The Spacetime Model ®
Part 3/5

Quarks and Antimatter

Version 6.02
August 2, 2012

Jacky Jerôme
Dipl-Ing, European Ingénieur EUR-ING

Tel: (0033) 615146741
Email: diaverre@sfr.fr

Editions AC42
42120 LE COTEAU (France)
ISBN 97829531234-0-1

Patent Rights

Scientific peers journals do not accept papers from independent researchers whatever their content. Due to the impossibility to publish this theory in peer journals, the author has chosen the patent way to keep priority of his work. It doesn't mean that you can't reproduce it. You do. This theory can be freely reproduced by anyone without charges.

This theory, the Spacetime Model, was registered in different legal forms for Copyright and at INPI, the French Patent Institute, under the following references:

238268, 238633, 244221, 05 13355-2 895 559, 248427, 258796, 261255, 268327, 297706, 297751, 297811, 297928, 298079, 298080, 329638, 332647, 335152, 335153, 339797, 12 1112.

First deposit date at INPI: **May, 5, 2005**
Major deposit date at INPI: **December, 27, 2005**

In 2006, this theory was addressed to more than 7000 physicists worldwide by e-mail. Several paper copies were sent in October 2006 to the most important Academics of Science and Committees of Foundations for Research.

This theory was also published on November, 30, 2006, on 28 different web sites. It is also referenced on many sites such as Google, Google Books, Yahoo, DMOZ... Since 2006, more than 300,000 Internet Users (about 230,000 Physicists) have read it.

Important note

This paper attempts to explain some enigmas of modern physics. In this regard, some parts are speculations, but Science can only advance through speculative theories.

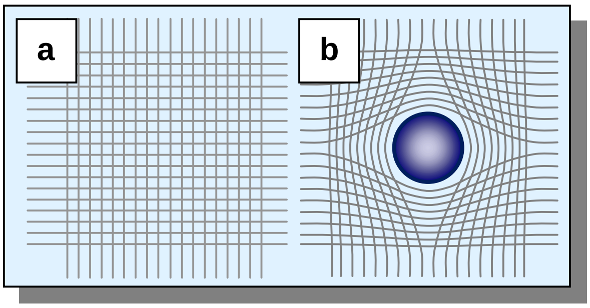
To date, the Spacetime Model, is nothing but a theory. Despite the fact that this theory is logical, coherent, and makes sense, the reader must be careful, bearing in mind that the Spacetime Model has not yet validated by experimentation.

Before reading…

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

The curvature of spacetime

Lets consider a flat spacetime (a). It could be logical to consider that it is the volume, not the mass, that curves spacetime (b).

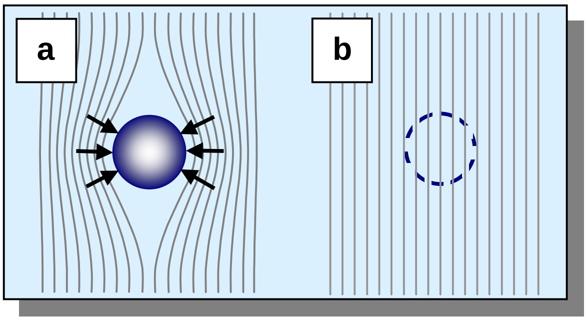


Einstein Field Equations and experimentations show that it is the mass, not the volume, that deforms spacetime… The solution to this enigma is given below.

Closed and open volumes

All volumes have not the same behaviour regarding spacetime. In reality, we have three classes of volumes:

a/ Volumes with mass, or "Closed volumes" such as elementary particles. Their internal spacetime "pushes" the surrounding spacetime to make room. Thus, "closed volumes" produce a convex curvature of spacetime. Since the latter has properties of elasticity (Einstein), it exerts a pressure on the surface of these volumes. As a result, a "mass effect" appears, i.e. an effect having all the characteristics of mass. The mass component [M] can be extracted from the pressure [M/LT^2] by simple mathematical operations. This conducts to a 4D expression of the mass as $M = f(x,y,z,t)$.



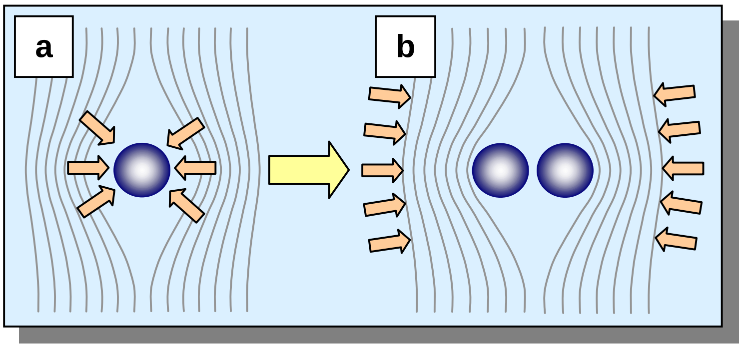
b/ Massless volumes, or "Open volumes". It is a vacuum but sometimes found in various forms such as the volumes of orbitals of atoms. These volumes exist but they are "porous" regarding spacetime. More exactly, they are subject to variations of spacetime but they don't curve spacetime themselves. Therefore, open volumes are massless since no curvature means no mass (Einstein).

c/ Apparent volumes are combinations of closed and open volumes. In atoms for example, the nucleus is a closed volume which has mass, whereas orbitals are massless open volumes. The proportion of closed/open volumes, i.e. volumes with/without mass, varies from one atom to another, from one molecule to another, from one object to another... This is why we feel that mass and volume are two different quantities. This is an illusion. It is the proportion of closed/open volumes that varies from one object to another, which gives us this feeling.

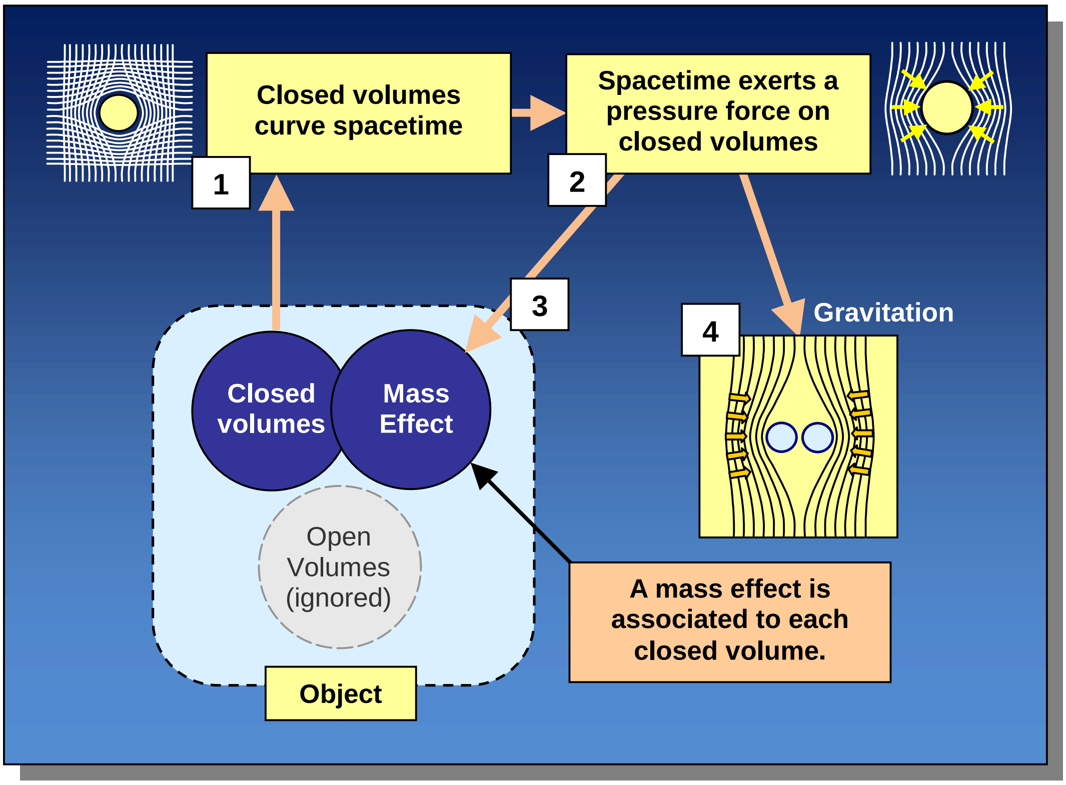
Mass and Gravitation

Two closed volumes inserted into spacetime curve it. Since spacetime is elastic, its curvature produces pressures on these two volumes. So:

Gravitation is not an attractive force between masses but a pressure force exerted by spacetime on closed volumes that tends to bring them closer to each other



As shown in this figure, mass and gravity are the same phenomenon



Note: Part 1 also shows that the Higgs Field is nothing but Spacetime.

