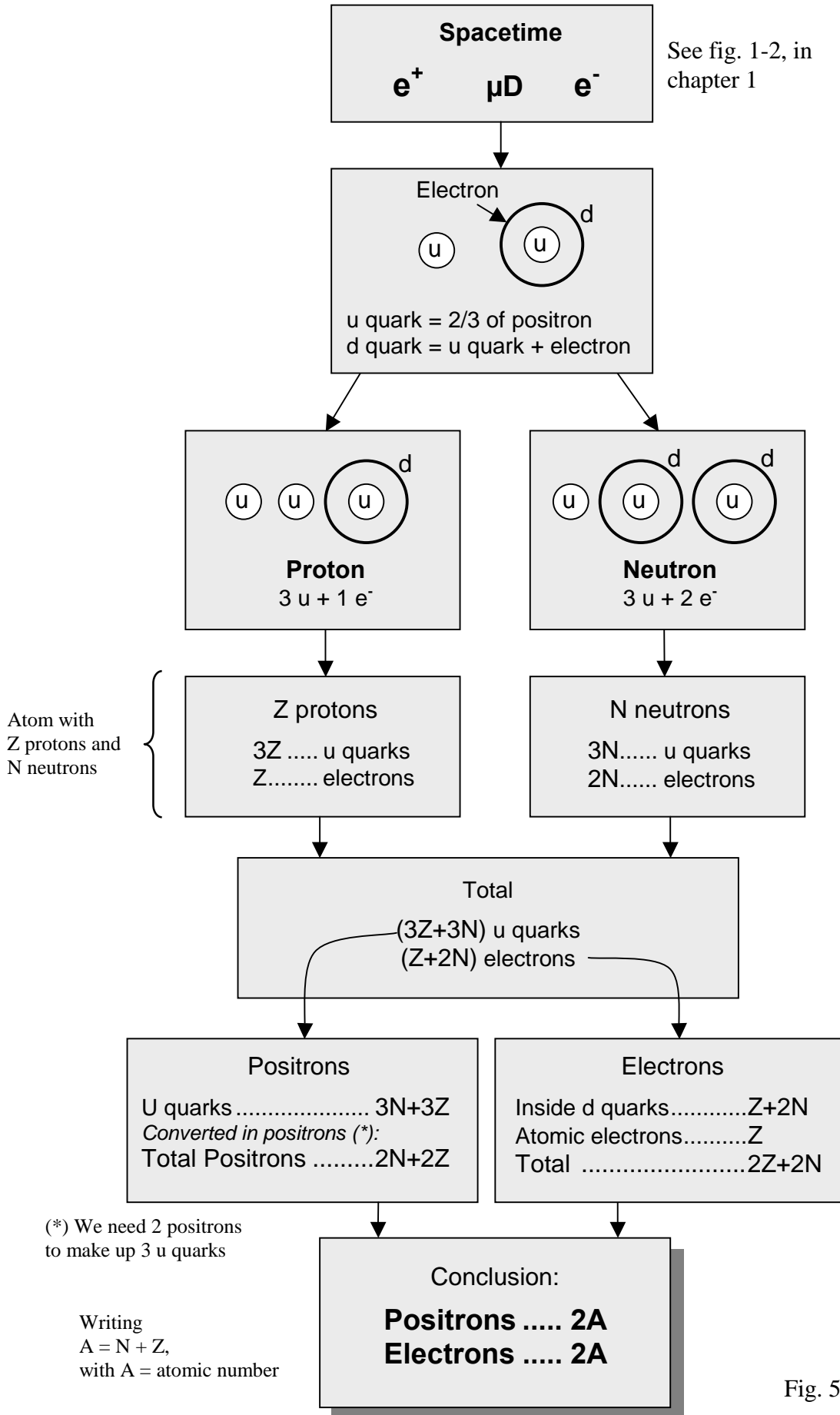
The flowchart of figure 5-1 gives the following formula:

$$k_{e+} = k_{e-} = 2A$$

(5-1)

k = number of electrons or positrons inside an atom
A = atomic number (A=N+Z)

¹ In reality, the β^+ radioactivity is not directly related to quarks (see Part 5). However, the reasoning given here is correct. Without good reason, it is not logical to think that antimatter is located in the deepest universe.



5.3 Example

The table below (fig. 5-2) shows the isobars A = 16. This table must be read as follow:

- u_N : The number of u quarks in neutrons (= N)
- d_N : The number of d quarks in neutrons (= 2N)
- u_Z : The number of u quarks in protons (= 2Z)
- d_Z : The number of d quarks in protons (= Z)
- U_{total} : Since each d quark contains a u quark, the total of u quarks is:

$$U_{total} = u_N + d_N + u_Z + d_Z$$
- **Positrons**: Since three u quarks are made up of two positrons, the number of positrons is 2/3 of U_{total} . This number is e^+ .
- **Electrons**: Each d quark contains one electron. Moreover, we have Z atomic electrons around the nucleus. The total of electrons is therefore: $d_N + d_Z + Z$

Nucleus	A	N	Z	Neutrons		Protons		U_{total}	Antimatter Matter	
				u	d	u	d		e^+	e^-
Be	16	12	4	12	24	8	4	48	32	32
B	16	11	5	11	22	10	5	48	32	32
C	16	10	6	10	20	12	6	48	32	32
N	16	9	7	9	18	14	7	48	32	32
O	16	8	8	8	16	16	8	48	32	32
F	16	7	9	7	14	18	9	48	32	32
Ne	16	6	10	6	12	20	10	48	32	32

Fig. 5-2

Conclusion: We see that we have exactly the same number of positrons as electrons. Matter strictly equals antimatter. This number of electrons or positrons is, in any case, and in any atom, the double of the mass number A. This means that antimatter is located into the nucleons' quarks.

We obtain the same result with any atom or isotope.

This rule, which is verified within the 2930 known isotopes¹, confirms the Spacetime Model

1. The "exotic" Li^3 is the only exception but its existence is not proven. Its acknowledgement depends on published works. In any case, this exception can't be retained as a valid objection. The problem comes from the lack of a neutron. In the Spacetime Model, as we will see, each nucleus needs at least one neutron. The Li^3 doesn't have any. If this isotope does indeed exist, it should decay immediately into three protons. The author doesn't have detailed information about Li^3 .

5.4 Antimatter in the universe

Given our current knowledge and depending on theories, the main elements in the universe are neutrons, hydrogen, and various atoms resulting from the Bethe Cycle or others. Black holes and dark matter are not taken into account since we don't know the exact constitution of these elements.

Neutrons

Each neutron is made up of three “u” quarks and two electrons (see the following chapter, paragraph 6-2). The three “u” quarks are made up of two positrons. Two positrons and two electrons mean that we have a perfect equivalence of matter and antimatter in the neutron.

Hydrogen and various atoms

We simply apply the formula (5-1). For hydrogen, since $A=1$, we have two positrons and two electrons ($= 2A$).

