

A step toward the  
Theory of Everything

# The Spacetime Model

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## Part 4

# Electromagnetism

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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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The “Spacetime Model” was also published on November 30, 2006, on 31 different web sites.

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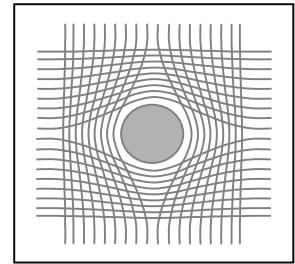
## Before reading...

To fully understand this part, the reader must be familiar with the deductions and results developed in Parts 1, 2 and 3. 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.

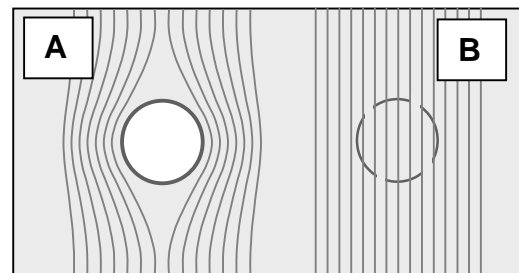


### Mass (Part 1)

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.

In reality, we have two classes of volumes:

- **Closed volumes (A):** These volumes make a displacement of spacetime. It is this spacetime curvature, which produces the mass effect. 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.



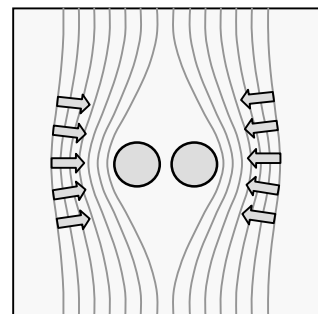
Each atom has a particular proportion of open and closed volume. This is why mass and volume give us the illusion of being two different quantities.

### 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 volumes.*



## 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 an important 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:

$$\begin{array}{ccc} \mathbf{Waves} & = & \mathbf{Matter} \\ \text{(Spacetime variations)} & & \text{(Spacetime areas)} \end{array}$$

## The "μDomains" (Part 3)

It would seem that global spacetime of the universe is divided into quanta called "microdomains" which are nothing but electrons or positrons without charge. Therefore, μDomains could have a mass of 511 KeV but, like neutrinos, they can't be detected.

The existence of μDomains is proven in several ways developed in Part 3. In particular, they fully explain, with consistency, the constitution of quarks and the location of antimatter in the Universe.

## The "Distributed Charge" Model (Part 3)

The explanation of wave-particle duality leads to an important deduction: electrons are not moving around the nucleus as a punctual particle but as a sort of "cloud of charge". Indeed, the charge of the electron is distributed into the μDomains surrounding the nucleus. Schrödinger's probability concept must be replaced by a more realistic concept called "Distributed Charge Model". The quantum mechanics formulas as Schrödinger Equation are not modified by this new approach, which is verified by experimentation.

# 1. EM Radiations

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*Paragraphs 1.1 to 1.7 of this chapter are identical to those of chapter 2 of Part 2 "Constitution of Matter". These paragraphs have been duplicated only for teaching purposes.*

*EM radiations are mathematically described with a high degree of accuracy, but no one is able to explain the constitution of photons and EM waves.*

*To solve the mystery of EM waves, we will proceed by an indirect method. Initially, we will try to understand why "c", the velocity of light, is invariant. There is a good probability that the solution to this enigma will lead us to the constitution of EM waves.*

## 1.1 History

The nature of EM radiations has always been the "pet peeve" of physicists. To this day, this problem has not been solved.

- Newton, during his time, thought that light was made of particles.
- In the nineteenth century, physicists favoured the wave concept. EM waves were propagated in aether, an unknown propagation medium.
- In 1905, continuing the works of Max Planck (Nobel Prize - 1918), Albert Einstein (Nobel Prize - 1921) built a particle theory of EM radiations. The concept of aether became obsolete since photons do not need any aether to be propagated. However, some problems, like Young's experimentations for example, were still not solved with the photon concept.
- Later, in 1922, Einstein returned to aether. He was confronted with the problem of duality since the photon is incompatible with the wave, and therefore with aether.
- In 1959, 39 years later, Louis de Broglie (Nobel Prize - 1929) proposed the idea that aether was made of neutrinos.
- Around 1980, physicists verified once more the constant speed of light with quasars, using embedded systems and telescopes in satellites.

These recent experiments show that the propagation of EM waves and the enigma of the constant speed of light are still not solved. The aether concept would help but no one is able to give an exact definition of it. Finally, since 1905, the enigma of the constitution of light has been so persistent it prompted Louis De Broglie to say: "*Science will make a great step ahead the day that it can explain a simple ray of light*".

## 1.2 Nature of EM radiations

One of the peculiarities of the EM wave is that it can be propagated in a vacuum. But in a vacuum... there is nothing... and the EM wave cannot exist in the absence of a propagation medium.

The introduction of the photon partially solves this problem. Indeed, like any particle, the photon can move in a vacuum. However, if an EM radiation behaves like a particle in 90% of the cases, it also behaves like a wave in the remaining 10% of cases, as in Young's slits experimentation. The enigma thus remains unsolved for these cases.

When a hard drive periodically makes one, two, three or more errors, it must be formatted. Of course, this leads to a waste of time, but there is no other solution. In quantum mechanics, errors or inconsistencies don't occur in one's, two's or three's, ...but in ten's. In such a case, the only thing to do is to "format" quantum mechanics. The best approach is to start from scratch, ignoring the few laws of quantum mechanics that are inconsistent, but keeping experimentations in mind.

Therefore, to understand the nature of EM radiations, we will not begin from 1905, when Einstein discovered the photon, but from 1916, after his discovery of general relativity. Indeed, if the key to the problem is spacetime, we must restart from general relativity. In this chapter, we will study the wave aspect of EM radiations.

### **Important note:**

*The particle aspect of EM radiations, namely photons, will be discussed in the following chapters.*

## 1.3 Separation of media

The problem of velocity additions suggests that we are in the presence of two distinct media:

### **1- "Apparent medium"**

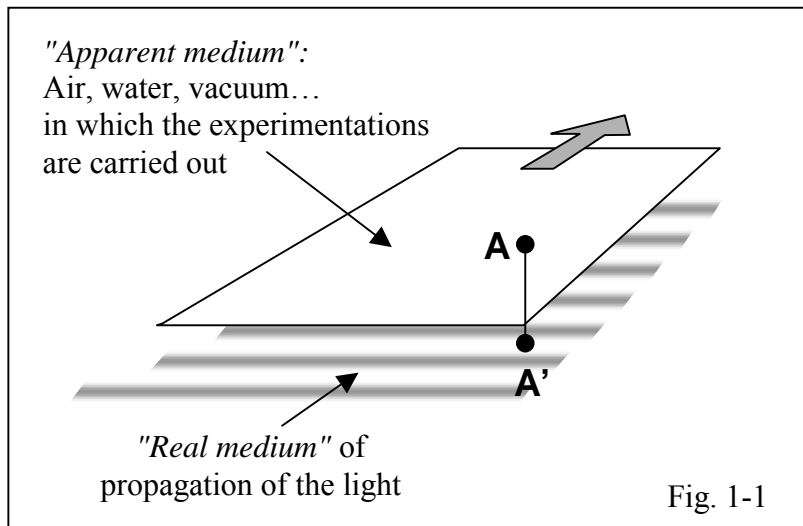
This is the visible medium that carries out the experimentations, and from where the EM wave is emitted.

For example, in Fizeau Experimentation, this medium is water, and in Michelson's, it is the Earth's atmosphere moved by the Earth itself.

### **2- "Real medium"**

EM waves are propagated in a "real medium". For example, this "*Real Medium*" could be De Broglie's "Neutrinos Sea".

The "*apparent medium*" and the "*real medium*" are overlaid (fig. 1-1).



In this figure, points A and A', as well as the apparent and real media, are separated for teaching purposes but, obviously, they share the same place. Any apparent medium has, necessarily, a subjacent real medium that is associated with it.

## 1.4 Properties of the "Real medium"

The "real medium", if it exists, must have at least the following two properties:

### 1- To be present everywhere

Since EM waves are propagated everywhere, the "real medium" must also be present everywhere, in air, in water ... and even in a vacuum. Spacetime is an excellent candidate to be this "real medium" since it is present everywhere, even in a vacuum<sup>1</sup>.

### 2- To have propagation properties

We know that any wave needs a propagation medium to move. Since spacetime is elastic and can be deformed, it is an excellent propagation medium.

Therefore, spacetime could be used without any problem as a support for EM waves.

This being said, gravity and EM waves do not curve spacetime in the same manner. Please see Part 1 "Mass and Gravity" concerning these subjects.

## 1.5 Constant speed of light

Let's imagine the emission of a beam, L, from a laser diode (fig. 1-2). The diode, A, is fixed on an "apparent medium" moving with the velocity "V".

In fact, the laser beam L is not emitted from the *apparent medium* as this figure shows, but from the point 'A' located in this "real medium" which is spacetime of the universe.

<sup>1</sup> Spacetime is not this unknown aether for which we are looking. Spacetime is spacetime. There is no other correct definition and spacetime can't be identified with aether. In order to avoid any confusion, we will use the term "real medium" instead of "aether".

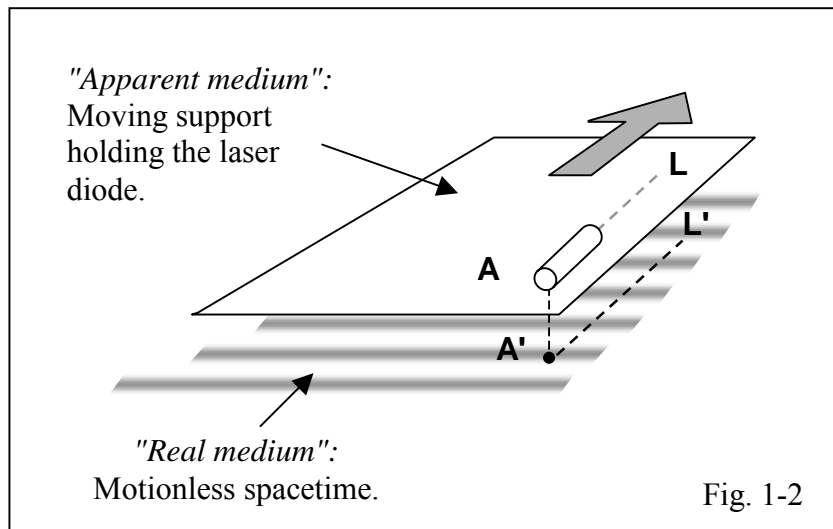


Fig. 1-2

Since light is propagated in the *real medium*, its speed depends only on the nature of this medium, and nothing else. In reality, the permittivity of free space  $\epsilon_0$  is not a "vacuum permittivity" but rather a "spacetime permittivity", a physical constant that defines the spacetime propagation characteristics, as the "spacetime permeability"  $\mu_0$ .