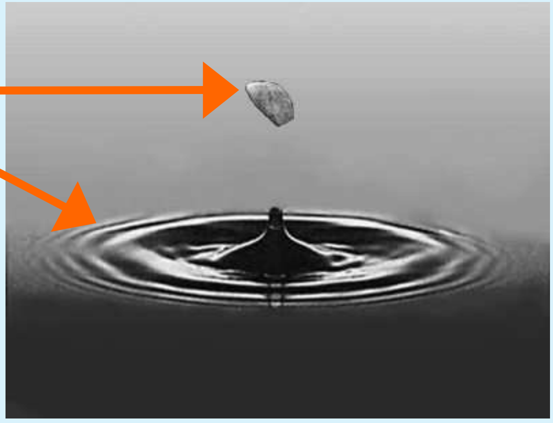
The Wave-Particle Duality

The following two figures fully explain the wave-particle duality.

Example 1

A stone
and a water wave
are of ***different matter****.*

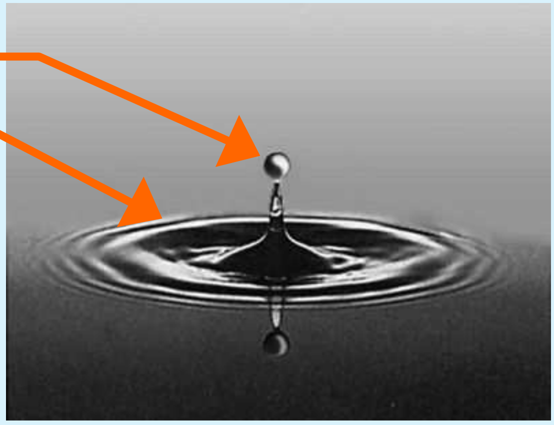
In that case, the wave-particle duality can't be explained.
It is an enigma.



Example 2

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

In this particular situation, wave-particle duality is explained with logic and consistency.



Particle	wood	stone	metal	**water**	glass	plastic	carbon
Wave	water	water	water	**water**	water	water	water
Medium	air	water	water	**water**	water	water	air
Duality ?	**No**	**No**	**No**	**YES**	**No**	**No**	**No**

Impossibility (wood) — Impossibility (carbon)

Duality is fully explained in this particular case

Wave – particle duality appears only in the very particular situation where the wave, the particle and the medium are of identical matter

The constitution of particles

Part 1 explains that mass and gravity also come from spacetime. Parts 2 and this part cover explanation of EM waves, which are nothing but spacetime vibrations, different than those due to gravitational waves. Linking this discovery, the wave-particle duality explanation, and experimentations such as the 511 KeV production from e+e- annihilations, we deduce that matter and waves, including De Broglie waves, are made of spacetime. More exactly, what we call "matter" is areas of low (electrons) and high (positrons) densities of spacetime. So:

Waves	=	**Matter**
(Spacetime variations)		(Spacetime areas)

The table of contents is located at the end of this document

1 Spacetime Cells

Two different fields are supported by spacetime: Electromagnetic (EM) and Gravitational fields. A simple and unique 4D spacetime can't support these two fields. The only way to solve this inconsistency is to consider that spacetime has a sub-structure.

In reality, this idea comes from Einstein. He was interested by Kaluza Theories but came back to a 4D spacetime with an hypothetic substructure. He was then opposed to the Copenhagen Interpretation of Quantum Mechanics. Unfortunately, he had so many detractors that he dropped his idea of substructure.

Nevertheless, this suggestion is 100% full of good sense because there is no other alternative to explain electromagnetic and gravitational fields. This is why this idea has been taken up again, but taking into account the recent discoveries concerning quarks. Here we show that spacetime would be parcelled out in a kind of "neutral electrons" called in this document SpacetimeCells, or sCells in abbreviated.

When Pasteur discovered invisible microorganisms, no one believed him. Like microorganisms, sCells are invisible since they have no charge. As neutrinos, they can't be moved. So, instead of saying as Pasteur detractors "Since I don't see sCells, they don't exist…", it is better to say "Why not? Let's study this possibility…".

1.1 Starting point: the charge of proton

The proton has an electrical charge that is equal in magnitude and opposite in sign to that of the electron. This charge is $1.602176565(35)\times10^{-19}$ Coulombs. Equality between the absolute values of the charges of the proton and of the electron is incredibly well verified. The relative difference between the absolute values is less than 10^{-21} !!! So, the question is

"How can we explain this incredible equality of these electric charges?".

Since the positron is the antiparticle of the electron (identical electric charge but in opposition of sign), its charge is exactly equal to that of the electron in absolute value. This suggests that the proton could be made of positrons. The problem is that the negative charge of the d quark also suggests that we could also find at least one electron inside the proton.

Finally three options can be selected:

- **2 positrons + 1 electron.** This possibility solves the problem of the charge but doesn't agree the mass. The global mass of (2 positrons + 1 electron) is about 1,5 MeV whereas the mass of the proton is 600 times more greater, about 938 MeV. This possibility must not necessary be rejected but is very improbable.

- **2 positrons + 1 electron + e+e- pairs**, such as 7 positrons and 6 electrons. The e+e- pairs increase the mass. The charge and mass are verified but we will have annihilations between e+ and e-. This is why this possibility must not necessary be rejected but is also improbable.

- **2 positrons + 1 electron + sCells**. The sCells replace e+e- pairs. Depending of the scheme of construction, sCells could prevent the e+e- annihilation. This scheme could be near to the nuclear fusion process. SCells also increase the mass. This scheme, which is more probable than the others, is covered in this chapter.

1.2 The basic particles of the universe

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 at least 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. If we consider that the particles of 2nd and 3rd groups of the Standard Model are particles of the first group in excited states, only eight particles can be considered: u quarks, d quarks, antiup quarks, antidown quarks, neutrinos, antineutrinos, electrons and positrons. So,

8 particles with 7 different charges are too many particles to make this point of view credible

It is obvious that the universe was created in a very simple state. It is a necessity. The simplest is the best. Its symmetry was elementary, probably originating with only one particle. This original particle remains to be determined. If physicists were to choose a particle among the 24 of the Standard Model, 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 and to build other particles. Thus, the second particle to be considered is, of necessity, the positron. It is, therefore, logical to think that the creation of the universe required only two particles, the electron and the positron.

ALL PARTICLES of the universe are probably made up with Electrons and Positrons

1.3 Current Particles

Let's examine the table 1-1, which summarizes some well-known particles.

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

Fig. 1-1

This table is not exact because we have omitted the neutrinos. Moreover, the neutron or antineutron are not exactly a "neutral proton". Lastly, the majority of particles are combinations of quarks, but neutral quarks don't exist. So, this table is nothing but a simple indication showing that the particles are grouped in three’s. A similar approach has already been used in physics with Lie Groups (from Hermann Weyl Works).

Despite these few objections, a particle is missing in this table, the neutral electron, or sCell.

1.4 Existence of sCells

To summarize, sCell seem to be necessary for the following reasons:

1/ The perfect equality between the charge of protons and electrons,

2/ The creation of the universe requires one, two or three particles, no more.

3/ Figure 1-1 shows that the "neutral electron" is missing.

4/ Substructure of spacetime from Einstein's suggestion,

5/ Quantification. According to Max Planck (Nobel Prize 1918), all components of the universe are quantified. It doesn't mean that spacetime is also quantified, but it is an interesting point of view.

6/ Quarks. It is impossible to build quarks with integers charges such as –1 (electrons) or +1 (positrons). A third charge, neutral, is probably necessary to prevent repulsion between charges of the same polarity.

7/ Antimatter. The suggestion of our quark model gives the solution to one of the greatest enigmas of physics: where is the antimatter in the universe?

8/ EM and spin. sCells perfectly explain the EM field, and probably of the spin too. These subjects are covered in Part 4.

9/ Other explanations. sCells explains several enigmas of physics such as:

- Quantum levels in atoms,
- Significance of the Schrödinger Model,
- Anomaly of the E_0 energy level in atoms,
- EPR anomaly,
- Young Slits enigma,
- The multiple paradoxes of photons,
- A rational explanation of the Heisenberg Uncertainly Relation,

So, we may reasonably consider that:

If sCells solve so many enigmas of physics, it can't be merely a simple coincidence.

However, at the present time, sCells have never been detected because, like neutrinos, they have no charge[1]. The existence of the neutrino is obvious when we measure the conservation laws of momentum, as Wolfgang Pauli (Nobel Prize 1945) did in 1930. This is not the case with sCells. That is the difficulty. The only way to prove their existence is from an indirect way and by deductions.