To summarize, the formula of the antimatter in the universe is:

$$k_{e^-} = k_{e^+} = 2n_n + 2n_H + \sum_{A=2\dots m} n_A 2A + \varepsilon \quad (5-2)$$

With:

- k_{e^-}, k_{e^+} Number of electrons or positrons in the universe
- n_n Number of neutrons in various elements. The “2” factor comes from formula (5-1).
- n_H Number of hydrogen atoms¹ in the universe. As in the neutron calculation, the “2” factor comes from the formula (5-1).
- Index A** Atomic number of the various atoms in the universe. The limit “m” is the maximum atomic number supposed in the universe. “A” serves as an index too. It starts from 2 since we have already taken hydrogen into account.
- N_A Number of atoms, of index A, in the universe.
- $2A$ Number of electrons or positrons of the atom of index A. The “2” factor comes from the same formula (5-1).
- ε Free electrons and positrons in various forms in the universe, other particles, free electrons from ionized atoms etc.. This quantity is negligible when compared to the other terms.

The universe contains strictly the same quantity of matter (electrons) as antimatter (positrons)

¹ Excluding the hydrogen isotopes, which are calculated in the following term.

5.5 Validation of the Spacetime Model

The confirmation of the theory on the antimatter of the universe, which is applied to the 2930 known elements without exception, is of considerable interest: **it validates the entire Spacetime Model.** Indeed, this conclusion is the synthesis of all preceding discoveries. The following flow chart (fig. 5-3) clearly states that, before coming to this important conclusion, it was necessary to find the solution to many unsolved enigmas of contemporary physics.

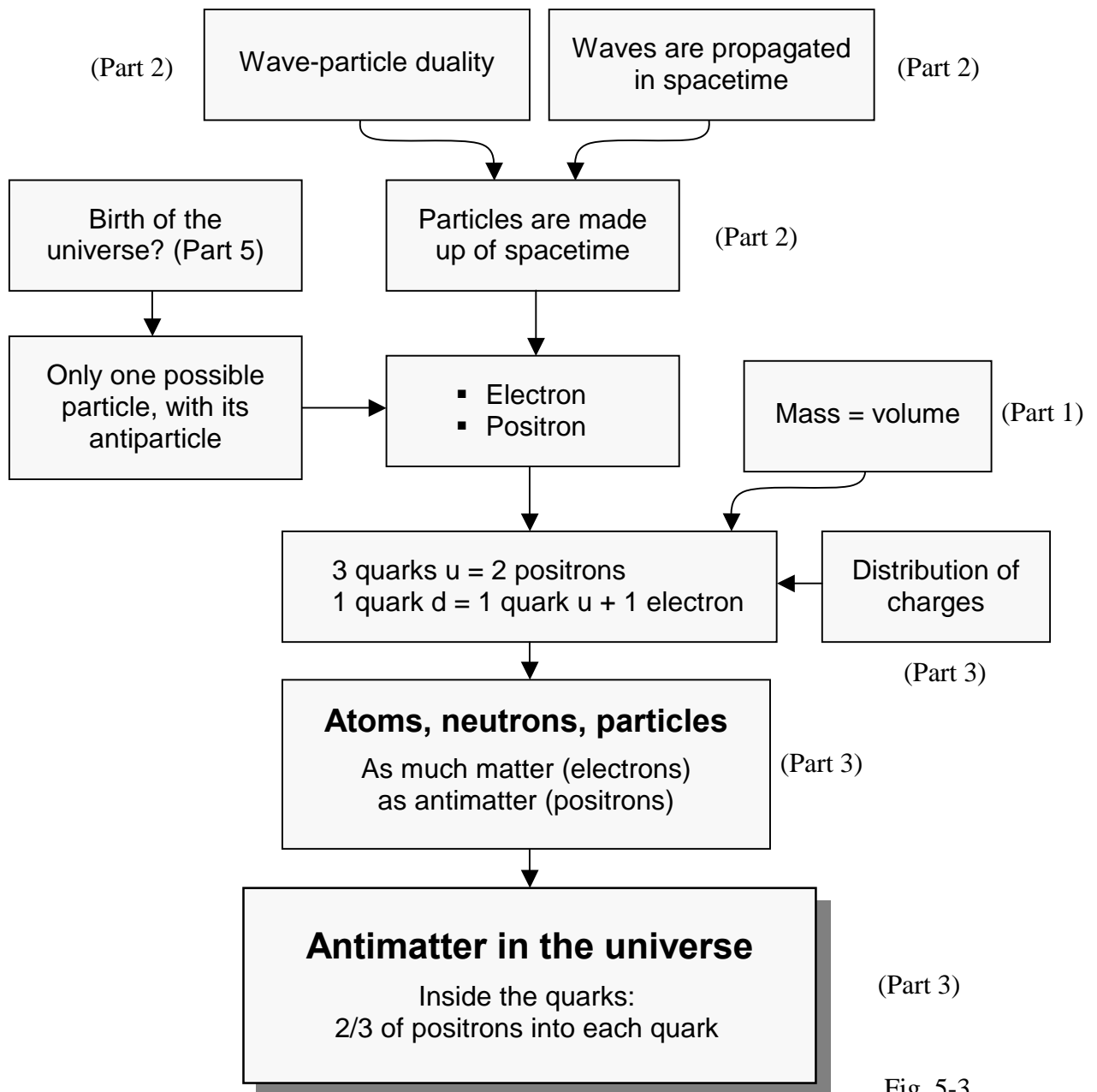


Fig. 5-3

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“The greatest joke that Nature has played on us was to have us believe that antimatter is at the edge of the universe when it is right before our eyes, into the quarks.”

6 Nucleons

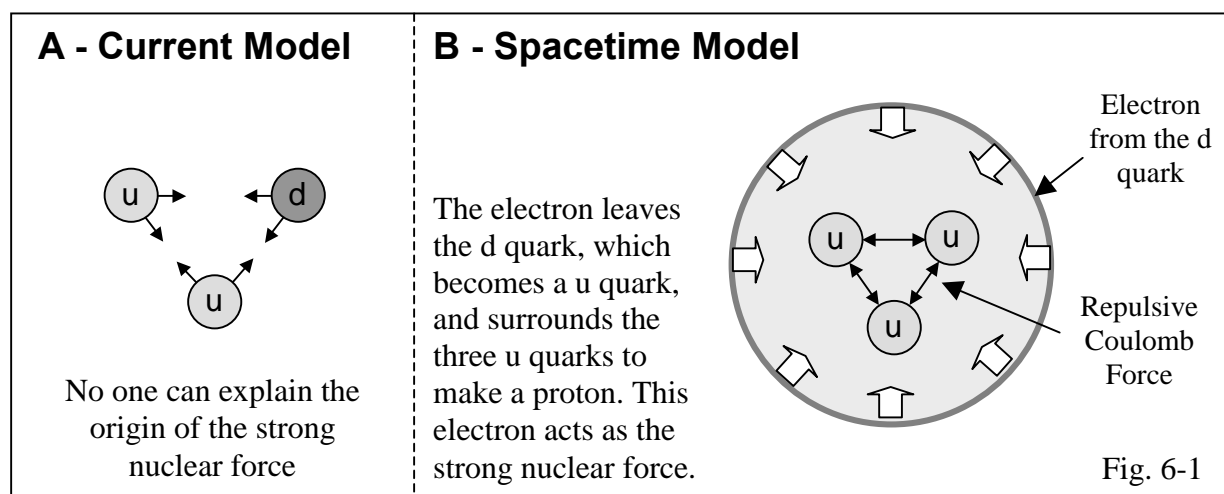
The explanation of the enigma of the antimatter in the universe confirms the quark model described in chapter 4. Are the nucleons affected by this structure?