Fizeau, Michelson and other physicists thought that light is propagated in this *apparent medium* which is moving, water, air, vacuum etc..., whereas, in fact, it is propagated in this *real medium* which is the "motionless" spacetime of the universe.

#### Note 1

We should not have any confusion between the word "motionless" used in the context of the universe, which is correct, and the same word used in Special Relativity, which is not relevant.

#### Note 2

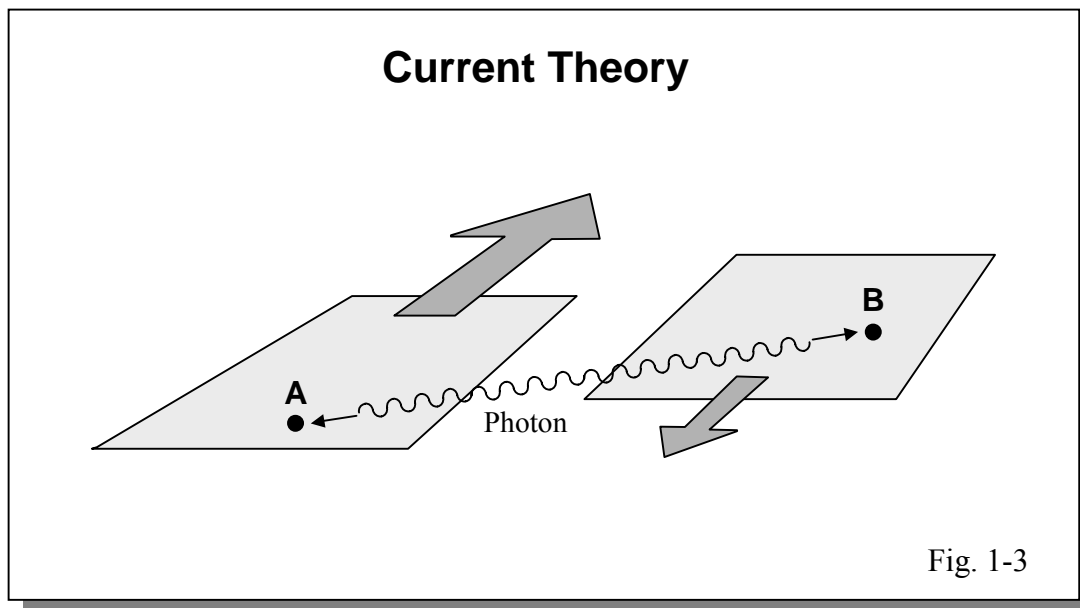
The spacetime of the universe, sometimes called "global spacetime structure", is the one that was created about 13.9 billion years ago, and not the local spacetime of special relativity. So, in this document, the word "spacetime" will always refer to "global spacetime structure of the universe", as in Friedman-Robertson-Walker Definition.

#### Note 3

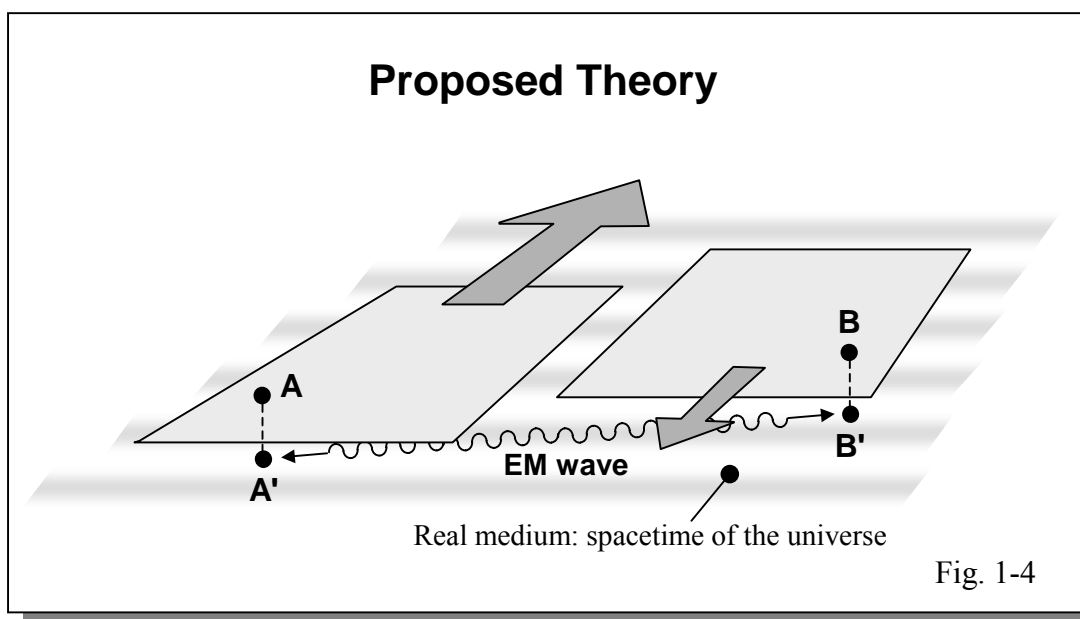
There should not be any confusion between the **apparent medium**, from where the EM wave is emitted, and its propagation medium, the **real medium**, which is spacetime of the universe.

## 1.6 Case of two reference spaces

Figures 1-3 and 1-4 show that the presence of a "real medium" does not affect the principles of Special Relativity.



A photon is emitted from A to B, or the converse, to synchronize the two reference spaces which are both moving. The points A and B belong to the apparent media. In this case, no one can explain why the speed of light is constant. Logically, the velocities should be added. Since this is not the case, this diagram must be revised (...but not the experimentations!!!), despite the fact it has been used since 1905.



Light is not propagated in the apparent medium, which supports the sources of light A and B, but in the real medium, which is **global spacetime of the universe**. EM radiations do not consist of photons but of EM waves. As a result, the constant speed of light is easily explainable. The velocity of light is a function of the real medium characteristics, i.e. spacetime permittivity  $\epsilon_0$ , and spacetime permeability  $\mu_0$ . Thus, the speed of light is always 300 000 km/s, whatever the velocity of the reference space, or the apparent medium, from where the light is emitted.

## 1.7 Conclusions

- EM waves are emitted from an *apparent medium* but are propagated by the *real medium*, which is global spacetime of the universe.
- In this *real medium*, the speed of light is 300 000 km/s. Its invariant velocity is only a function of the permittivity of spacetime  $\epsilon_0$  and of the permeability of spacetime  $\mu_0$
- EM waves are a succession of spacetime vibrations.

Therefore, although it amounts to the same thing, it would be more accurate to write:

*“The speed of light is 300 000 km/s in spacetime”*

rather than:

*“The speed of light is 300 000 km/s in a vacuum”*

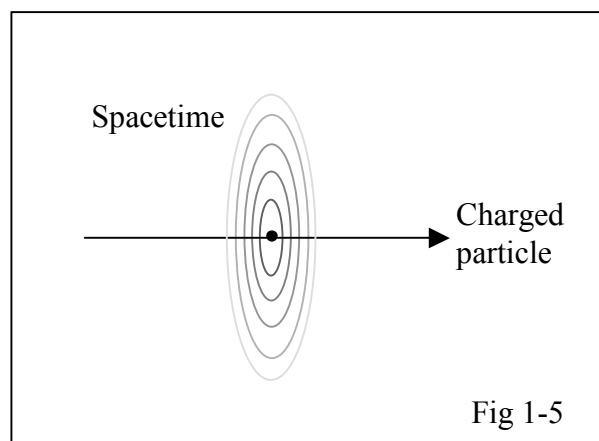
*Note:*

*Under certain conditions, EM waves may move at a speed different than 300 000 km/s. For example, using Bose Einstein condensates made up with sodium atoms at  $-273.15^\circ$ , Lene Vestergaard Hau, from Harvard University, USA, slowed down EM waves to 17 m/s. In the same way, EPR (paragraph 3.12) also is an exception to the theory. The Spacetime Model partially covers these exceptions, particularly in Part 1 "Mass and Gravity".*

## 1.8 Application 1: Displacement of charged particles

By no means, can a moving, charged particle emit other particles called "photons". In the same way, a stone falling into water cannot emit tiny stones in all directions.

The photon concept (chapter 3), from this point of view, is nonsense. Reality is much simpler. With the image of a stone falling into the water, the displacement of a particle produces movements in spacetime (fig. 1-5). From a mathematical point of view, these spacetime perturbations are "EM waves" but have all the characteristics of photons.



## 1.9 Application 2: The $\Delta q/\Delta t$

As we know, a motionless stone in water doesn't produce water movements. A stone begins to make eddies only when it moves.