1.5 Properties of sCells

If sCells exist, we can imagine their properties which are:

- A sCell has a "closed volume" equivalence of 511 KeV but, since it can't be moved, it doesn't curve spacetime to make room. It means that a sCell is massless. However, if one or more sCells are enclosed in a particle, these sCells become closed volumes and get mass. See Part 1.

[1] Not exactly. The present theory predicts that the neutrino has a very weak charge of a fraction of 1 ppm.

- Their relative density of spacetime, i.e. their charge, must be null,
- Since a sCell doesn't have any charge, it is not possible to move it or to detect it.
- The neutral charge of a sCell can be split in two symmetrical charges, -1 and +1. These charges goes in other sCells to make an electron-positron pair. So, if the universe began with only sCells (= 4D spacetime), there should be strictly as many electrons as positrons (see Part 5).
- Charges of electron-positrons pairs may be transmitted from sCells to sCells.

1.6 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 from only these three particles.

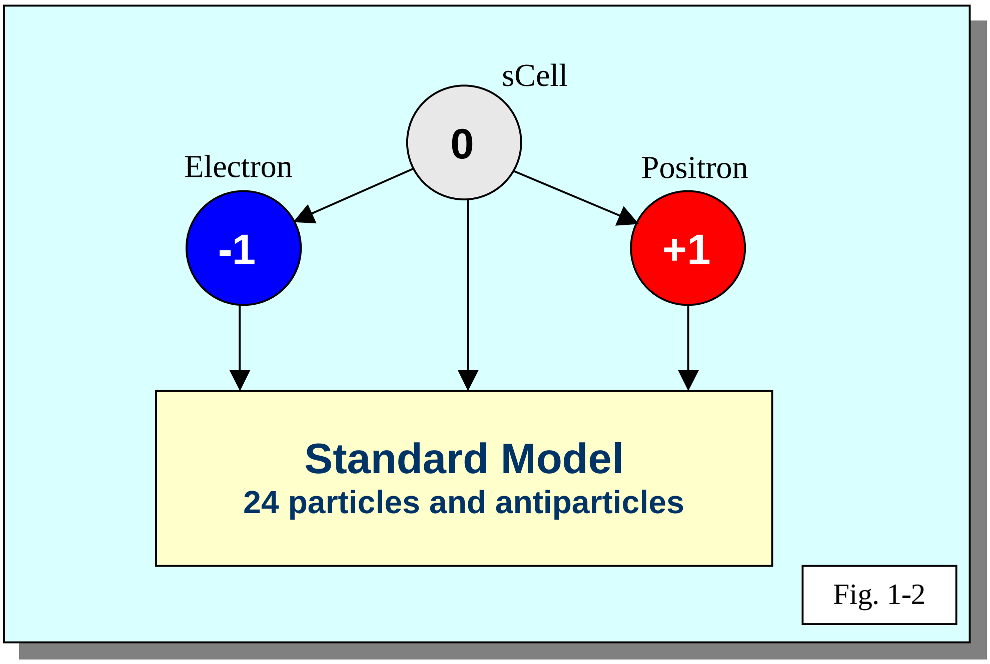


Fig. 1-2

1.7 Example of sCells

To understand the sCells Concept, let's take the example of water.

In everyday life, water is like a continuum. In reality, water is made of H_2O molecules. Each molecule is a kind of quanta. Spacetime is like water, we think that it is a continuum, but in reality it is made of sCells.

Since gravitation or gravitational waves are spacetime movements, they can be identified to eddies in water. Since EM field is transmitted by sCells (see Part 4), we can identify it to an electric field transmitted from H_2O molecules to H_2O molecules. So, water can transmit two different kinds of forces, but on different manners. Spacetime is based on the same principle.

This page left blank intentionally

2 The "Distributed Charge" Model

In this chapter, we explain the role of sCells, if they exist, in atoms. We will further see other enigmas solved by sCells.

Contrary to a preconceived idea, in atoms, the electron is not moving around the nucleus as a punctual particle. This is a consequence of the wave-particle duality (see Part 2). In reality, the charge of electron(s) is distributed into sCells, making a kind of "cloud of charges" around the nucleus. This new model can also be applied to quarks and composite particles such as neutrons.

2.1 Electrons in atoms

Electrons are not moving around the nucleus as punctual particles but rather as waves. Their charge is distributed in several sCells (fig. 2-1). So, we have a "*distribution of spacetime density*". This is confirmed by several experimentations such as the electron diffusion by a neutron (see section 6). This view is in accordance with Schrödinger or Dirac models.

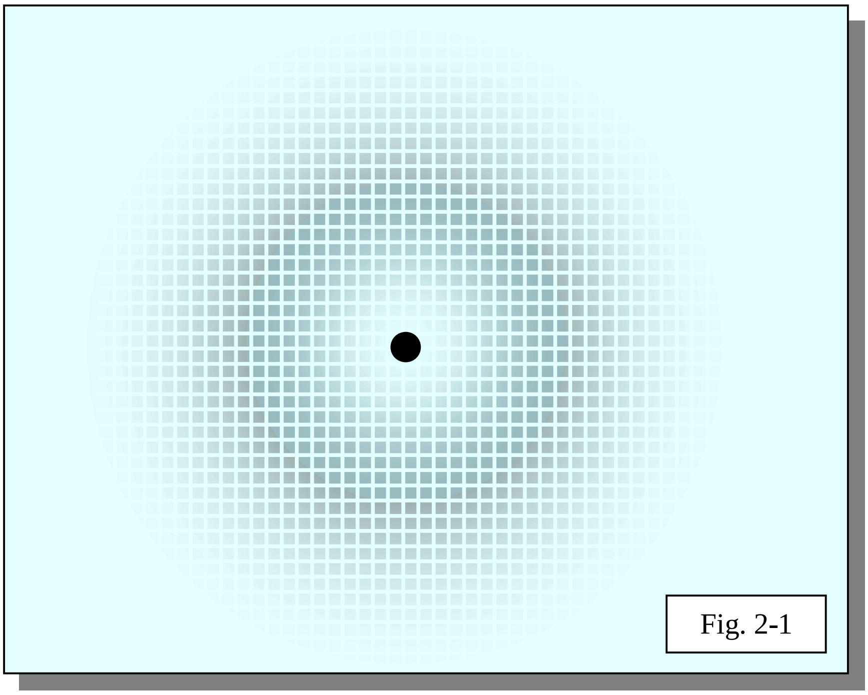


Fig. 2-1

Note: The spin is mainly covered in Part 4.

2.2 The Schrödinger Model

Let's imagine, for example, that the electron wraps up the nucleus in 50 sCells. Instead of having a continuous moving electron around the nucleus with a charge of -1, we will have 50 sCells with a charge of –0.02 each.

This is called the "distributed charges" model or, in other words, a distribution of spacetime density inside sCells.

The Schrödinger Equation

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 sCells, the total probability of finding the electron on its orbital is 0.02 x 50 = 1.

Proposed theory

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

As we see, from a mathematical point of view, nothing is changed. However, the explanation of this phenomenon much more credible than that of a "probability cloud". 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 "Spacetime density".

Another important point is that Einstein was right when he was opposed to the Copenhagen Interpretation of Quantum Mechanics. He never agreed with this explanation of "probability cloud" posed by Schrödinger (Nobel Prize – 1933) and Max Born (Nobel Prize – 1954).

All things considered, the Spacetime Model is more close to Einstein's view than to the view of his detractors. Indeed, the two explanations lead to identical mathematical results, but here we have a consistent explanation of the so-called "probability cloud".

2.3 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 as explained in this part.

For example, let’s consider a “ball pit”, also known as “ball pool” (fig. 2-2, next page).

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 (air more exactly).

[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 Uncertainly Relation.

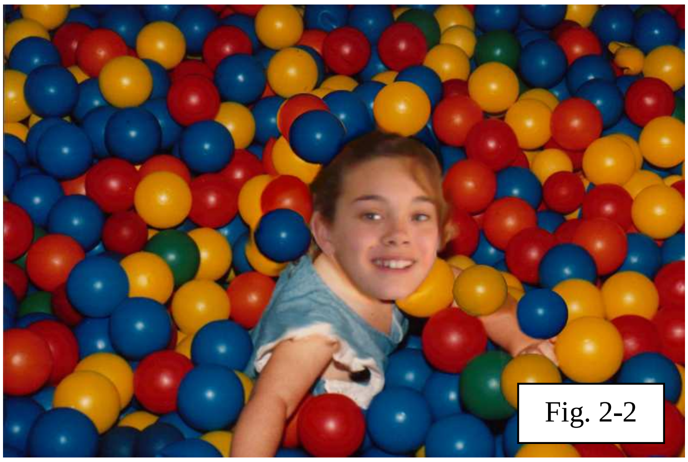


Fig. 2-2

In atoms, the phenomenon is identical. If the electron is that particle moving around the nucleus, no one can explain why 99.999% of the atom is a vacuum (fig. 2-3A), and why we feel that 99.999% of a vacuum is "matter".