This chapter covers the proton and neutron schemes according to the "distributed charge" model. A scenario of the creation of nucleons is proposed.

6.1 Proton

The (u u d) quark structure of the proton in figure 6-1A is not exact and must be replaced by the (u u u) + electron structure (fig. 6-1B), which is in perfect accordance with experimentations. That does not change any previous calculations of antimatter.

Indeed, the three quarks (u u d) are not bound by a hypothetical strong nuclear force whose origin is unknown. Nature made things a lot simpler. A free electron surrounds the three u quarks and keeps them locked up. This electron acts as a rubber band: the more one moves away from the center, the stronger the force becomes. When the proton interacts, its electron surrounds a u quark, which becomes a d quark. This makes us believe that the d quark exists inside the proton. This, however, is an illusion. Examination of some interactions and logical deductions let's suppose that the d quark is built during the interaction with the proton's electron of one of its three u quarks.

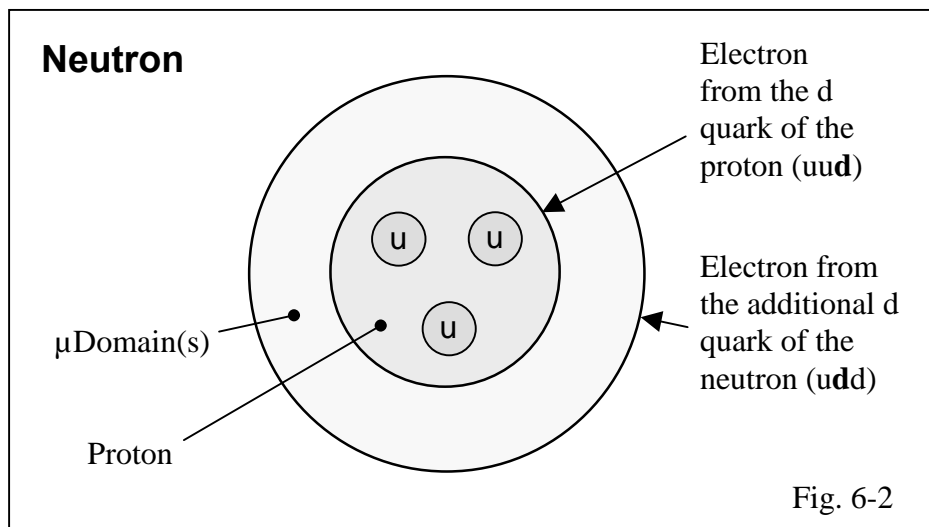


6.2 Neutron

The neutron is a proton surrounded by an electron (fig. 6-2). Please note that the fermions/bosons law of addition is covered in paragraph 2.6, Part 4. This electron has two effects:

- It cancels the positive charge of the proton making it neutral
- It increases the volume, i.e. the mass, of the proton.

These effects are confirmed by experimentation. However, μ Domains are probably kept closed between the two electrons surrounding the three quarks. If that were the case, the pressure made by the outer-shell electron, due to the Coulomb Force, would decrease the μ Domains volume, which would be lower than 511 KeV.



...And, as we could expect from experimentation,

The decay of the neutron gives a proton and an electron¹

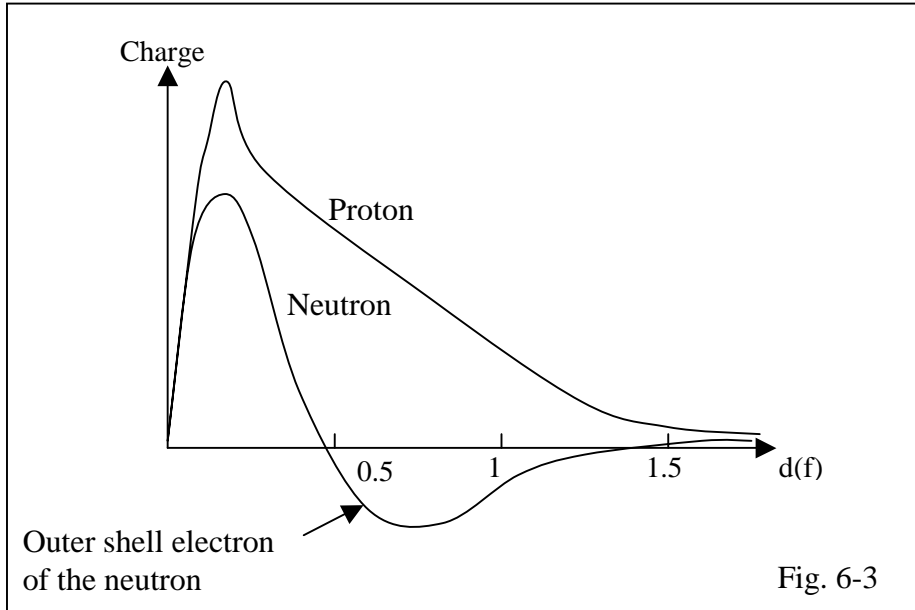
6.3 Confirmation by experimentation

The shape of the neutron reflects exactly our “distributed charge” model (fig. 6-3). The neutron is neutral only at 1.5 to 2.10^{-15} m.. A negative charge appears at a distance of 0.5 fermi. No one can give a rational explanation of this phenomenon.

The Spacetime Model offers a very simple explanation of this enigma. The negative charge comes from the electron surrounding the proton to make up a neutron (fig. 6-2). Therefore, this well known experimentation confirms that:

1. The neutron is made of an electron, which surrounds a proton,
2. Since this experimentation is a reality, the “distributed charge” model is a reality too.

¹ Since the antineutrino is a secondary effect (see chapter 8), it is not mentioned here.