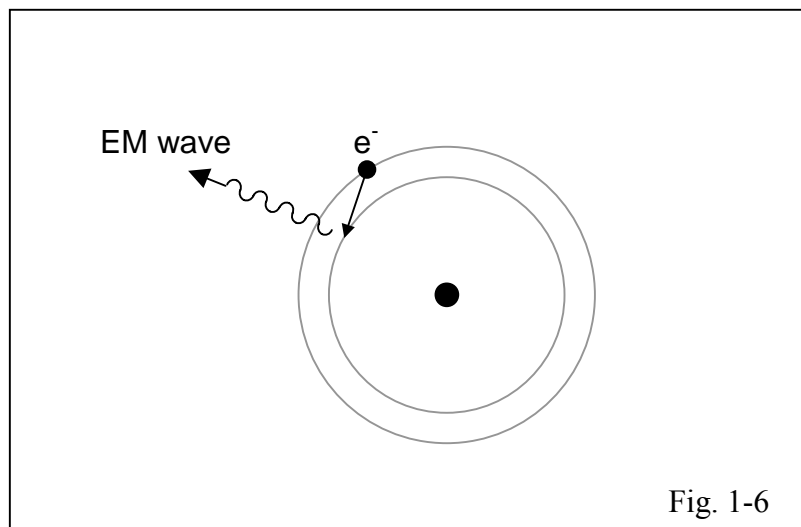
We have the same phenomenon in spacetime; a motionless electron doesn't create any perturbation, or wave.

Therefore, **we have a perfect match between this common phenomenon on Earth and electromagnetism ( $\Delta q/\Delta t$ )**. This simple example clearly shows that the photon concept, despite the fact it has been used since 1905, is inconsistent.

Moreover, this phenomenon is in perfect accordance with the third principle of duality (see chapter 1 of the document "Constitution of Matter").

## 1.10 Application 3: Changes in orbitals

In the same way, there is no emission of photons when an electron moves from a higher to a lower orbital (fig. 1-6). This point of view is also scientific nonsense.



The explanation of the EM radiation emitted during a change of orbital follows the same principle as the precedent. The passage of the electron from one orbital to another of less energy creates movements in spacetime, like whirlpools or eddies in water. These movements are EM waves or, to be more precise, "quantified EM waves" (see the following chapters).

*Note: In reality, contrary to a preconceived idea, the electron does not move continuously on the orbital. Therefore, this diagram is not exact. Part 3, "Quarks and Antimatter", covers this subject.*

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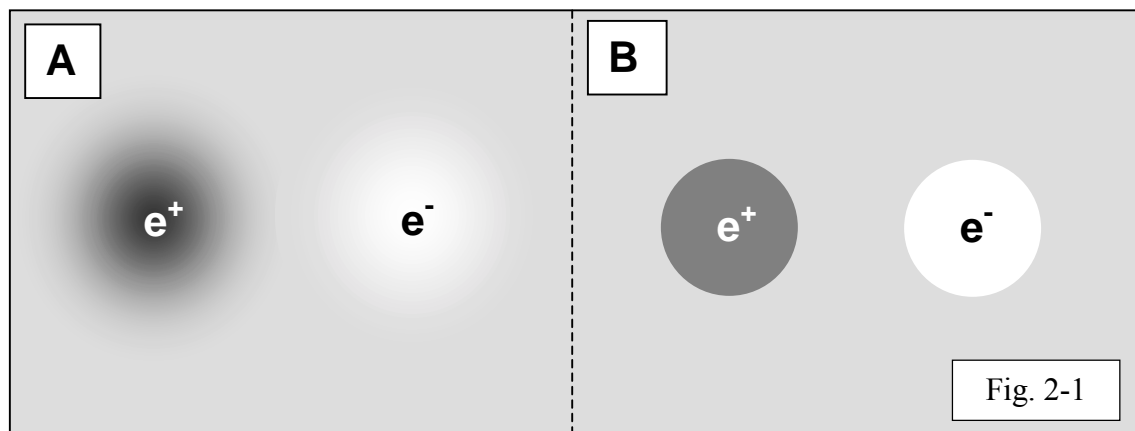
## 2 Electromagnetism

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*Everyone acknowledges the EM force but no one can clearly explain how it works. This chapter examines the electromagnetism force in detail and solves this enigma.*

### 2.1 The electron

The volume of the electron is measured with remarkable accuracy: 510.998918 KeV. Therefore, its borders are very precise and clearly defined. Indeed, the electron and positron are not those particles that were described in Part 2 “Constitution of Matter”, as figure 2-1A shows. They are, rather, particles illustrated in figure 2-1B.

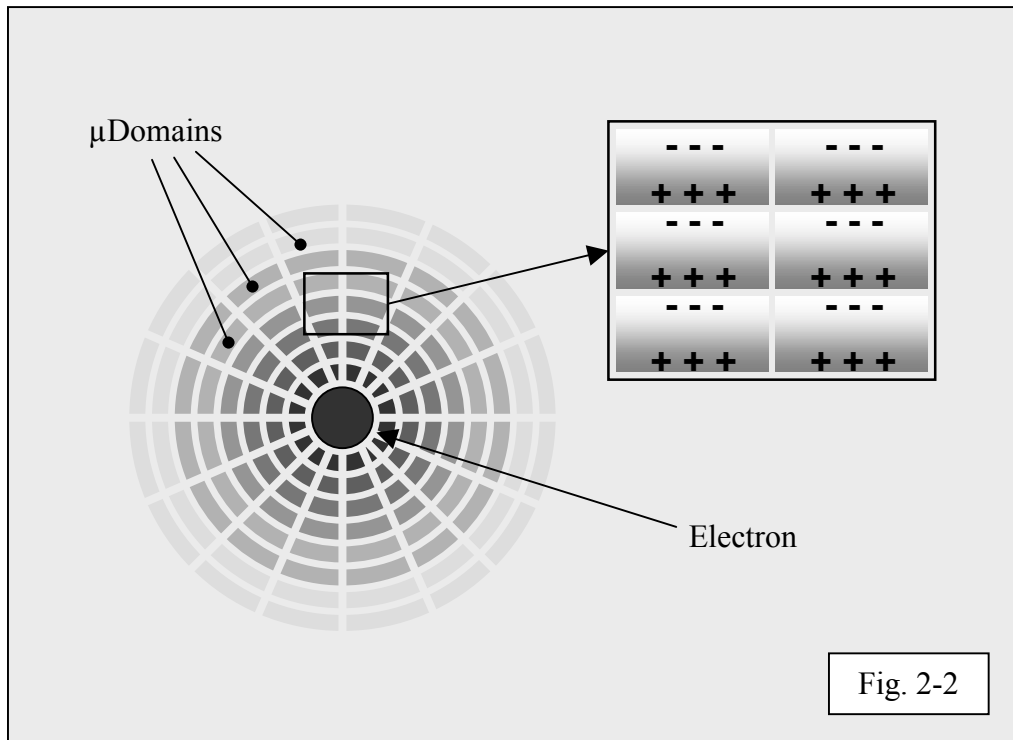


Part 3 “Quarks and Antimatter” demonstrates that electrons and positrons are charged  $\mu$ Domains whose borders make a volume, or “mass effect”, of 510.998918 KeV (see the introduction in page 3 of this part). Since these borders are very “clean”, the propagation of the charge of the electron, i.e. spacetime density (see Part 2 “Constitution of Matter”), over its boundary is an enigma. How can the EM field exceed the electron's borders?

The solution is very simple.

$\mu$ Domains, defined in Part 3, have a homogenous spacetime density that makes their charge neutral. Under an external influence, like near a charge, this homogeneity is disturbed.

The electric field creates a pressure of spacetime on one side of the  $\mu$ Domain, and a depression on its opposite side. Thus, the electric field can be gradually propagated, step-by-step, **inside** the  $\mu$ Domain (fig. 2-2). Each  $\mu$ Domain acts like an electric dipole.



*The representation of this figure is only for teaching purposes. The  $\mu$ Domains and the electron have the same volume: 511 KeV., and not the different volumes represented in this figure.*

## 2.2 1D polarization of $\mu$ Domains

Let's use polar co-ordinates. The electric polarization seen in the preceding paragraph is a function of the radius,  $r$ , which has only one dimension (1D). At a distance  $r$  from the center, all  $\mu$ Domains are electrically polarized with the same intensity, regardless of the  $\phi$  and  $\theta$  angles. This situation is normal since we are in a spherical symmetry.

Figure 2-3 represents, on the left, a 3D view of a static electron and six  $\mu$ Domains. On the right is a cross-section of the left view. If the electron is fully static it produces only an electric field, which is this one-dimensional polarization. As we know, the magnetic field does not exist.

**The electric field is a one-dimensional polarization of  $\mu$ Domains, which is only a function of the "r" radius**

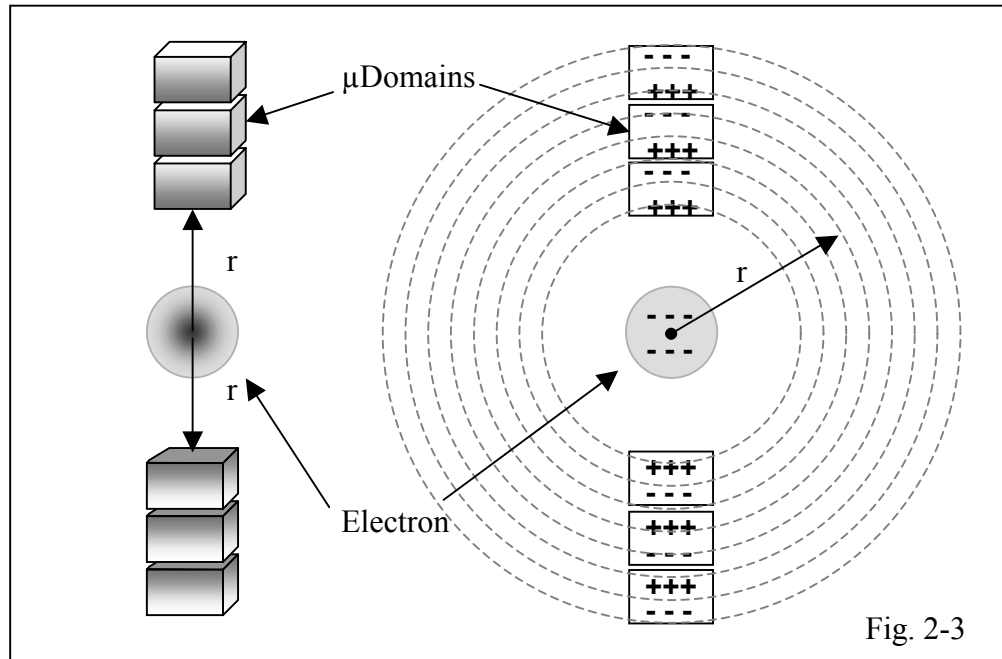


Fig. 2-3

### 2.3 3D polarization of $\mu$ Domains

We know that:

- Electromagnetism appears only if the charged particle is moving,
- The electric field and the magnetic field are two different effects of a common phenomenon. James Clerk Maxwell demonstrated this in 1872.