If electrons are distributed in sCells as figure 2-1 shows, the amount of "matter" (0.001%) is the same but we have the perception that "matter" exists (fig. 2-3B).

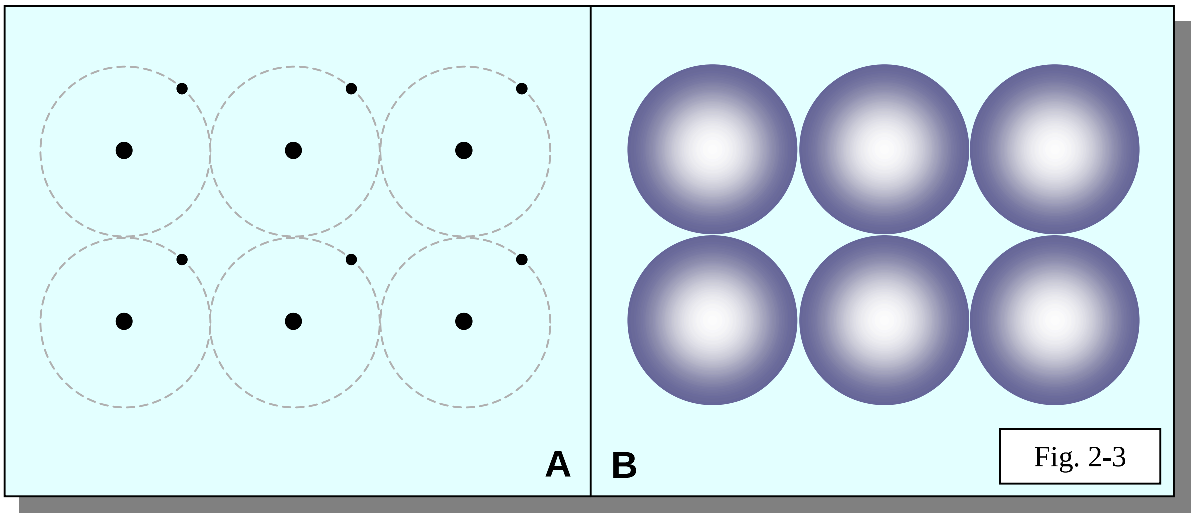


Fig. 2-3

2.4 The photoelectric effect

In atoms, the electron is moving around the nucleus at a great distance from it. Thus, the probability that a photon has to meet the electron is practically zero, despite the number of atoms are in matter. This observation is highlighted with graphene sheets. Under these circumstances, why does the photoelectric (PE) yield reach 95%?

If the electron is distributed in sCells all around the nucleus (fig. 2-3B), this enigma becomes clear. In all cases the photon meets sCells partially charged. In such a case, the PE yield may reach 100%, even in graphene. Please note that Part 4 also covers the PE effect.

.

This page left blank intentionally

3 U and d quarks

In chapters 1 and 2 we have supposed that electrons and positrons are charged sCells, i.e. sCells that have a density of spacetime 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 a possible 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 interesting conclusions. Of course, these conclusions must be validated by experimentation.

3.1 U and d quarks

When quarks was discovered, physicists thought that the d quark is an u quark with an electron. A similar idea was emitted in 1932 when Chadwick discovered the neutron, which was considered as the association of a proton and an electron.

These two ideas were dropped because this point of view is not in accordance with the spin.

Today, the violation of spin is not longer an argument of opposition for different reasons, confirmed by the "crisis of proton". Part 4 covers this subject.

If quarks are built according to the "distributed charge" model, we could have the following scheme (fig. 3-1 next page). Please note that this figure has been deliberated simplified for teaching purposes.

This model seems confirmed in chapter 4 by a formula that calculates the antimatter in the universe.

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 because the open volume enclosed by the electron is transformed in closed volume and get mass. This explains the mass difference between the d and u quarks.

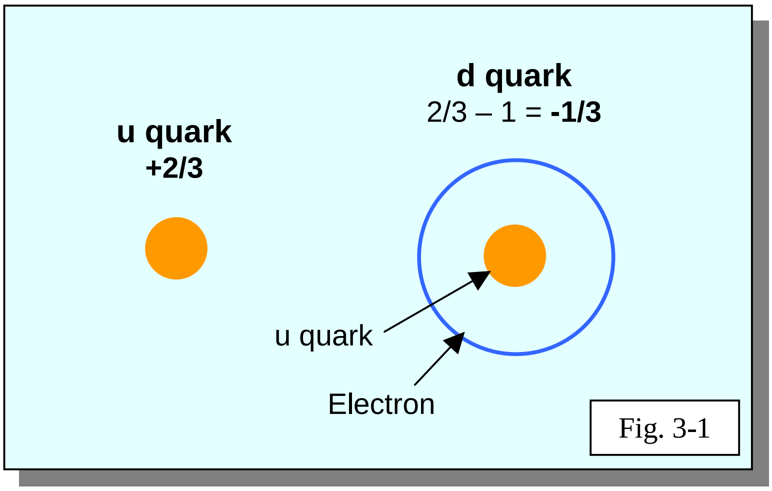


Fig. 3-1

3.2 Quarks construction (proposal)

A suggestion of the construction of u and d quarks is represented in figure 3-2 on the next page. The following sequence is detailed for teaching purposes. Other sequences may also be proposed. We will see later that protons, neutrons and hydrogen atoms have a simpler construction.

Constitution of quarks

U quarks ....2 positrons lead to 3 u quarks
D quarks ....= U quark + Electron

Notes

Experimentation gives a value different from 511 KeV for u quarks. Several explanations are possible. For example, the two positrons may merge with 10 sCells. In this case, the overall volume will be equal to 12 sCells (10 sCells + two positrons). The mass must be calculated from the mass formulae (see Part 1).

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.

The scheme of figure 3-2 may need 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.

Phase 1: Fusion

Two positrons (charge +1) merge with one or many sCells to make a temporary particle having a charge of +2.

Phase 2: Separation

When the charge of +2 is uniformly distributed, a 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 latter according to the "distributed charge" model. The electron closes up one or many sCells. Thus, we obtain a charge of +2/3 - 1 = -1/3. The closed volume (= mass) of the d quark is necessarily larger than that of the u quark.

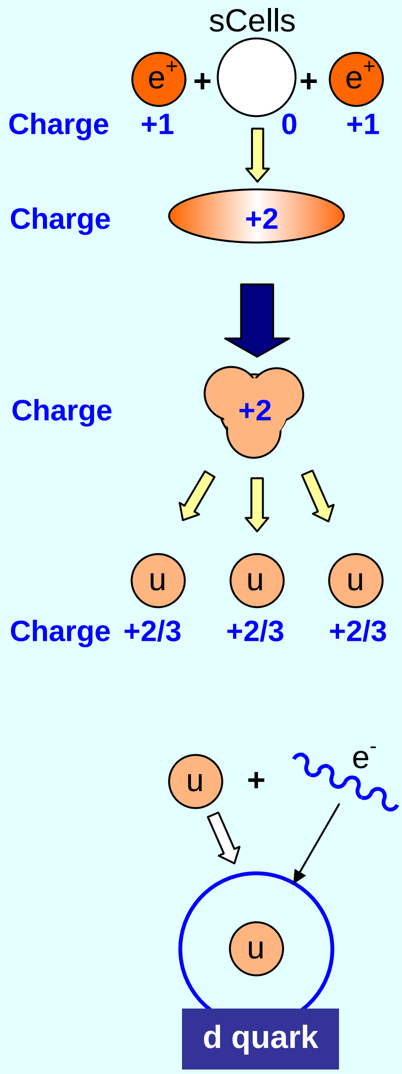


Fig. 3-2

This page left blank intentionally

4 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

4.1 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.
- The positrons we are looking for are not far from electrons, 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. In other words, we can say: *Search the electron, and you will find its companion, the positron*[1]*, 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. In the universe, we know that 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)?…

[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 within the nucleus[1].

To summarize, these two starting points let's consider that

We have a strong probability of finding antimatter inside the nucleus, not at 14 billion light-years from Earth

4.2 Homogeneity of the atom

Since we need 3 positrons to make an u quark, and by adding an electron we get a d quark, it is easy to calculate the number of electrons and positrons inside any atom. The calculation is done in the flowchart (fig. 4-1) 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: 2A (A = atomic number). Therefore, the amount of antimatter in the universe is strictly equal to that of the matter.

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

Inside any atom, the number of electrons Ne^- is strictly equal to the number of positrons Ne^+

$$N_{e+} = N_{e-} = 2A \qquad \text{Equ. (4-1)}$$

[1] In reality, the β^+ radioactivity is not directly related to quarks but since everything is spacetime (see Part 2), the reasoning given here is correct. Without good reason, it is not logical to think that antimatter is located in the deepest universe.