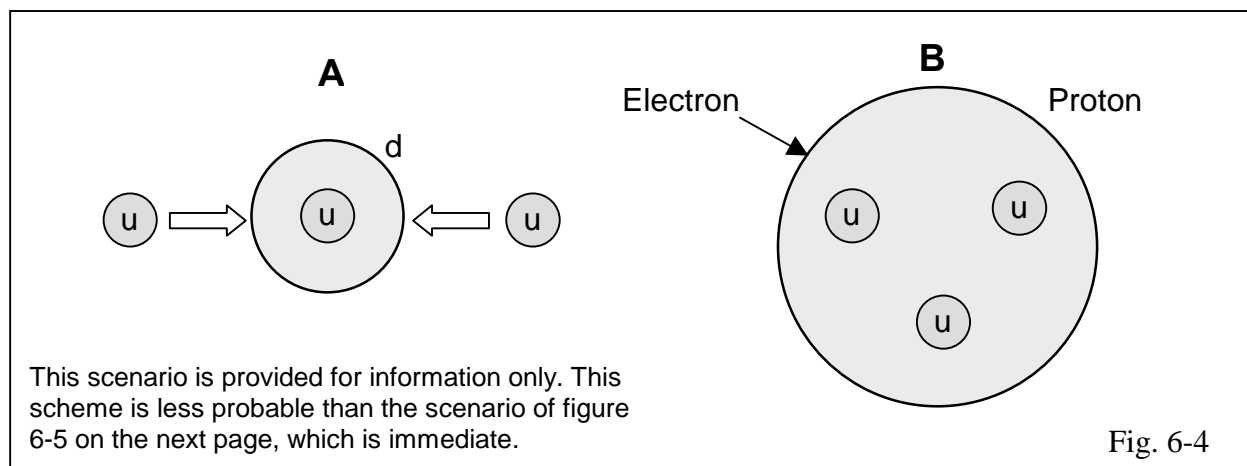
6.4 Direct proton creation

The scenario of the creation of protons described here, at the very first moments of the universe, is more probable than other scenarios because it is simpler. It is also perfectly logical. Its description is given in figure 6-5 on the following page. It should be noted that the creation of protons is immediate and only requires one phase.

It was pointed out, earlier, that the universe, at the time of its creation, was necessarily **very simple**. By no means is this an assumption or a conjecture. It is a necessity. Any phenomenon during its creation, whatever it is, is necessarily very simple too.

The simplest is the best.

As an alternative scenario, figures 6-4A and 6-4B require two stages. The u and d quarks are initially built separately. Then, a d quark attracts two u quarks. The electron leaves the d quark and surrounds the three u quarks to make up a proton.



This scenario is provided for information only. This scheme is less probable than the scenario of figure 6-5 on the next page, which is immediate.

Building H atoms and neutrons from spacetime

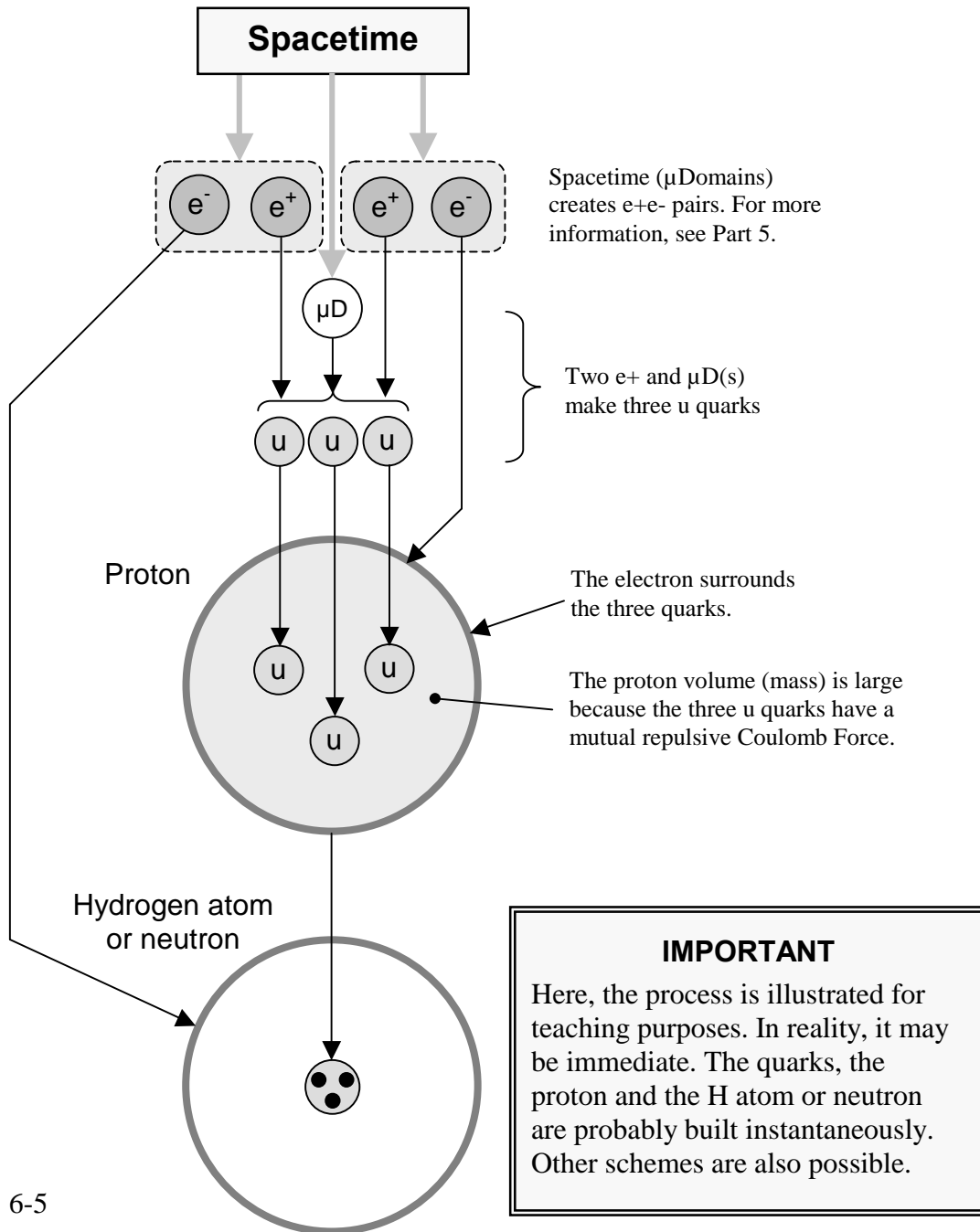


Fig. 6-5

6.5 Proton synthesis

When experimentation produces a proton, this particle is not directly created. The collision of the incoming particle(s) with the target produces spacetime movements, which split into electrons and positrons or, in other words, into electrons and quarks. This scenario is exactly the same as the gamma production from an e^+e^- pair. Conversely, a gamma ray may produce a new e^+e^- pair and so on... Thus, the proton synthesis or meson/baryon interactions are not "special interactions" since particles and waves are made of spacetime. We must keep in mind that "all is spacetime".