These two remarks lead to the following deduction.

The radial co-ordinate is already used by the electric field. We can, therefore, deduce that the magnetic field uses one or both of the remaining co-ordinates, angles  $\theta$  or/and  $\varphi$ . This point of view is exactly what the experimentation proves. Indeed, to describe magnetism, we need vectors perpendicular to each other, whereas only one vector is necessary to define the electric field.

We don't know exactly the shape of the magnetic polarization of the  $\mu$ Domains. We may suppose that it is in 3D, but a 2D polarization must not be excluded. The only thing of which we are sure is that the magnetic field is propagated inside  $\mu$ Domains, like with the electric field, but with different directions of polarization.

### 2.4 Principle of magnetism

Why does this polarization appear only in this situation, when the electron is moving?

The response to this question is found in the third principle of wave-particle duality: “When the particle is moving, it becomes a wave” (see Part 2 Chapter 1).

Indeed, when the electron is moving, its shape changes from a corpuscular state to a wave.

We know that the magnetic field doesn't exist when the electron is motionless. In this case, the field is only a function of the radius "r", as seen in the preceding paragraph.

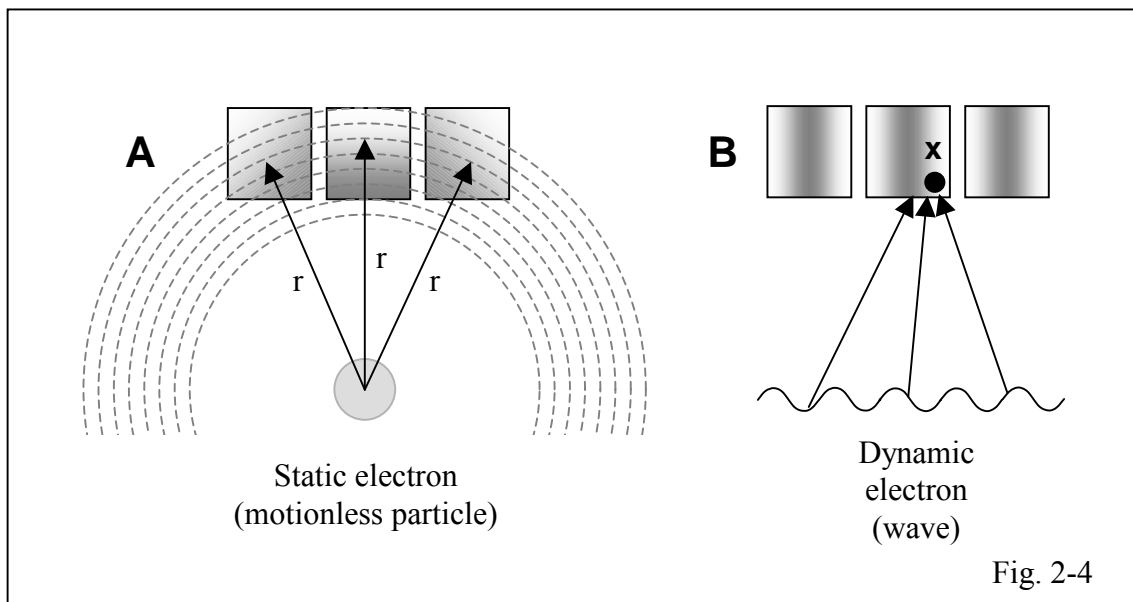
When the electron is moving, it becomes a wave. Its spherical symmetry disappears. Therefore, the field can't be expressed with only one variable, the "r" radius. Additional variables, angles  $\theta$  or/and  $\varphi$ , are necessary to describe the field.

Figures 2-4 A and B show the difference between a static and dynamic electron. We must only keep in mind that when a charged particle is moving, the corpuscular shape disappears and the particle becomes a wave.

- Static electron (on the left, fig. 2-4 A)
 

When the electron is motionless it is a particle with a spherical symmetry. The electric field is propagated in  $\mu$ Domains, which are polarized in only one direction: the "r" radius (1D). In other words, at a distance "r" from the particle, each  $\mu$ Domain is polarized in the same manner. The magnetic field doesn't exist
- Dynamic electron (on the right, fig. 2-4 B)
 

When the electron is moving it is no longer that particle with a spherical symmetry, but becomes a wave. Each  $\mu$ Domain is subject to many polarizations produced by the different parts of the wave. For example, point "x" receives three different fields, each having different intensities. An additional 2D polarization is thus added to the previous 1D one. The result is that all  $\mu$ Domains are polarized in 2D or 3D (r,  $\varphi$  and  $\theta$ ) instead of 1D (r only).



In other words, magnetism does not exist as a fundamental force. It is the Coulomb Force, nothing more. The magnetic field is a sort of "lateral" Coulomb Field. The orientation of the  $\mu$ Domains' polarization produces a new phenomenon called "magnetism", but **we must keep in mind that magnetism is nothing but a Coulomb force in a different direction.**

We must also note that the particle, when it is motionless, has an electric field (1D), which acts like a monopole since it is a punctual object. On the other hand, the magnetic field (2D/3D) requires dipoles (the wave) to create it. So, **the magnetic monopole can't exist**. This is exactly what is proven by experimentation.

Lastly, it is also possible to have a magnetic component without an electric field. This is the case, for example, of permanent magnets. It is only a matter of the polarization of  $\mu$ Domains<sup>1</sup>.

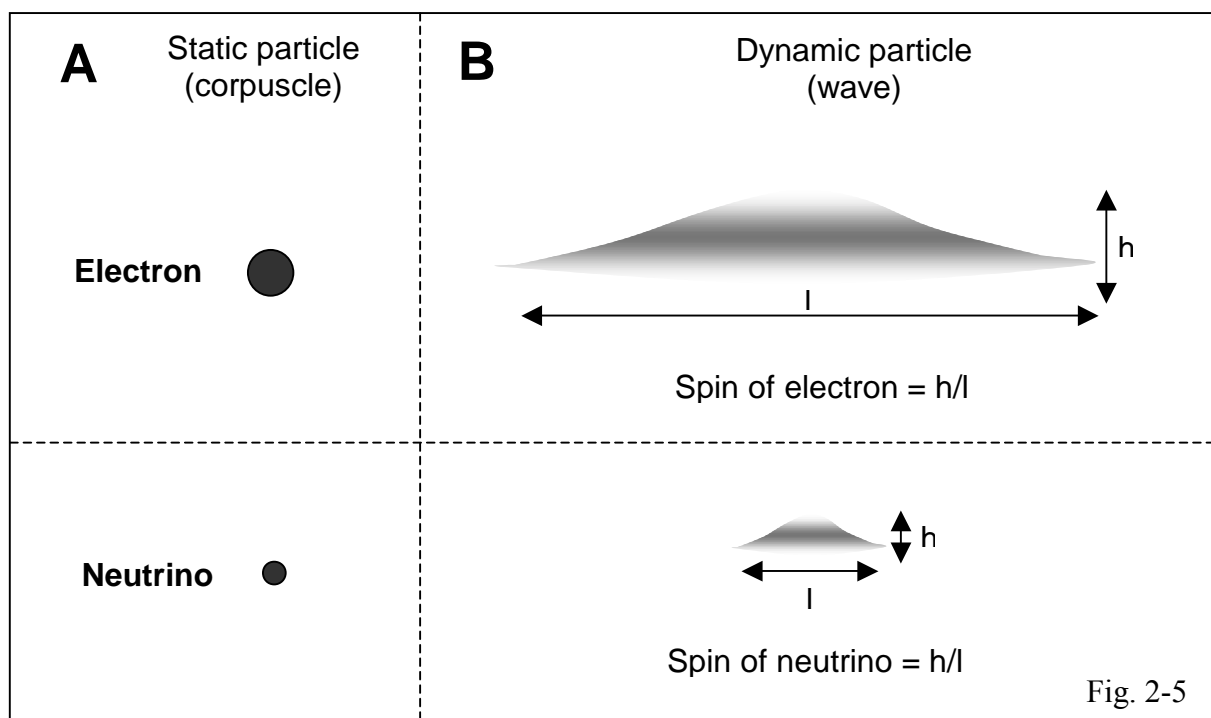
## 2.5 The spin (proposal)

Since its discovery by Pauli in 1924, the spin remains a true mystery. No one knows exactly what the spin is.

The Spacetime Model doesn't share the complexity of quantum mechanics. The universe is very simple by necessity and needs only 4 dimensions, no more. From this point of view, we can deduce that the spin is related either to the charge, like electromagnetism, or to the mass (volume). It seems that the spin is related to electromagnetism rather than to the mass.

Since the spin is not proportional to the charge, it could be a simple ratio, like  $h/l$  on figure 2-5, in relation to the wave or, more precisely, to the magnetic component of the wave.

The following example (fig. 2-5), which is only a suggestion, shows the idea proposed. The two particles, an electron and a neutrino, go towards the reader. On the left (A), the two particles are motionless, i.e. in their corpuscular form. The spin doesn't exist. On the right (B), these two particles are moving as waves producing the spin effect.



<sup>1</sup> The current document can't cover, completely, so vast a subject.

If this point of view is correct, the spin would not be a value attached to any particle but rather a value attached to the mode of propagation of the waves. More precisely, the spin would be 0 with an EM wave, and a multiple of  $1/2$  with matter waves.