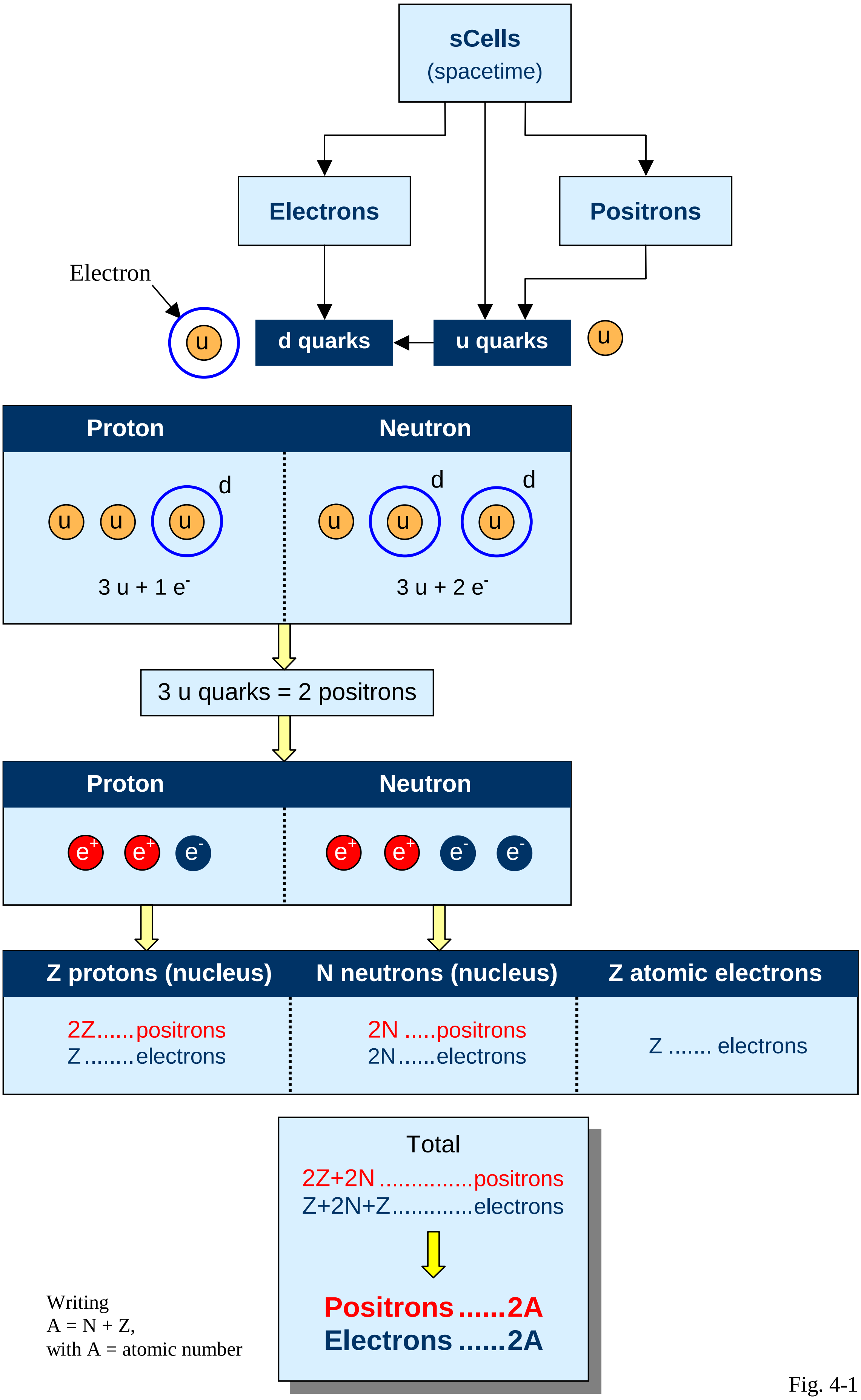

sCells
(spacetime)
Electrons
Positrons
Electron
u
d quarks
u quarks
u
Proton
Neutron
u u u d
3 u + 1 e-
u u d u d
3 u + 2 e-
3 u quarks = 2 positrons
Proton
Neutron
e+ e+ e-
e+ e+ e- e-
Z protons (nucleus)
N neutrons (nucleus)
Z atomic electrons
2Z......positrons
Z........electrons
2N .....positrons
2N......electrons
Z .... electrons
Total
2Z+2N ....positrons
Z+2N+Z............electrons
Positrons 2A
Electrons 2A
Writing
A = N + Z,
with A = atomic number

Fig. 4-1

4.3 Antimatter in nuclei

The table below (fig. 4-2) shows some 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: $d_N + d_Z + Z$

				Neutrons u d d		Protons u u d			Antimatter	Matter
Nucleus	A	N	Z	u_N	d_N	u_Z	d_Z	U_{total}	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. 4-2

Here we show that we have exactly the same number of positrons as electrons whatever the atom. Matter strictly equals antimatter. The number of electrons and positrons, in any case and in any atom, is 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, verified within the 2930 known isotopes[1], 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 of the Li^3 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. This problem of neutron also exists in atoms with a halo. This tends to confirm the theory here discussed.*

4.4 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

We have shown that we have a perfect equivalence of matter and antimatter in the neutron.

Hydrogen and various atoms

We simply apply equation (4-1). For hydrogen, since A=1, we have two positrons and two electrons (= 2A).

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

$$k_{e-} = k_{e+} = 2n_n + 2n_H + \sum_{A=2\ldots m} n_A 2A + \varepsilon$$

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 (4-1).

N_H Number of hydrogen atoms[1] in the universe. As in the neutron calculation, the "2" factor comes from the formula (4-1).

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 (4-1).

ε Free particles in various forms in the universe such as muons. This, quantity is negligible when compared to the other terms.

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

So many coincidences are not due to chance.
It means that sCells are probably a reality.

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

This page left blank intentionally

5 The Standard Model

The Standard Model does not take into account the origin of the quarks, i.e. positrons and electrons in accordance with the Spacetime Model. Moreover, here we show that the presence of neutrinos is very debatable.

This chapter is a complement to the Standard Model.

5.1 Basic particles

The scheme of the construction of quarks is shown in chapter 3.

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 come probably from the electron. To date, we don't know how they have been built. These particles have not been represented in Fig. 5-1 (next pages).

5.2 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). Sometimes, a simple annihilation can produce this backward movement; sometimes, various interactions are responsible. This means that neutrinos may depend on the interaction, but since particles can be transformed in gammas and conversely, this point is not important.
- So, neutrinos are not basic particles. They are rather a kind of secondary effect.
- The closed 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 for example, 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 ppm. 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, remembering that we often find only that we are looking for.

In an e+e- annihilation, a possible charge of the neutrino would be equal to:

$$q = \frac{Ma - Mb}{Ma} \, 1.602 \times 10^{-19} \, C$$

With:

q = charge of the neutrino, in Coulombs
Ma, Mb = mass, or closed volume (see Part 1), of the electron and positron. The greatest mass of both is Ma.

- The charge should have the polarity of the particle having the greatest mass. To date, we don't know with accuracy the masses of the positron and the electron.
- 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 sCell. A neutral particle like the neutrino should not exist.

Maybe these deductions are wrong, but they are much more credible than the current explanation, i.e. a neutrino which comes from nowhere.