6.6 Asymptotic freedom

The "asymptotic freedom" discovered by David Gross, Frank Wilczek and David Politzer (Nobel Prize 2004) states that, contrary to the other forces whose intensity decreases with the distance from interaction, the strong nuclear force increases with it. Thus, the quarks are practically free at short distance, but are prone to a very strong force, which ties them together when they move away from each other.

Very often, physicists use the image of a rubber band to explain this asymptotic freedom: the more we move away from the center of the rubber band, the more intense is the recall force.

That is exactly what the electron does in the Spacetime Model. Like a rubber band, it surrounds the three u quarks and prevents them from moving away from each other.

Note: This model of nucleons was not built of all parts to satisfy the asymptotic freedom theory. It results from the polymorphism concept of the wave-particle duality enigma described in Part 2, chapter 1.

The initial problem, for the author, was to logically explain the "probability density" of the Schrödinger Equation. The concept is mathematically perfect, but no one can rationally explain the probability. The "distributed charge" concept is a more rational solution.

The author extended this model to all particles, quarks, baryons, mesons.... In this way, he noticed that, finally, all components of Nature are based on the same concept, the "distributed charge" model. One of the major successes of this model is to explain perfectly the enigma of antimatter in the universe (see chapter 5). It also means that the strong nuclear force doesn't exist per se. Instead, the electron acts as a rubber band and produces a Hooke Force, which is an elastic force. This conclusion is nothing but the logical connection between the Author's "distributed charge" model and the asymptotic freedom theory.

So:

The "distributed charge" model is in perfect accordance with the asymptotic freedom theory and experimentation.

6.7 Hydrogen atom (proposal)

As curious as it seems, there is no difference between a neutron and a hydrogen atom (fig. 6-6). In both cases, an electron surrounds a proton, in accordance with the distributed charge model. The Δ° could probably be inserted into this scheme, as the Δ^{+} in a similar proton scheme.

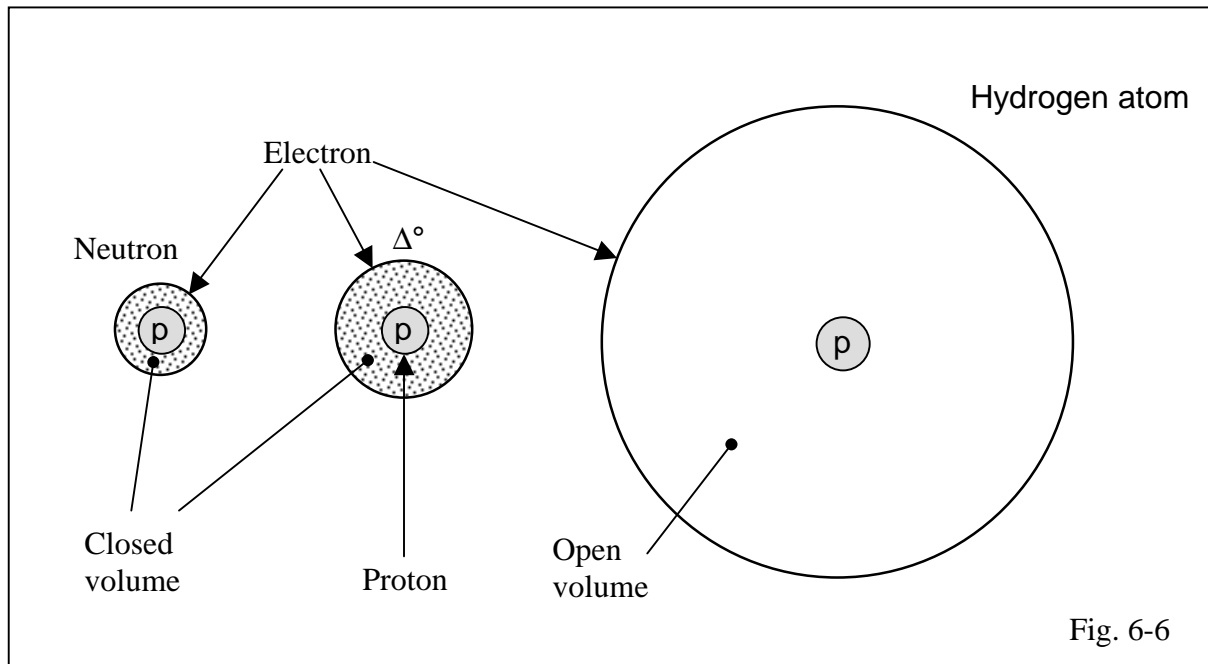


Fig. 6-6

The only difference is the mass. In the neutron and Δ° , the electron creates a closed volume, with mass, while in the hydrogen atom, it creates an open volume, or is massless, since its orbital is much larger and is "porous" to spacetime.

Nature's favoring of the neutron or the hydrogen atom may be a simple fact of proximity and energy. When the proton is met, if the electron-wave is large, a hydrogen atom may be created. Conversely, if the electron-wave is small, as in a proximity phenomenon, a neutron may be created. This suggestion must be studied thoroughly.

Note: Information in this paragraph needs verification and must be considered with great care.

6.8 Equality of charge of the proton

One of the greater mysteries of physics is the charge of the proton: why is it strictly equivalent to that of the electron, with a theoretical accuracy of 10^{-21} ?

With the "distributed charges" model, the explanation of this enigma becomes very simple:

- The proton is made up of three quarks (u u d)
- But the quarks (u u d) are made up of (u u u) and one electron
- The quarks (u u u) require 2 positrons, and thus have an overall charge of +2.

- Since the "d" quark is a "u" quark surrounded by an electron, the resulting charge is $+2 - 1 = +1$
- In this way, it seems logical that the proton charge, +1, would be equal to the electron charge since it comes from the excess positron.

**To summarize, the charge of the proton is:
2 positrons – 1 electron = 1 positron.**

So, as in the resolution of antimatter of the universe,

The charge of the proton, which is exactly +1, comes from only one basic particle: the positron.

This explanation shows that:

- **The three quarks (u u u) of the proton come from two positrons**
- **The "d" quark is a "u" quark surrounded by an electron**

6.9 Antineutron

Experimenters try to detect spontaneous transformation from neutrons to antineutrons. It is theoretically possible if energy allows it (fig. 6-7, on the following page).

- The neutron decays in (u u u) quarks and two electrons.
- The (u u u) quarks are recomposed into two positrons.
- In addition, the two electrons are linked with μ Domain(s) in order to make up three antiup quarks.
- The two positrons surround these three antiup quarks to make an antineutron.

The neutron and the antineutron are both made up of two positrons and two electrons.