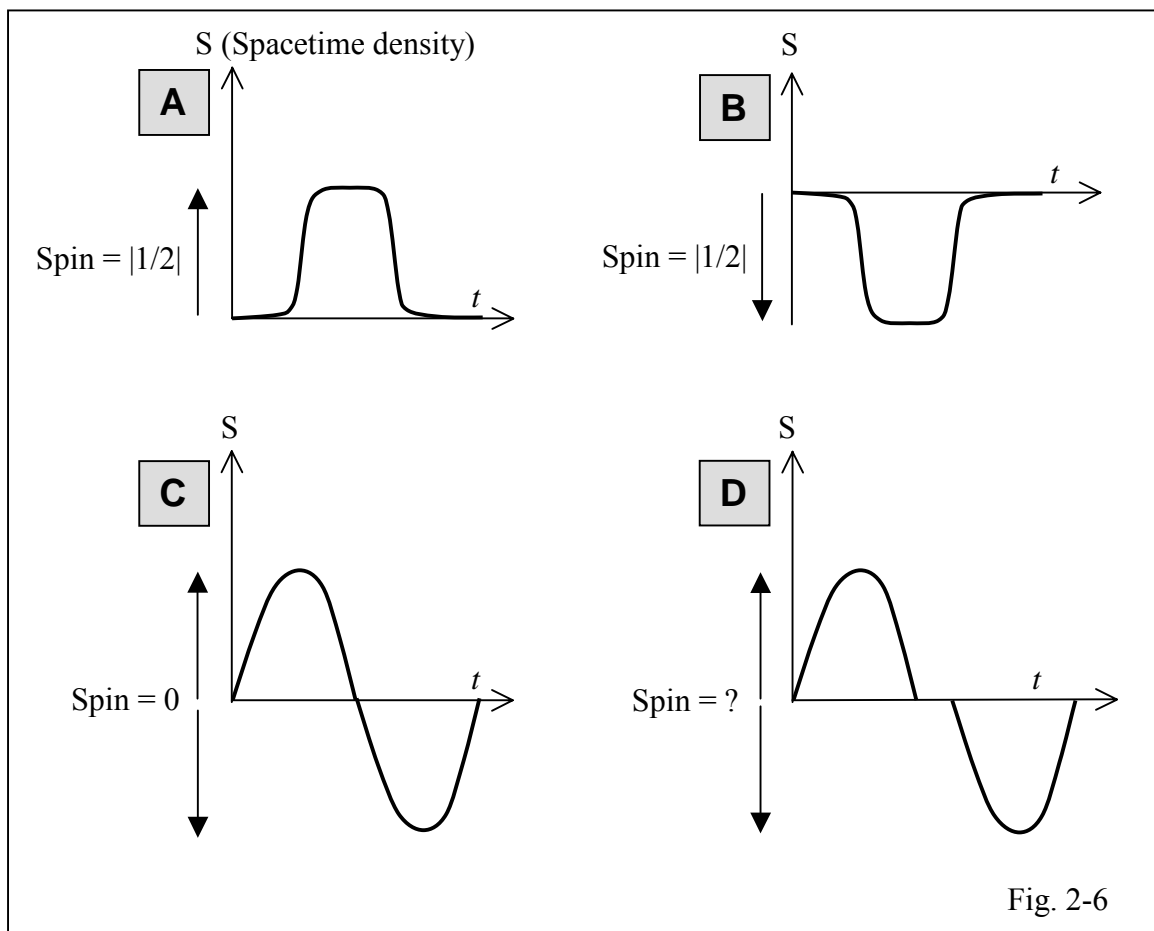
This point of view means also that any motionless particle can't have a spin. In other words, the theory described in this document predicts that **the spin exists only when the particle is moving**, i.e. only when the particle is in its waveform. However, if the particle is moving at low speed, its form is between a corpuscle and a wave. In such a case, the spin could have a different value, for example  $1/4$  instead of  $1/2$  (this suggestion must be considered with great care).

This approach may be illustrated by the following examples (fig. 2-6):

**Cases A and B:** Matter waves. The spin is a multiple of  $1/2$  in absolute value.

**Case C:** EM waves. The spin of a half-period cancels each other.

**Case D:** In some cases, we can have a set of half-periods. This is the case when an atom is moving. The atom is moving as a complex set of waves (quarks, electrons...) and their individual spins can or can't be mutually cancelled. This depends on the overlap of the individual waves.



## 2.6 Rule of addition of spins

The rule of addition of spins has been devised taking into account the experimentations conducted in 1930's. This theory is applied with success in the majority of cases (molecules, atoms...), but its application to all components of physics without any reservation is highly debatable for the following reasons:

- 1/ It is not possible to create a reliable theory concerning the spin since the real nature of this parameter is unknown<sup>1</sup>.
- 2/ The rule of addition of spins applies in most cases, but this does not mean that it applies in all cases. Any extrapolation toward the quarks or other particles may produce debatable results since our knowledge of the nature of these components, as our knowledge of the spin, is very poor. More precisely, we have an excellent knowledge of the particle's behavior from a mathematical point of view but we are still not able to answer the fundamental questions concerning the basic phenomena: What is the charge? mass? gravity? spin?....
- 3/ Moreover, the spin seems to be a function of the overlap of waves. As we know, molecules and atoms are much larger than protons or quarks. When these elements are moving, the overlap of their waves is different. Therefore, we may get erroneous results when extrapolating the rule of addition of spin toward elementary particles since we don't know exactly the wave shape of each particle, which is concerned.

To summarize, molecules and atoms are well known, but...

- 1/ the real nature of the spin is unknown,
  - 2/ the overlap of waves is unknown,
  - 3/ the wave of an atom is much larger than the wave of a quark
  - 4/ the basic phenomenon of electrostatic is unknown,
  - 5/ the basic phenomenon of magnetism is unknown,
  - 6/ charge is unknown,
  - 7/ mass is unknown,
  - 8/ gravity is unknown,
  - 9/ the nature of electrons, quarks and other particles is unknown...
  - 10/ the mass of quarks is measured with poor precision
- ...etc...

Under these conditions, is it reasonable to assume that the rule of addition of spins, which is 100% correct with molecules, atoms, and some particles, can be extrapolated to all particles of physics without reservation?

Of course, not. This extrapolation is hazardous.

*For all these reasons, the violation of the rule of addition of spins can't be retained as a valid objection to the proposed theory, the "Spacetime Model".*

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<sup>1</sup> Saying "the spin is a quantum value" doesn't mean anything. Indeed, this definition "the spin is a quantum value" doesn't explain the real nature of the spin.

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## 3 The Photon

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*In chapter 1, we have considered the wave-like behavior of EM radiations. Here, we study its particle-like behavior, i.e. the photon.*

### 3.1 Justification of the photon

The following experimentations seem to confirm the existence of the photon:

- **The Planck Quantum** is a physical reality and not just a mathematical concept. This unit absolutely must be preserved.
- **Experimentations** (photoelectric effect...) also tend to prove that the photon exists. The interpretation of these experimentations is, however, debatable<sup>1</sup>.
- **The EM wave decrease.** This decrease in  $1/r^2$  makes it impossible for a wave to exist far from its origin. Only the photon concept would resolve this paradox. This chapter contains a new explanation of this phenomenon.
- **Vacuum propagation.** This enigma is not relevant since EM waves can be propagated in spacetime, and spacetime is present in a vacuum. This problem was solved in chapter 1.

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<sup>1</sup> In 1905, when Einstein explained the PE effect using the Planck Quantum, the atom's internal configuration was unknown. Rutherford thought that the atom was like an "English pudding". In 1905, physicists didn't know that the atom had a nucleus. Einstein thought that the poor efficiency of the PE effect was in relation to the probability that the photon had to meet an electron (in 1905, electron distribution was described as being like raisins in a pudding). Later on, physicists demonstrated that the electron was: 1/ infinitely smaller than the nucleus and, 2/ a huge distance from it, proportionately. This means that the collision probability between a photon, if it exists, and an electron is practically null. However, and paradoxically, the yield was increased to attain about 98% today. This paradox remains a mystery. The cross section calculations and other theories about the photon are highly debatable, not from their mathematical point of view, but, in their interpretation, if we regard the photon as a particle. On the other hand, as every physicist knows, several different mathematical theories may be devised to explain a given phenomenon. For example, we know three different theories which are mathematically verified, to explain mass and gravity: the Higgs boson, Superstrings (E. Wirren) and the Spacetime Model (Part 1). At least two of these three theories are wrong, despite the fact that they are all mathematically verified. It means that any theory, which is not fully explained with logic and good sense, must be considered with great care. This is the case of theories concerning the photon and the PE yield, because their explanation is not consistent and remains a true mystery. See paragraphe 3.2.

## 3.2 Inconsistencies of the photon

- **Its velocity:** The photon's velocity is 300 000 km/s, no more, no less. This is illogical because if the photon is a particle, it may travel at any speed. What would we think of a vehicle moving at only one speed, 100 km/h, no more, no less?
- **Its impossibility to stop:** Why can't the photon stop? In the preceding example, what would we think of a vehicle (a particle), that can't stop?
- **It's massless:** If the photon is a particle, how does one explain its lack of mass?
- **Its acceleration:** If the photon is emitted from an electron moving at 280.000 km/s, how can it immediately accelerate to 300 000 km/s <sup>1</sup>? What is this unknown force that gives the photon an additional speed of 20 000 km/s?
- **The causal principle:** The photon concept continuously violates this principle. Some experimentation needs a particle-like behavior, and other a wave-like behavior. It is obvious that the photon, once emitted, has not the ability to predict its future. It does not know its own destiny. More precisely, it does not know if the experimenter needs a particle-like behavior for his experimentation, or a wave-like behavior. Since the two behaviors do not simultaneously exist, this prediction causes a real scientific problem.
- **Its constitution:** What is the constitution of the photon? No one knows...
- **Displacement of a charged particle** (paragraph 1.7): How can a charged particle that is moving emit other particles called "photons"? It is like a stone falling into water emitting tiny stones... This concept is disconcerting.
- **Orbital change of an electron** (paragraph 1.9): In the same way, no one can explain how an electron, moving from one orbital to another, can emit tiny particles called "photons".
- **EPR:** In this experimentation, it would be necessary for the photon to have a kind of thought transference with another photon at a distance of several meters...
- **Young Slits:** Here too, the photon poses a serious problem of logic.

These 10 inconsistencies - and probably more - mean that the photon concept, despite the fact it has been used since 1905, must be seriously revised.