Standard Model		**Proposed Theory**	
Matter	*Antimatter*	*Matter*	*Antimatter*
electron	positron		
u quark	u antiquark		
d quark	d antiquark	Electron	Positron
neutrino	antineutrino		
muon	antimuon		
tau	antitau		
etc…		*All particles are combinations of electrons, positrons and sCells*	

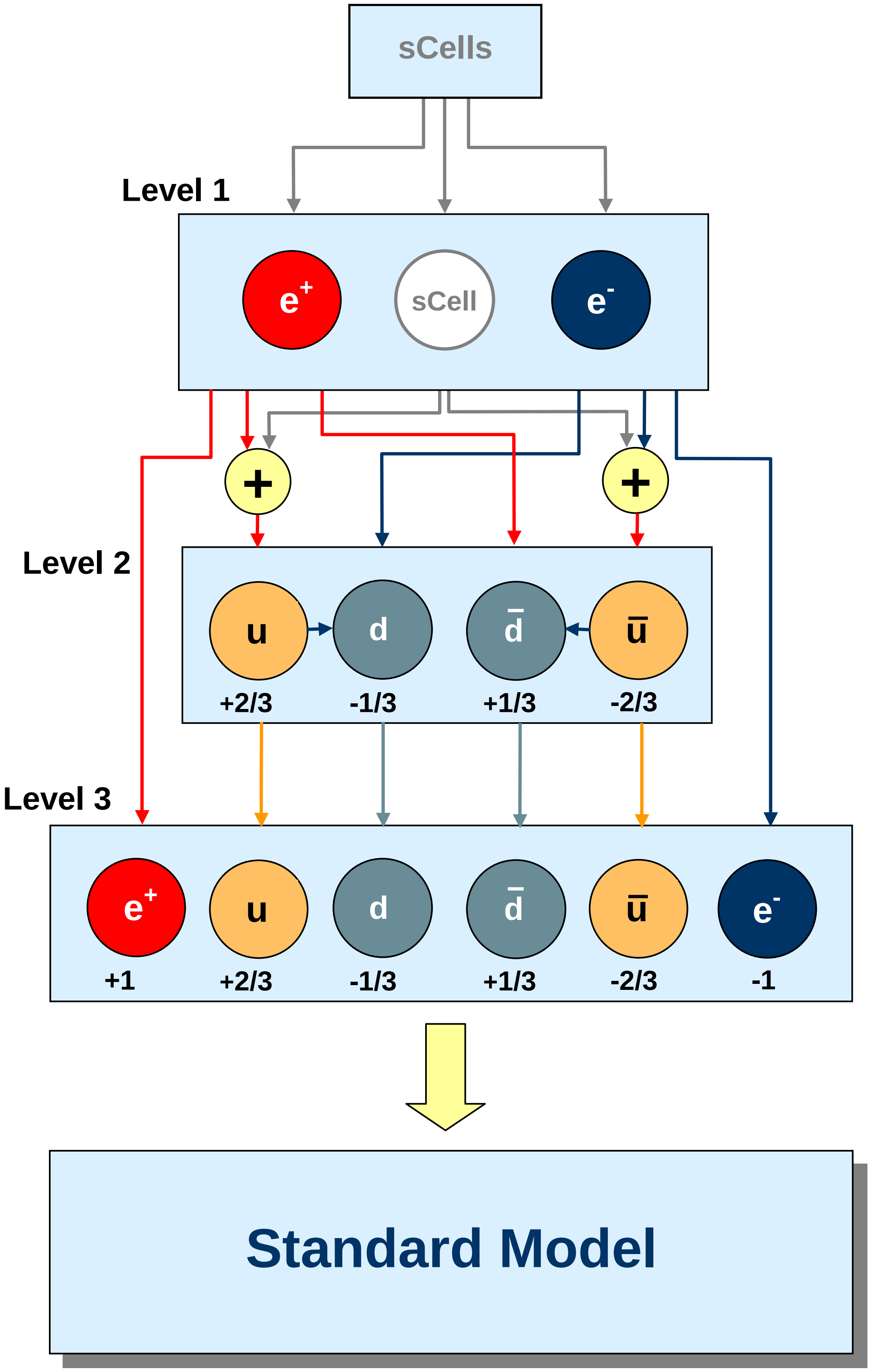

sCells
Level 1
e+
sCell
e-
+
+
Level 2
u
d
d̄
ū
+2/3
-1/3
+1/3
-2/3
Level 3
e+
u
d
d̄
ū
e-
+1
+2/3
-1/3
+1/3
-2/3
-1
Standard Model

Fig. 5-1

This page left blank intentionally

6 Nucleons

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

6.1 Protons

The "Distributed Charge" Model suggests that the (u u d) quark structure of the proton shown in figure 6-1A is not exact and must be replaced by the (u u u electron) structure of figure 6-1B. The two figures are in perfect accordance with experimentations and do 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. When the proton is created, the electron leaves the d quark (see Fig. 3-2). This free electron surrounds the three u quarks to keep them locked up and acts as a rubber band: the more one moves away from the centre, the stronger the force becomes.

Examination of some interactions and logical deductions let’s suppose that the d quark is built during the interaction with an u quark and an electron.

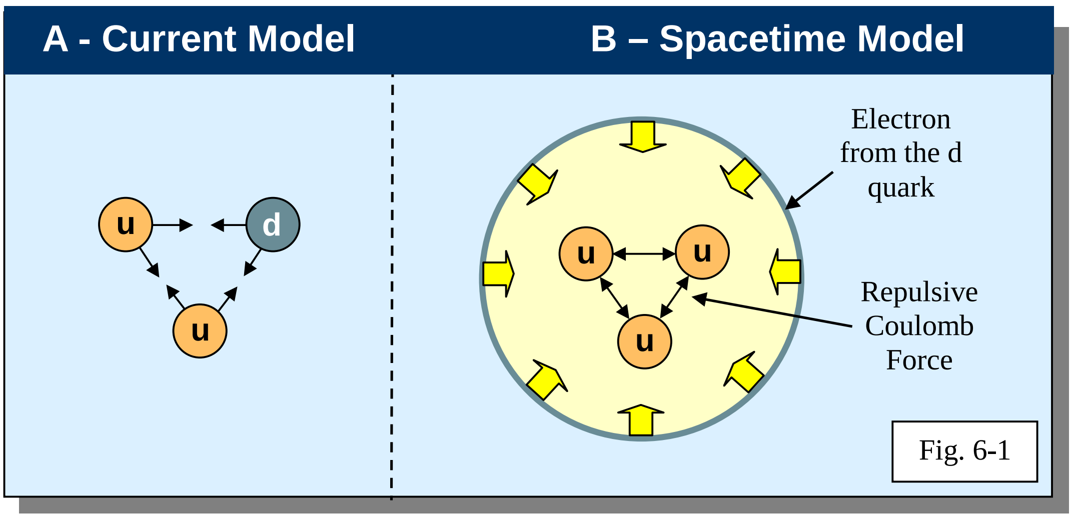


Fig. 6-1

6.2 Neutrons

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

- It cancels the positive charge of the proton making it neutral
- It increases the closed volume (mass) of the proton to make a neutron.

The sCells kept closed between the two electrons surrounding becomes closed volumes and get mass.

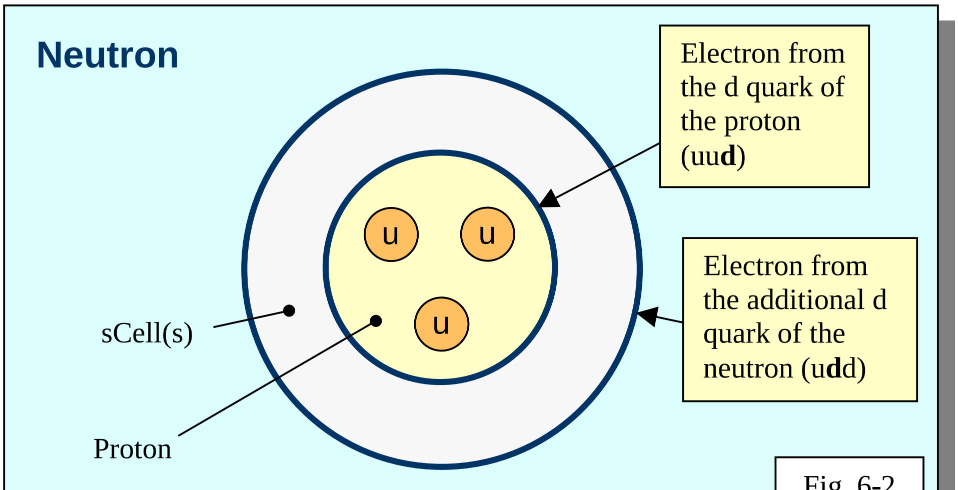


Fig. 6-2

…and, as we could expect from experimentation,

The decay of the neutron gives a proton and an electron [1]

6.3 Confirmation by experimentation

The shape of the neutron reflects exactly our “distributed charge” model (fig. 6-3, next page). 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 strongly suggests that:

1. The neutron is made of an electron, which surrounds a proton,
2. The “distributed charge” model seems to be a reality.