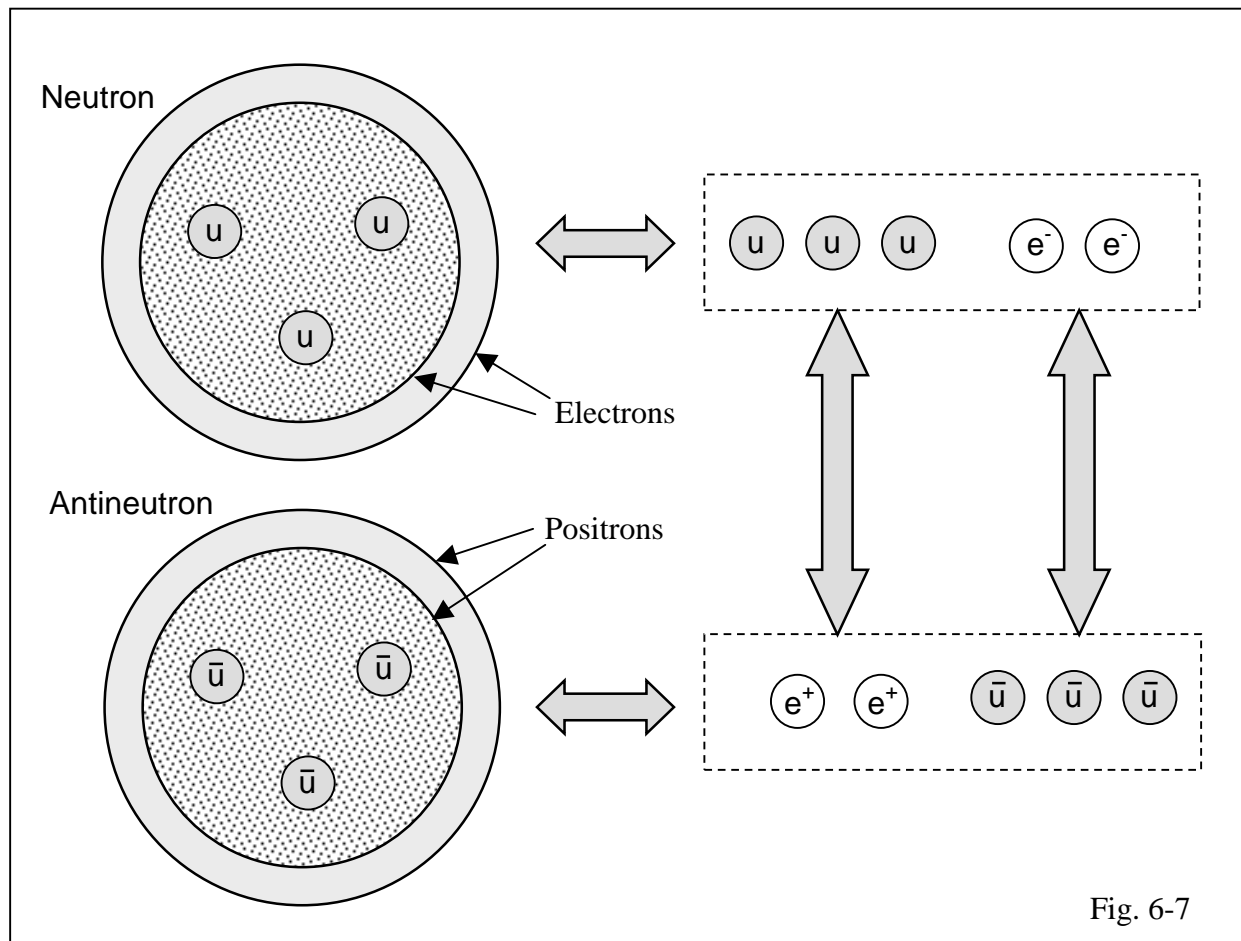


Fig. 6-7

7 Interactions

In Part 2, we have already studied two interactions, the e^+e^- pair production by a gamma, and the opposite effect, the e^+e^- annihilation. Since all components are made up of spacetime, it is possible that various interactions follow the same rule as the e^+e^- production or annihilation.

This chapter covers basic interactions to establish a guideline.

7.1 Guiding principles

According to the first principle of duality pointed out in chapter 1 of Part 2, any EM wave may be transformed into a particle and the converse. We must always keep in mind that

**Particles do not come from a vacuum
but from spacetime movements**

For example, figure 7-1 on next page, shows the creation of six quarks, three u and three u bar, an e^+e^- pair, and a residual gamma. All these components are created at practically the same time from the spacetime movements, or gammas.

In this example, the most probable scheme is the creation of a proton-antiproton pair. However, any other particles may be created. Of course, we must have the same quantity of electrons-positrons before and after the interaction, including the gammas¹. Finally, the incoming gamma provides many possible combinations.

The same principle may be applied in high-energy interactions. The particles' jets come from spacetime movements produced by the particle collision.

In our example, the creation of three u/u bar quarks requires the presence of two positrons/electrons very close to each other. The particles are created mainly due to energy, but the proximity should probably also be taken into account.

¹ This new way to consider that, in the universe, we have only three components, the electrons, the positrons and the μ Domains, doesn't change the current formulas in quantum mechanics.