## 3.3 Decrease in $1/r^2$

We pointed out that EM waves are propagated gradually in  $\mu$ Domains. At a distance "r" from the emission source, it arrives at a moment when the charge contained in a  $\mu$ Domain becomes too weak to be propagated in the next adjacent  $\mu$ Domain. This limit is, in fact, a quantum. But this is not exceptional since all objects are quantified, in one way or another. In accordance with Max Plank, the quantum is a necessity.

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<sup>1</sup> We could say that the speed may increase in order to preserve the momentum but the interaction remains a true mystery, not from a mathematical point of view but if we try to understand the phenomenon using logic and good sense. The main problem comes from the mass of the photon, which is null.

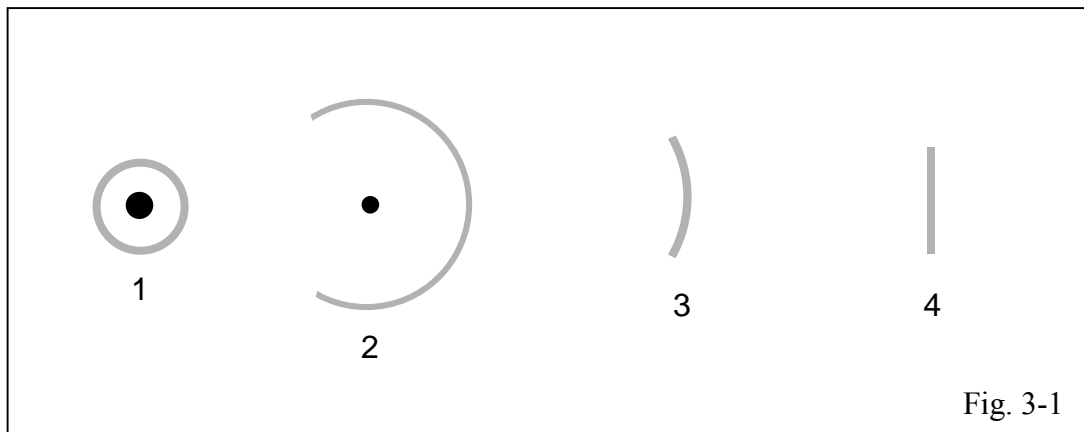
The charge, which passes from one  $\mu$ Domain to another, must be higher than this quantum. Under this condition, how will an EM wave react when the charge transmitted in the  $\mu$ Domains approaches this quantum? There are only two possibilities:

- The charge disappears completely. The EM wave dies.
- The charge remains grouped. In this case, the EM wave ceases to decrease.

The first possibility is not credible because, in Nature, nothing totally disappears. Therefore, the second possibility is more reasonable.

### 3.4 The "quantified wave"

The various steps of the wave during its travel, from its creation to a distance away, are represented on figure 3-1.



- **Step 1:** The wave is created in a  $360^\circ$  space (grey circle). Note that the angle is not necessarily  $360^\circ$  and may have any other value.
- **Step 2:** At some distance from its source, the decrease in  $1/r^2$  of the EM wave reaches its quantum. The spacetime density of the wave is too weak to continue to decrease while propagating from  $\mu$ Domains to  $\mu$ Domains. The wave has only one solution: to break at an unspecified place to remain grouped<sup>1</sup>.
- **Step 3:** The distance increases, and the arc of the circle decreases proportionally.
- **Step 4:** The wave is now very far away from its source and its curvature becomes practically a segment or, in quantum mechanics terms, a "wave pack". The EM wave always keeps its wave behavior while remaining grouped. It can thus travel billions of light-years as a photon would, but as a small "piece of wave".

This is what we call a “**quantified wave**”.

<sup>1</sup> This phenomenon may be better understood by replacing the EM wave with a water wave. The quantum of water is the  $H_2O$  molecule. It is obvious that a water wave can't be smaller than a  $H_2O$  molecule. When the  $H_2O$  quantum is reached, the wave doesn't continue decreasing but breaks. However, please note that this simple comparison is done for teaching purpose only. A quantified wave can't be identified to a  $H_2O$  molecule.

So, when we see galaxies, our eyes do not perceive a photon but a "quantified wave". During all its travel, this wave remains grouped<sup>1</sup>.

Let's now consider the different phases of a quantified wave.

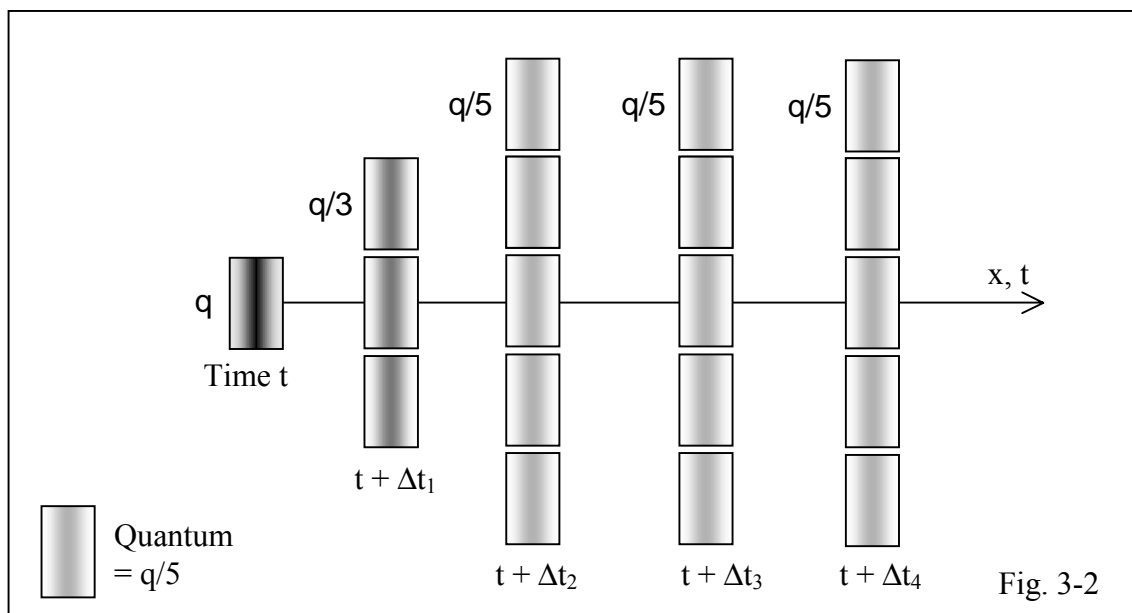
### 3.5 The emission

EM radiations are always spacetime movements, or EM waves. The photon, as a particle, doesn't exist.

### 3.6 The travel

Once emitted, an EM radiation keeps its waveform. Beyond a certain distance, since the charge can't go under the quantum level, there is a possibility that an "ordinary wave" become a "quantified wave".

Figure 3-2 shows an EM wave that is propagated gradually in  $\mu$ Domains. The charge is  $q$  at the source level, and is divided by 3, then by 5. In figure 3-2, the quantum  $q/5$  is reached at Time  $t + \Delta t_2$ . The EM wave doesn't continue decreasing over time  $t + \Delta t_2$ .



During its travel, the EM radiation keeps its waveform.  
It can, nevertheless, be quantified if the distance requires it.

<sup>1</sup> On earth, we have a similar phenomenon: capillarity.

### 3.7 The reception

When a part of the wave inside a  $\mu$ Domain meets an element, atom or something else, an interaction may take place. The  $\mu$ Domain is emptied of its charge. Gradually, it empties all other adjacent  $\mu$ Domains forming the wave (fig. 3-3).