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

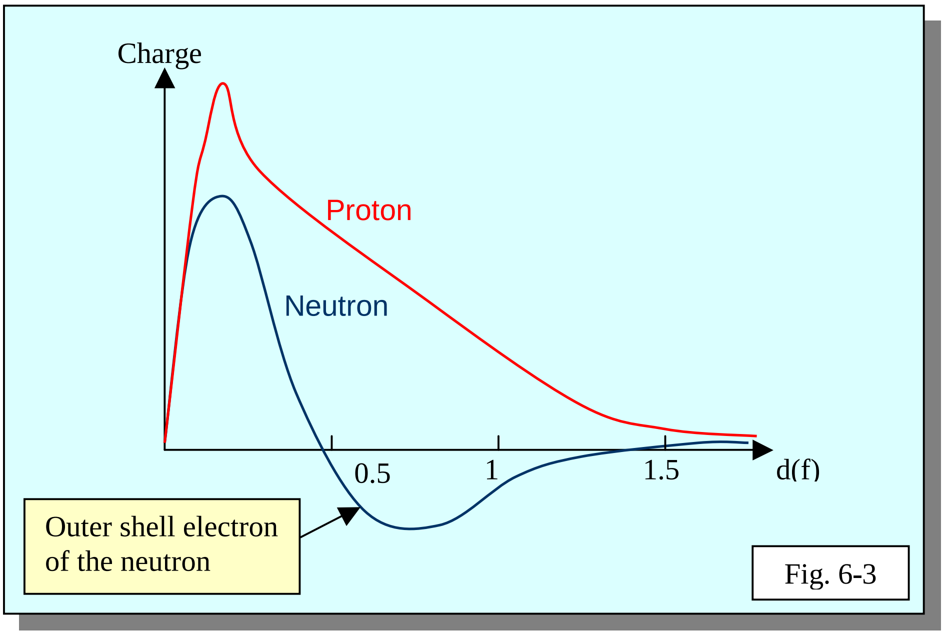


Fig. 6-3

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 6-4 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.

6.5 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 centre 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.

Building H atoms and neutrons from spacetime

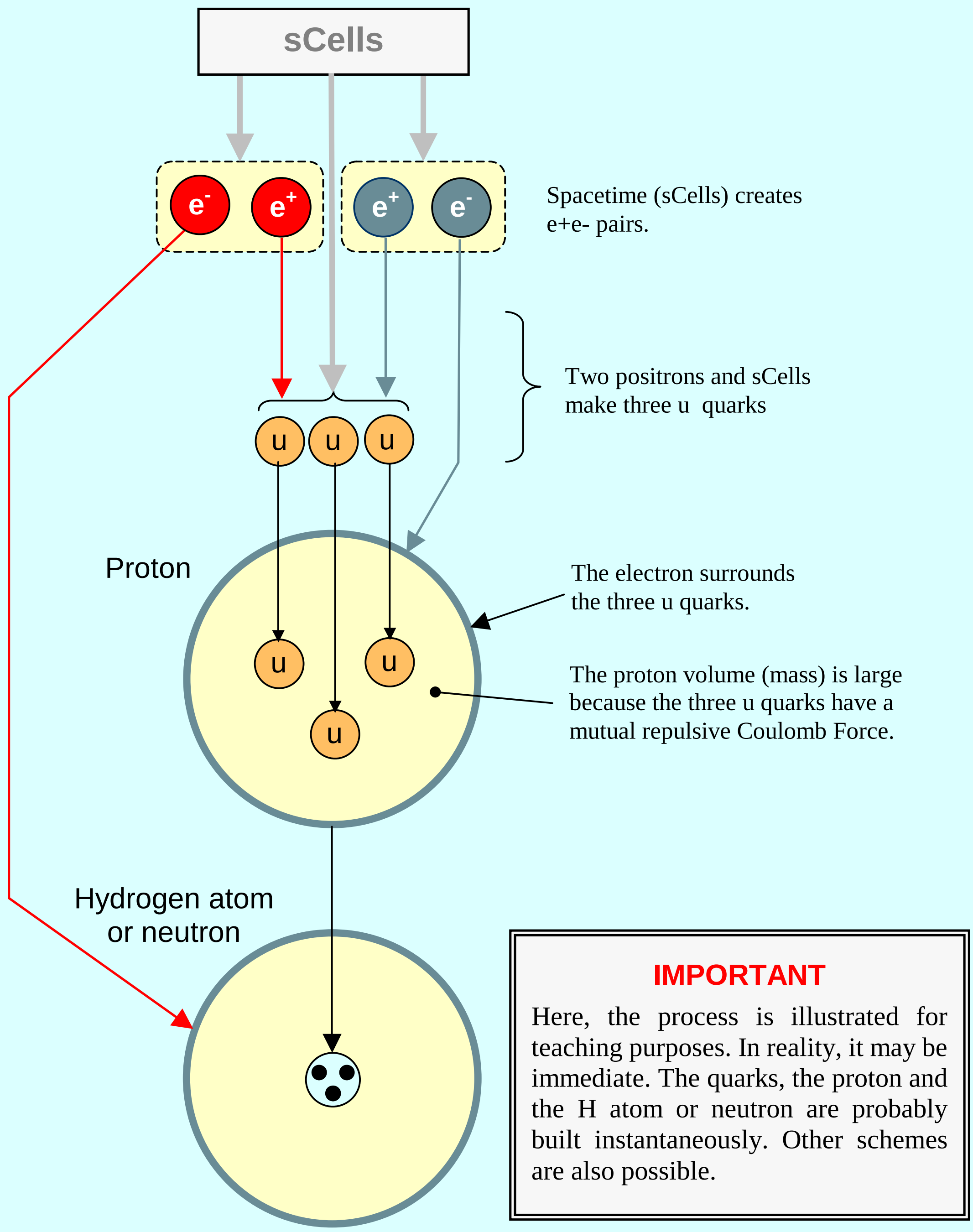


Fig. 6-4

Note*: The initial problem, for the author, was to logically explain the "probability density" of the Schrödinger Equation. As explained, 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. It also means that the strong nuclear force doesn't exist per se. Instead, the electron acts as a rubber band and produces a kind of 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.

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

6.6 Hydrogen atom (proposal)

It appears that the neutron and the hydrogen atom have the same principle of construct (fig. 6-5). In both cases, an electron surrounds a proton, in accordance with the distributed charge model. It seems that probably the Δ° (neutral delta) and other particles follow an identical scheme. However, in some cases such as π mesons, the proton may be replaced by a composite particle.

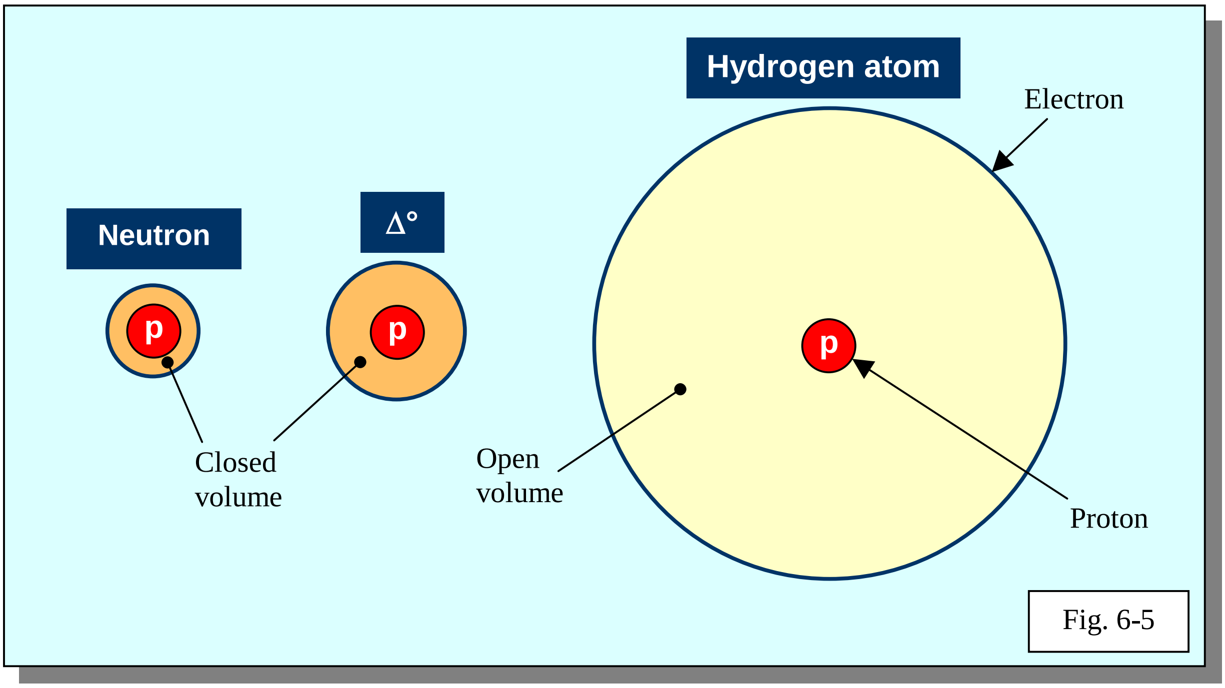


Fig. 6-5

The charge is null in all cases. The only difference is the mass. In the neutron and Δ°, the electron creates a closed volume, with mass. In the hydrogen atom, it creates an open volume, i.e. a massless volume, since its orbital is much larger and therefore is "porous" to spacetime.

Nature’s favouring 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.