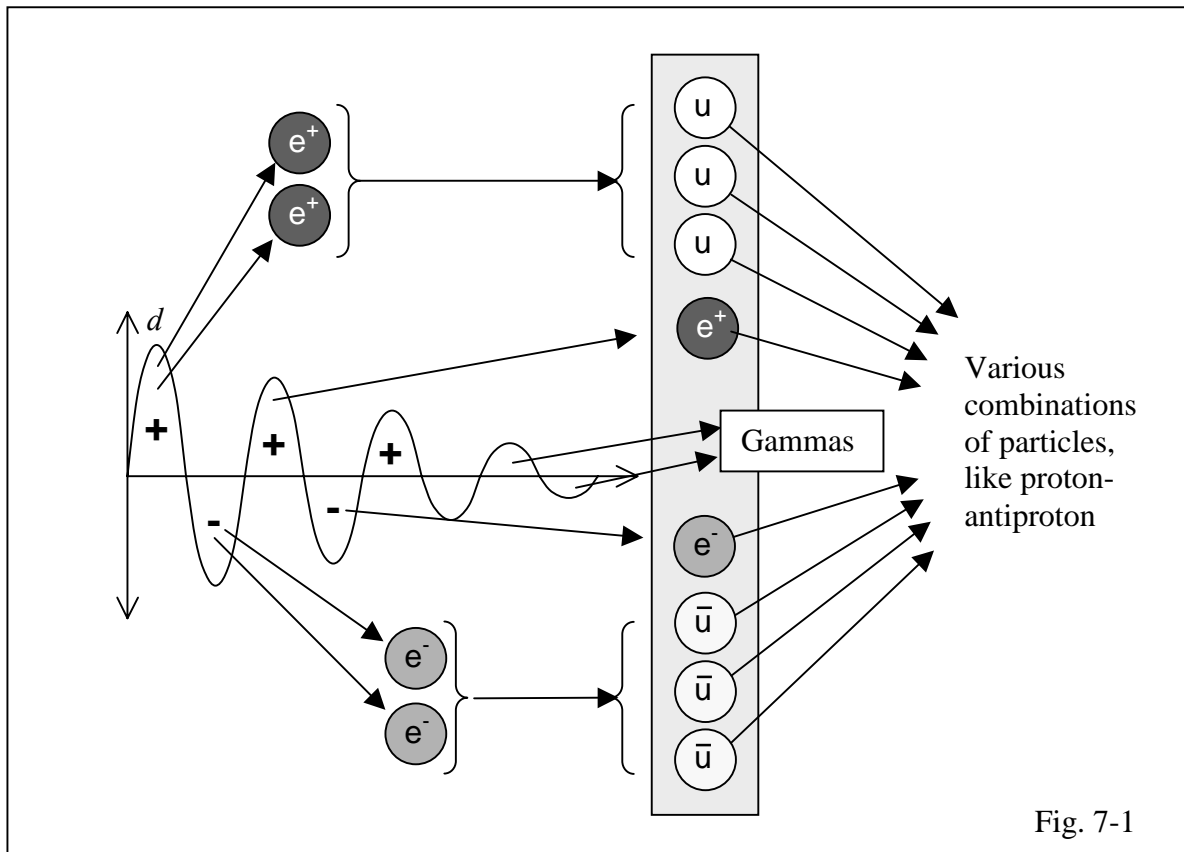


Fig. 7-1

It should be noted that these schemes are in perfect agreement with Feynman's diagrams.

*Spacetime (waves) is converted into
spacetime (particles) and the converse.*

**All interactions become
virtually possible**

This means that any heavy particles (SUSY...) may exist and will probably be discovered in the future since all particles are made of spacetime¹.

7.2 Formulation (proposal)

This document contains many schematics for teaching purposes. However, sooner or later, it will be necessary to classify particles according to the Spacetime Model.

¹ Since the real nature of the spin is unknown, it is not impossible to find some heavy particles having a spin = 1 or 2 or, why not, 3 or 4.... Such cases do not mean that these heavy particles would explain gravity or other phenomena. A good knowledge of the spin mechanism is necessary before making any assertion.

In this way, it would be useful to have a simple method of representing the internal structure of the basic components, electrons, positrons, quarks....

The following scheme can be used. A parenthesis means an electron or a positron is surrounding the other basic particles. Of course, parenthesis must go in pairs. For example:

d quark	e-(u)
Proton	e-(u, u, u)
Neutron	e-(e-(u, u, u))
Antiproton	e+(u bar, u bar, u bar)
etc...	

The particles that surround the others are the electron and positron. They act as the "strong nuclear force". Since this force is necessary in any composite particle, meson, baryons..., we can state the following rule¹:

All composite particles must have
at least one parenthesis pair

Or, as an alternative,

All composite particles must have
at least one electron or positron

¹ However, there are two exceptions, the Li^3 isotope, which may not exist, and the Δ^{++} , which is not stable.

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8 The Standard Model

The Standard Model does not take into account the origin of the quarks, i.e. the positrons. Moreover, the presence of neutrinos among the leptons is very debatable.

This chapter is a complement to the Standard Model.

8.1 Basic particles

The scheme of the construction of quarks is indicated in the table 8-1 on the following page.

The s, c, b and t quarks may be built with electrons and positrons, like the u and d quarks, with particular schemes and energy levels. This is also the case with the two other leptons, the muon and the tau, which are built with an electron. For that reason, these particles have not been represented in this table.

8.2 Neutrinos

Within the Spacetime Model, the properties of neutrinos are not in accordance with the Standard Model. Here are their properties:

- Neutrinos seem to be backward movements in spacetime (see Part 2, chapter 5). Sometimes, a simple annihilation can produce this backward movement; sometimes, various interactions are responsible. This means that neutrinos may depend on the interaction. However, this assumption requires verification.
- So, neutrinos are not "basic particles" but rather a kind of "secondary effect".
- The volume (mass) of the neutrino should be equal to the very slight difference in the volume of particles involved in the interaction.
- If the neutrino comes from an e⁺e⁻ annihilation, its mass is equal to the difference of mass between the electron and the positron. As stated in Part 2, the neutrino seems to be a "residual particle", more exactly a "residual wave".
- The Spacetime Model predicts that **neutrinos would have a very small charge**, lower than a few parts in a million. Usually, physicists consider that the charge has an integer value of -1, 0 or +1, except for quarks and some particles like the delta⁺⁺.

This point of view explains why the neutrino's charge has always been considered equal to zero. The fact that much experimentation has been conducted near a neutron reactor has not been taken into consideration so this very slight charge has never been highlighted¹. On the other hand, *"we find only that we are looking for"*.

- In an e⁺e⁻ annihilation, a possible charge would be equal to:

$$q = \frac{M_a - M_b}{M_a} 1.602 \times 10^{-19} \text{ C}$$

With:

q = charge of the neutrino, in Coulombs

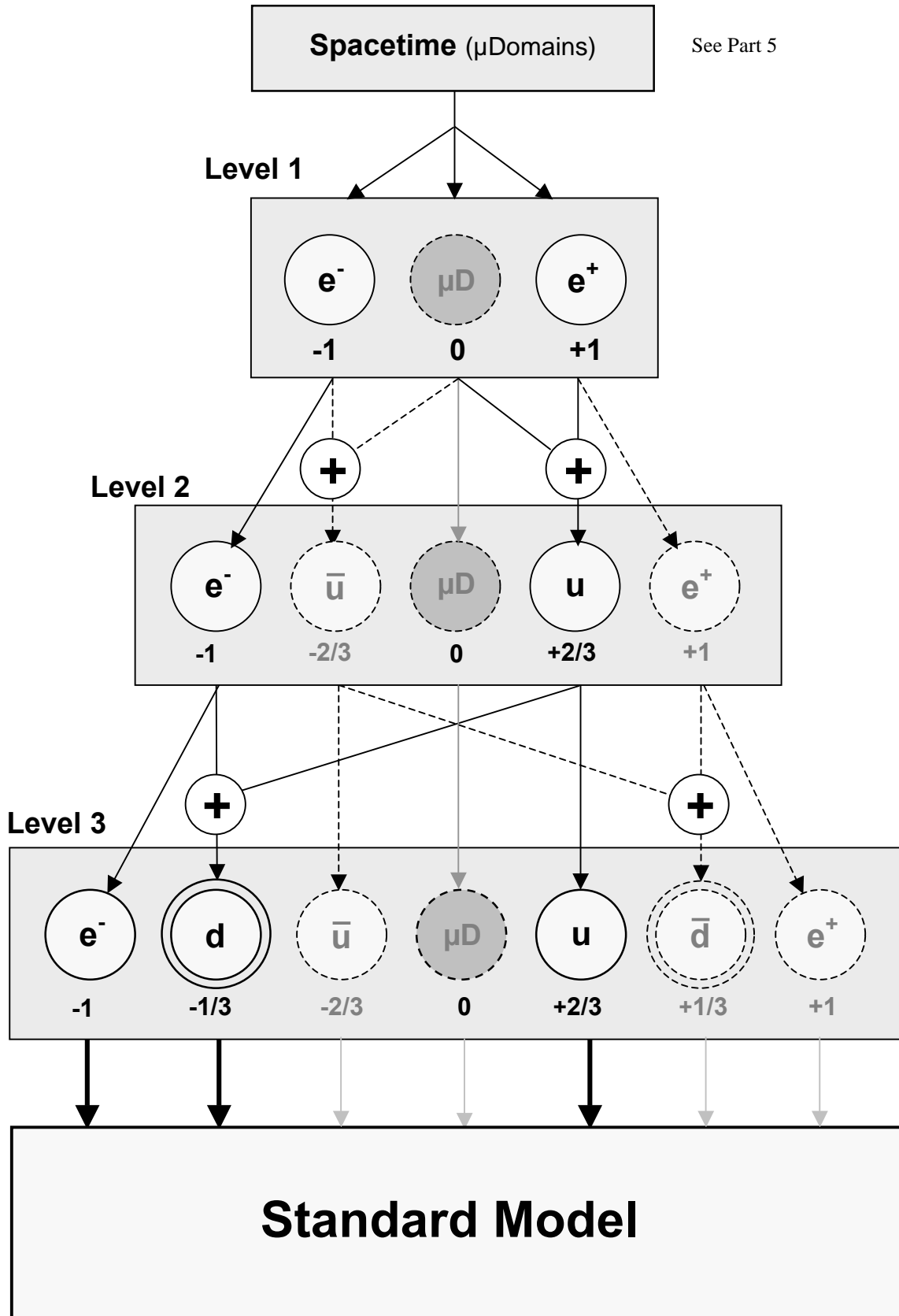
M_a, M_b = mass, or volume (see Part 1), of the electron and positron. The greatest mass of both is M_a.