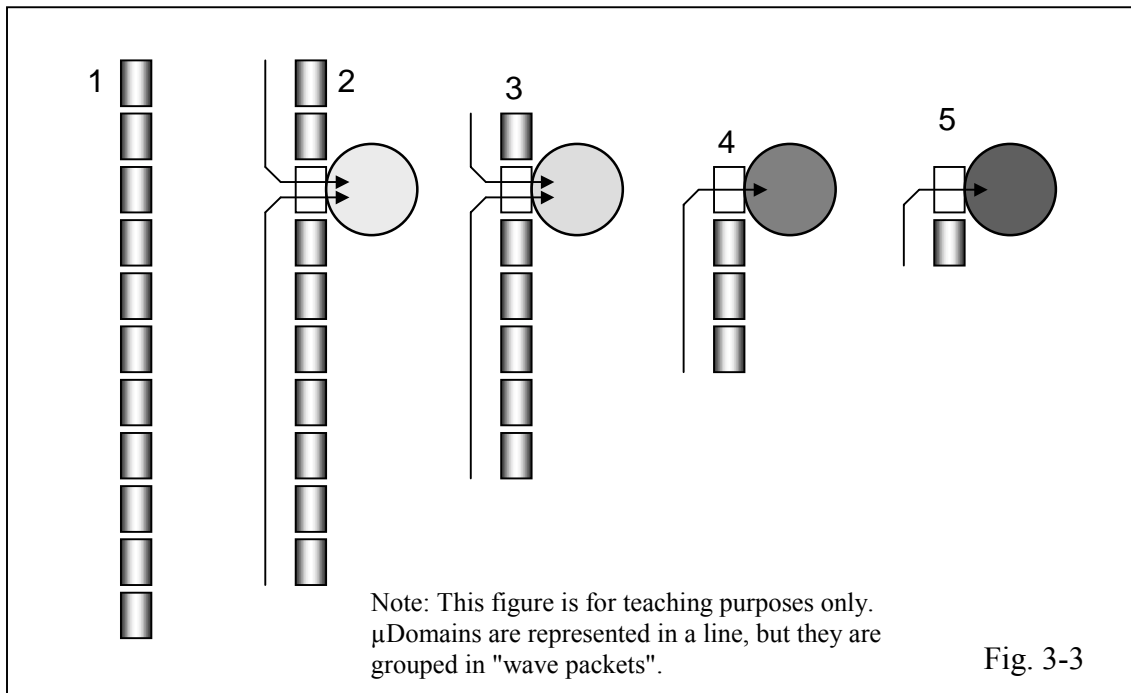


Fig. 3-3

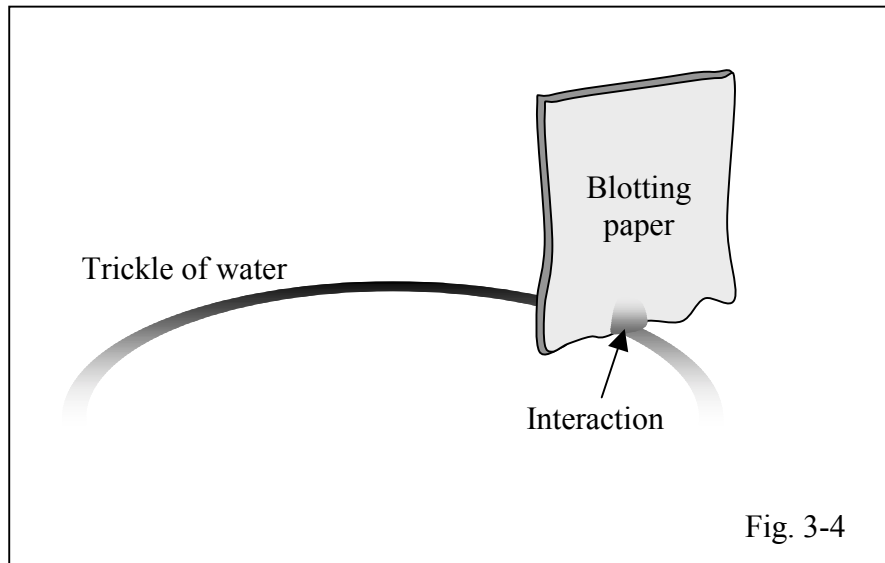
- **Phase 1:** The EM wave propagates normally.
- **Phase 2:** It meets an element that absorbs its energy. The  $\mu$ Domain in contact is emptied. This element is not necessarily in the center and can be anywhere at the front of the wave.
- **Phases 3 and 4:** The EM wave continues to be absorbed by the element. The  $\mu$ Domains are gradually emptied, step-by-step,  $\mu$ Domain-by- $\mu$ Domain.
- **Phase 5:** The EM wave is almost completely absorbed by the element of interaction.

An identical process exists on Earth (fig. 3-4). The EM wave is replaced by a trickle of water. The particle, which absorbs the wave energy, is replaced by a blotting paper. The trickle of water is absorbed by the blotting paper at the place of interaction, or measurement.

To summarize:

The interaction takes place with a kind of "virtual photon", which is, in reality, an EM wave.

- This wave may be quantified if the distance requires it.
- This wave is absorbed at the place of measurement.



### 3.8 Validation of the proposed theory

How can we prove that photons must be replaced by "quantified waves"?

We already have multiple proofs.

- The constant speed of light, 300 000 km/s, proves that we are in front of a wave and not of a corpuscle. If an object moves at one and only one speed, this object can't be a particle but a wave, and the speed of this wave is function of medium characteristics.
- Any particle has the ability to stop. Why doesn't the photon? It means that the so-called "photon" is not a corpuscle but a wave. Indeed, a wave never stops.
- Saying that the "mass" of the photon must be null is scientific nonsense. Only a wave has a null mass, not a particle.
- The displacement of a charged particle ( $\Delta q/\Delta t$ ) can't emit tiny particles called "photons". This is nonsense. If this displacement produces waves, this enigma becomes consistent. Etc...

If we replace the word "photon" by "quantified wave", we solve all of these inconsistencies, and many more.

### 3.9 The Experimenter

Let's return to the example in chapter 1 of a small sailing boat in the middle of a swimming pool. The experimenter is assumed to be inside it. If the boat starts to pitch, the experimenter wouldn't know if his boat was hit by a stone (a particle) or by a wave of water (EM wave). Likewise, in quantum mechanics, the experimenter is unable to say if he measured a photon or an EM wave.

The simple fact of measuring the EM wave produces the disappearance of it, giving the illusion of having measured a virtual "photon-like particle"

This phenomenon is quite simple to understand by returning to our blotting paper of fig. 3-4. The simple fact of putting this blotting paper anywhere on the trickle of water produces the disappearance of the water. The experimenter believes that, at the point "c" on the figure, he measures a photon but in reality, he measures a wave.

### 3.10 Young Slits

Let's imagine a group of five EM waves (fig. 3-5). These waves pass by two slits. Two detectors, right (R) and left (L), count the number of "photons" passing by each slit.

When a wave reaches an atom of a detector, the energy included in  $\mu$ Domains is emptied by a PE effect (or Compton Effect, or anything else). The  $\mu$ Domains are immediately emptied at the speed of 300 000 km/s. This speed is so high and the vacuum between atoms and particles is so huge that a wave can't activate two detectors at exactly the same time. In other words, a wave may reach the two detectors at approximately the same time **but activates one, and only one at a time**. A very short  $\Delta t$  or fraction of pS is sufficient to make the difference.

However, there is a very slight probability, nearly zero, that the two detectors are activated at the same time. In this case, it is logical to think that the energy of the incoming wave is split. For example, a 1 MeV wave may be detected as two waves of 500 KeV each, or 520 KeV - 480 KeV. Examining the distribution of the measured waves with a coincidence system must highlight this phenomenon, which could be additional proof that we measure waves and not photons. However, please note that this prediction is not 100% certain. It is only a suggestion.

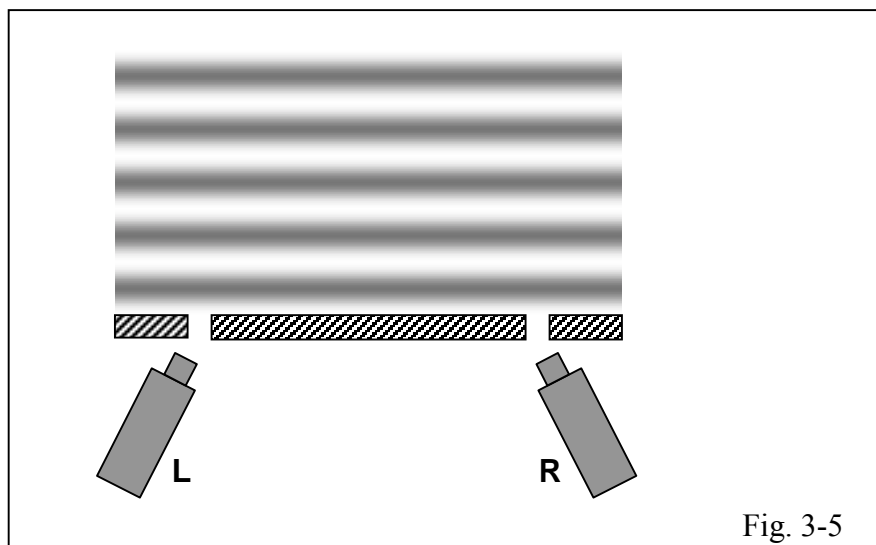


Fig. 3-5

To better understand this principle, let's replace the five waves of fig. 3-5 by five trickles of water and the two detectors by two blotting papers (fig. 3-6). A trickle would be absorbed by the first blotting paper reached. It is obvious that when a trickle has been absorbed by one blotting paper there is no water left for the second blotting paper to absorb.

The experimenter therefore thinks he is counting the number of photons. In reality, he is counting the number of waves randomly absorbed by each detector.