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

6.7 Equality of the proton charge

The mystery of the charge of the proton has already been discussed. 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 from the d quark.
- The quarks (u u u) are made of 2 positrons, and thus have an overall charge of +2.
- The "d" quark is a "u" quark surrounded by an electron.
- The resulting charge is therefore +2 - 1 = +1

In this way, it seems logical that the proton charge, +1, would be equal to the electron charge in absolute value since it comes from the excess positron.

6.8 Antineutrons

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

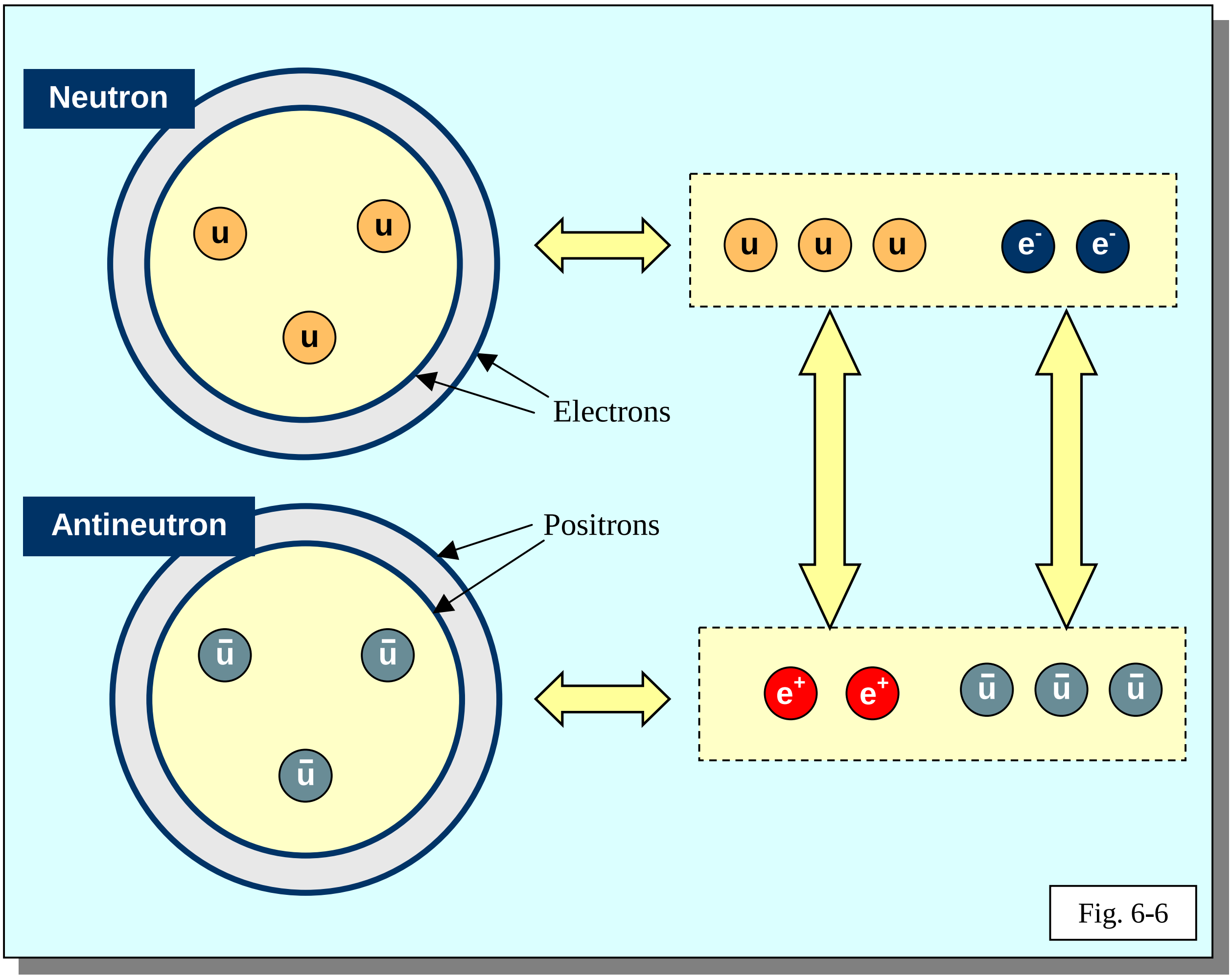

Neutron
u
u
u
u
u
u
e-
e-
Electrons
Antineutron
Positrons
ū
ū
ū
e+
e+
ū
ū
ū

Fig. 6-6

This page left blank intentionally

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 gammas[1]. 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 sCells, doesn't change the current formulas in quantum mechanics.

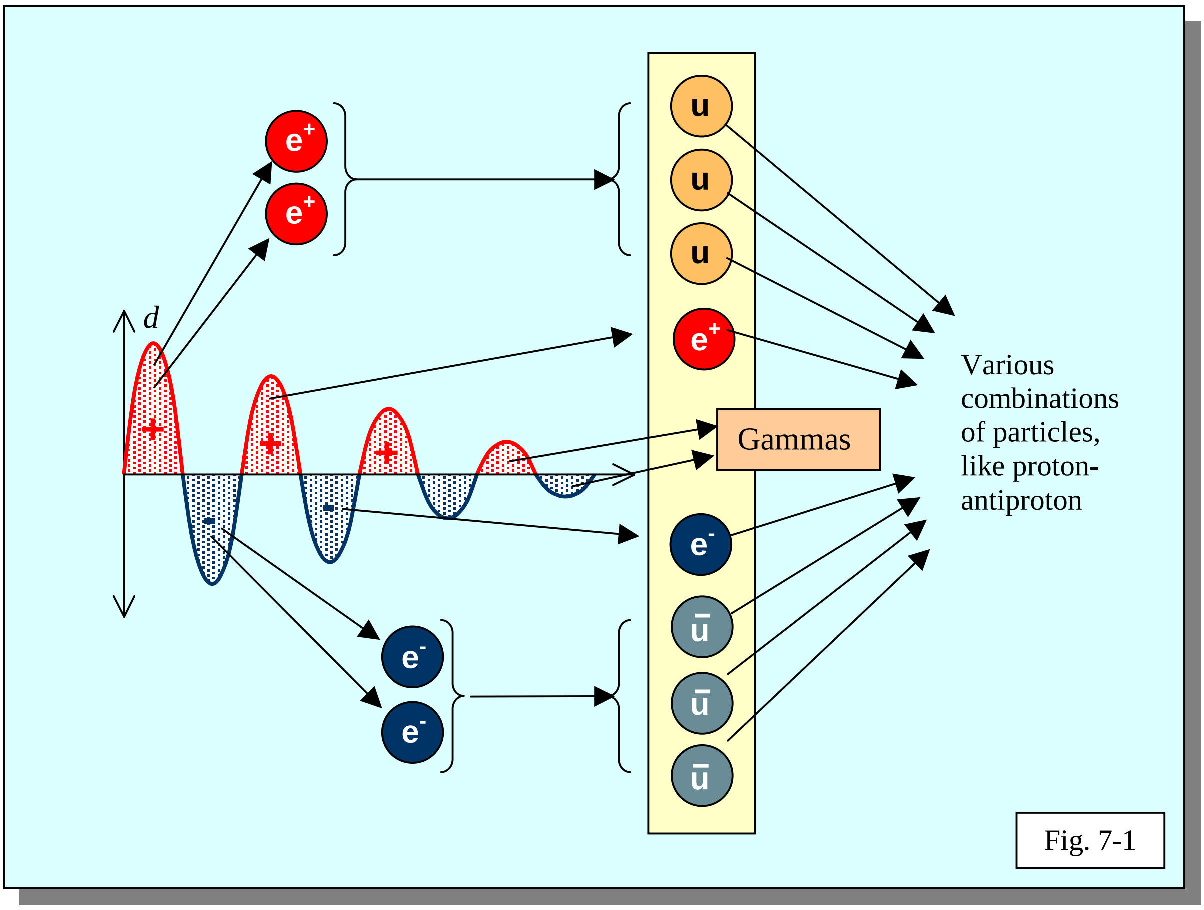


Fig. 7-1

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

Spacetime (waves) is converted into spacetime (particles) or conversely.

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 spacetime.

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. 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. The basis particles are e+, e-, u, ubar, d and d dbar. 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............ (u) e-
Proton .... (u, u, u) e-
Neutron .... ((u, u, u) e-) e-
Antiproton........ (u bar, u bar, u bar) e+
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 rule[1]: All composite particles must have at least one parenthesis pair. It means that:

All composite particles must have at least one electron or positron

Or, translated to nuclei:

All nuclei must have at least a neutron

The necessity to have an electron or positron surrounding other particles explains probably the fact that in atoms with halo we don't see any proton in the halo. The latter is built with neutrons only.

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

This page left blank intentionally

Table of contents

This page left blank intentionally