- The charge should have the polarity of the particle having the greatest mass.
- Since the neutrino comes from an electron or a positron, its spin must be 1/2. Experimentation confirms this point of view.
- In the Spacetime Model, the only basic neutral particle that could exist is the μDomain. A neutral particle like the neutrino should not exist.

8.3 Other particles

Among the seven particles of level 3 on figure 8-1, two are the basic particles of all the stable matter in the universe: the electron and the u quark. The d quark is not a "basic" particle since it is made up of a u quark and an electron.

¹ However, it is possible that a quantum of charge may exist. In such a case, the charge of the neutrino may be equal to zero. Please note that this quantum of charge, if it exists, must not be confused with the Planck Quantum of charge, which is not a real quantum like "h" but a unit (the word "quantum" often leads to a confusion).



Note: As indicated in paragraph 8.1, this figure does not include neutrinos and particles of groups 2 and 3, such as heavy quarks, which are various combinations of electrons and/or positrons.

Fig. 8-1

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Complements

Predictions

- The u quark is made up of two positrons and μ Domain(s) (Chapter 4).
- The d quark is a u quark surrounded by an electron (Chapter 4).
- Antimatter is located inside nuclei, more exactly, inside quarks (Chapter 5)
- An elastic diffusion of electrons on the d quark would highlight its “distributed charge” model. The graphic must be close to that of figure 6-3.
- The configuration of the proton is e-(u u u) instead of (u u d) (Chapter 6)
- The neutron is a proton surrounded by an electron (Chapter 6).
- The strong nuclear force doesn't exist if the particle or nucleus has not at least one electron or one positron (paragraph 6.6).
- The neutrino could have a very slight charge (Paragraph 8.2)

Partitioning the theory

The five parts of the Spacetime Model can be downloaded at the following URL address:

- Part 1** Mass and gravity..... www.spacetime-model.com/mass.pdf
Part 2 Constitution of Matter www.spacetime-model.com/matter.pdf
Part 3 Quarks and Antimatter www.spacetime-model.com/quarks.pdf
Part 4 Electromagnetism www.spacetime-model.com/electromagnetism.pdf
Part 5 Forces, the Universe www.spacetime-model.com/forces.pdf

Part 1 - Mass and Gravity

Mass

In our world, mass and volume seem to be two different quantities because in atoms, the mass is not proportional to the volume. So, we have a large range of atoms with different mass and volume. However, at the particle level, mass = volume. In reality, we have five classes of volumes. The two main classes are:

1. **Closed volumes.** These volumes produce a displacement of spacetime. As we know, the spacetime curvature produces gravity, but it also produces a "mass effect". Electrons are examples of closed volumes. Indeed, electrons have a mass.

.../...

.../...

2. **Open volumes.** These volumes exist but do not produce any displacement of spacetime. If there is no curvature, there is no "mass effect" either. Orbitals in atoms are examples of open volumes. Indeed, orbitals are massless.

Each atom has a particular proportion of open and closed volume. This is why mass and volume seem to be two different quantities but this is an illusion. At the particle level, more exactly at the electron and positron level, mass equals volume. Composite particles, like mesons, are combinations of other classes of volumes.

Gravity

Contrary to a preconceived idea, spacetime is not curved by mass but by closed volume. This phenomenon is the same as when a ball is immersed into water: It is the volume of the ball, and not its mass, which produces the displacement of water.

Part 2 - Constitution of Matter

Before understanding the constitution of matter, the author had to solve three enigmas:

1. How to explain the wave-particle duality from a scientific point of view.
2. Why electromagnetic waves have a constant speed of 300 000 km/s.
3. How an e^+e^- pair can be transformed into two gammas of 511 KeV, i.e. how matter is transformed into waves and the converse.

The solving of these three enigmas conducts to the knowledge of the constitution of matter and EM waves. This new theory is confirmed by much experimentation.

Part 4 - Electromagnetism

The mystery of the wave-particle duality solved in Part 2 leads to a full knowledge of electromagnetism. This phenomenon is quite simple to understand.

In short, when a charged particle is motionless, its electric field has a spherical symmetry. When it moves, it becomes a wave and its spherical symmetry disappears. Its 1D space is transformed into a 2D/3D space. A magnetic component (2D/3D) is added to the electric field (1D) of the particle.

This phenomenon is exactly what experimentation proves ($\Delta q/\Delta t$).

Part 5 - Forces, the Universe

Nuclear force

Electrons or positrons, which surround other particles as a spacetime wave, produce a recall force toward the center of the particle, like a rubber band. This force is nothing but the "strong nuclear force".

Unification of forces

This part unifies the three basic forces (gravity, electroweak and strong nuclear force) in two generic forces: the Coulomb Force and the Hooke Force.

The Universe

A suggestion regarding the creation of the universe is proposed. In reality, the Big-Bang Theory does not explain the "electron mystery" and this enigma is discussed. This Part offers two suggestions, much more credible than the "Big-Bang", regarding the creation of the universe.

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