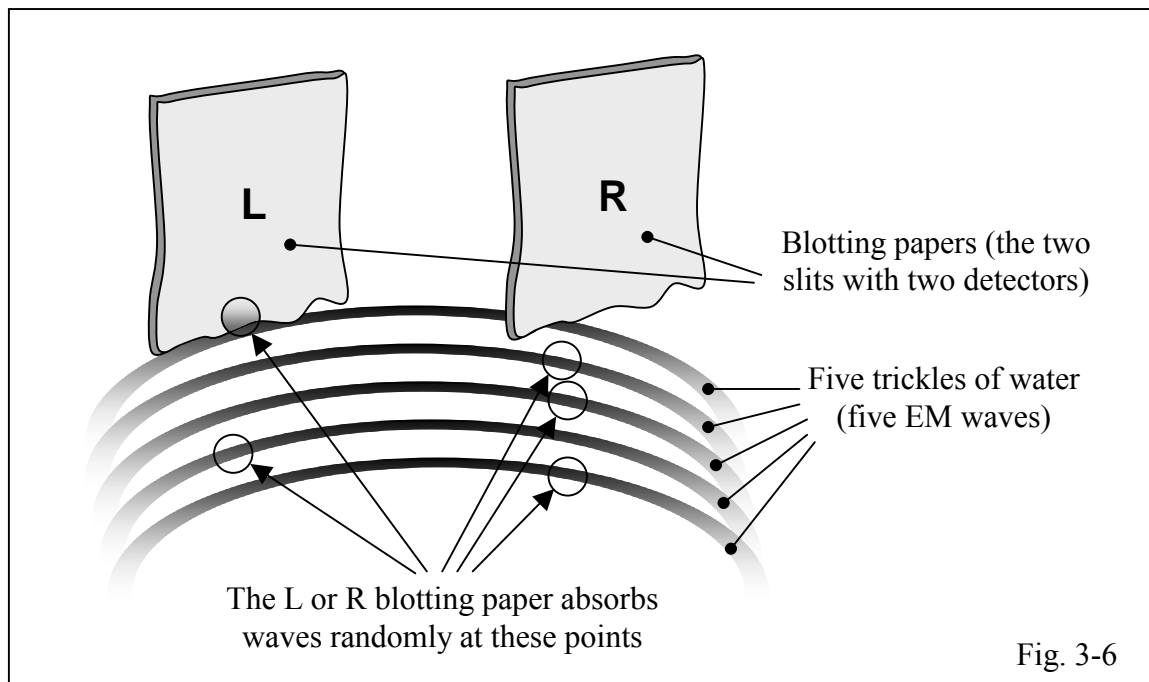


Fig. 3-6

### 3.11 The Heisenberg Uncertainly Relation

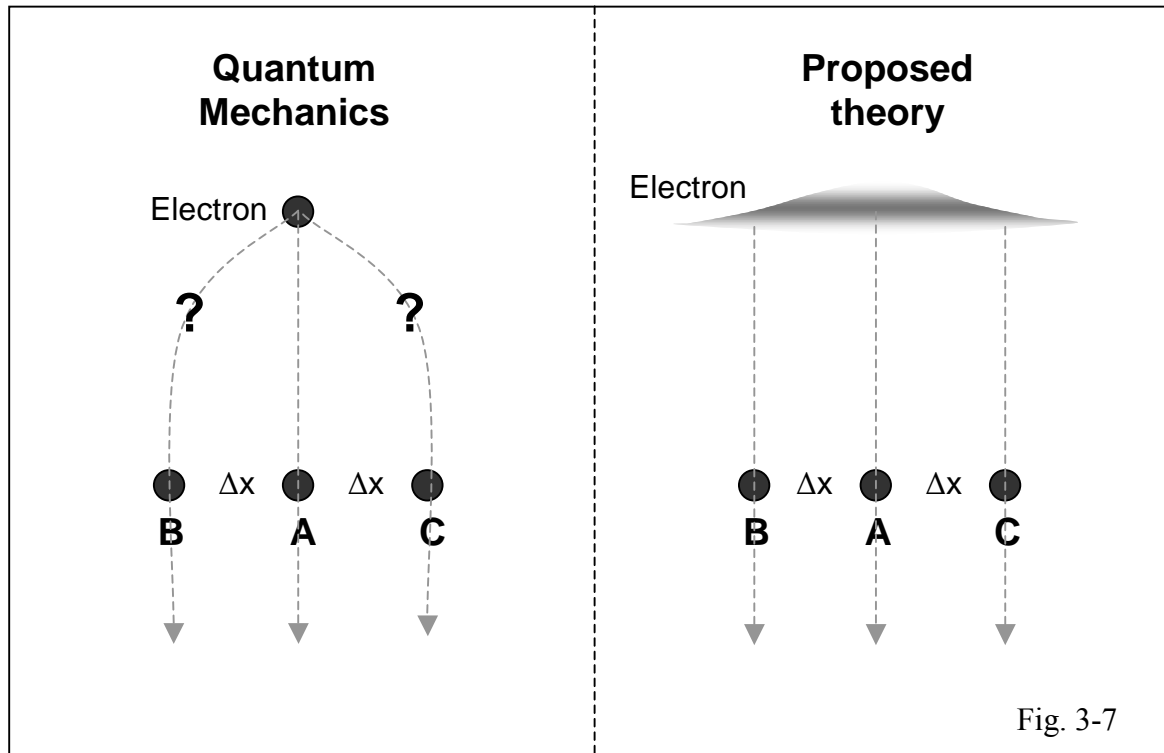
Everyone knows the formulation of the Heisenberg (Nobel Prize – 1932) Relation but no one is able to explain it. In the framework of the proposed theory, its explanation becomes very simple and gives additional proof in favour of this new theory.

Let's consider, for example, an electron.

**Quantum Mechanics:** If the electron moves as a particle, it must pass through point A (fig. 3-7) and not points B or C. This would seem to be nonsense. However, this nonsense is a reality. Why? No one can explain with consistency this strange phenomenon.

**Proposed theory:** The third principle of wave-particle duality (see Part 2 “Constitution of Matter”) states: “*When the particle is moving, it becomes a wave*”. Therefore, points A, B and C are all crossed by the electron-wave. We are facing the same phenomena as the Young Slits<sup>1</sup> explained in the preceding paragraph. As in our example of blotting paper, the wave may be absorbed at point A or, with a less high probability, by points B or C.

<sup>1</sup> Although it amounts to the same thing, it would be wise to compare the Uncertainly Principle to the Davisson-Germer rather than to the Young Slits Experimentation.



Note: With regard to the Uncertainty Relation, we may suppose that the shape of the wave packet depends on its speed. Taking into account experimentations and the Heisenberg Theory, the immediate deduction is that the wave becomes more conical as its energy increases (Gauss Curve for example).

### 3.12 EPR<sup>1</sup> (proposal)

A simplified diagram of the EPR is given in figure 3-8.

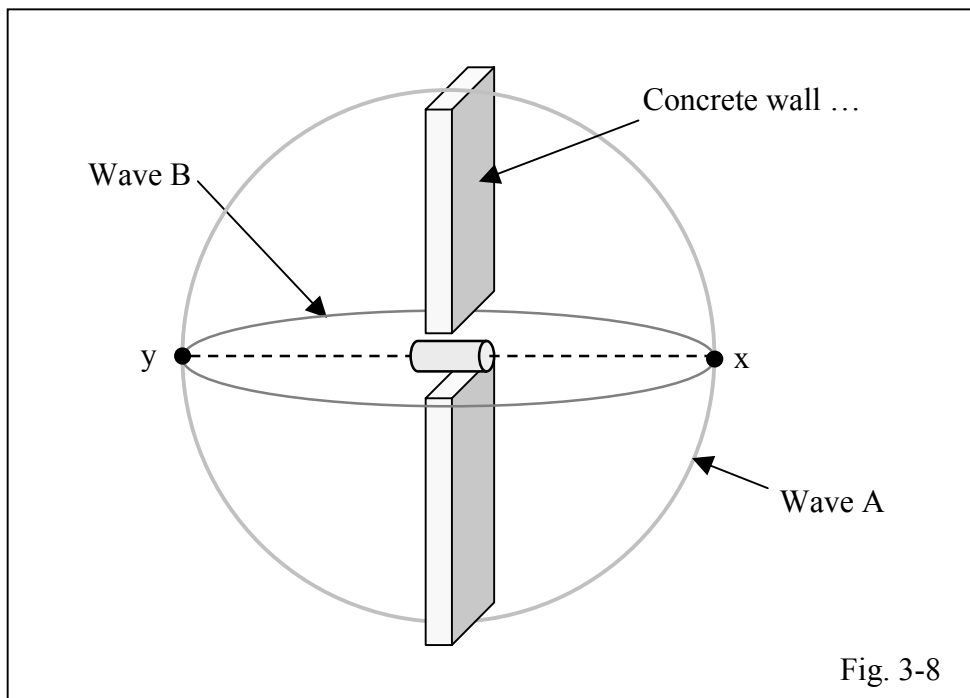
In the EPR experiment, it is necessary to replace the photon concept with waves. Two waves, "A" and "B", are emitted with a perpendicular polarization of the one compared to the other. These waves are propagated in  $\mu$ Domains and are "catalysed" in x and y.

If it has been decided to take the vertical wave "A" in point x, it will remain the horizontal wave "B" for point y, and the converse. Whatever the wave taken in x, it will always remain the complementary wave in y.

If the two measuring instruments, x and y, are isolated by something to avoid interference such as a concrete or a metal wall, the wave still exists, even if it is not seen. The reason is quite simple: the EM wave is propagated in spacetime, and spacetime is present EVERYWHERE... even inside a concrete or a metal wall...

However, it must be pointed out that, as a consequence of the curvature of spacetime (see Parts 1 and 2), the EM wave may be slowed down or absorbed by molecules of the wall.

<sup>1</sup> The author is a physics hobbyist and has no access to reliable data concerning many EPR experimentations. Therefore, explanations given in this paragraph must be taken with great care.



From this point of view, the Spacetime Model predicts that the mystery of EPR disappears if the two points of measurement, at 180°, are located far from the point of emission. The reason is quite simple. In such a case, traditional EM waves become quantified EM waves.

In other words, the mystery of EPR exists only if the EM waves are not quantified. This enigma no longer exists with quantified waves.

### 3.13 Conclusions

The table on the following page draws a comparison between the photon and the quantified wave concepts.

To summarize this chapter:

What is the photon?	
A mathematical object, like a vector <sup>1</sup> .....	<b>YES</b>
A reality, like a particle.....	<b>NO</b>

<sup>1</sup> Most physicists agree this point of view

Problem	Explanation
Planck Quantum	Replacing the photon by a quantified wave doesn't modify the Planck Quantum. This unit is perfectly logical and must continue to exist.
Decreased in $1/r^2$	This problem is solved by the "quantified wave"
Propagation in a vacuum	This question becomes meaningless since this problem has been solved in chapter 1.
Only one velocity, "c"	The fact that the photon can move at only one speed, c, is nonsense if it is considered as a particle. Indeed, a particle can move at any velocity. Since the photon doesn't exist as a physical reality, even though it may exist as a mathematical object like a vector, the question about its speed becomes meaningless.
The photon acceleration	When an EM radiation is emitted from a particle moving at a speed of 280 000 km/s, it is a (quantified) EM wave which is emitted, not a photon. Knowing the origin of this additional 20 000 Km/S speed becomes meaningless.
Causal principle	EM radiations are nothing but waves. Since a wave has no alternative about duality, i.e. a wave is a wave and not a photon, the choice between wave and particle is meaningless. The fact that the photon is interpreted as a mathematical object doesn't conflict with this principle.
Matter of photon	Since the photon doesn't exist, this question is meaningless.
Orbital change	It is impossible to explain how an orbital change by an electron can emit photons. On the other hand, if this orbital change produces spacetime movements, EM waves, all becomes clear.
Displacement of a particle	It is impossible to explain how a charged particle, which is moving, can emit photons. On the other hand, a moving particle, which produces spacetime movements, is easy to understand.
e+e- pairs creation and e+e- annihilation	If the EM radiation is made of photons, the e+e- pair creation, as the e+e- annihilation, is a true mystery (Part 2 "Constitution of Matter"). Only an EM wave, quantified or not, can explain this enigma.
Young Slits	This enigma is explained. See § 3-10
Uncertainly Relation	This enigma is explained. See § 3-11
EPR	This enigma is explained. See § 3-12

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## 4 Waves and Complements

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*This chapter gives additional explanations concerning waves, in the framework of the Spacetime Model, taking into account the equality Mass = Closed Volume developed in Part 1.*

*This chapter is not fundamental and is included, primarily, for the benefit of non-physicists.*

### 4.1 EM waves: Simplified explanation

Here is a simple experiment explaining the EM wave emission produced by an orbital change in atoms. You can do it yourself in your bathtub. This example highlights that a change of orbital produces waves, not photons.

*Open your hand beside your lengthened legs and wait until the water is still. Then, suddenly, close your hand. You will immediately feel a wave being propagated on your entire body.*

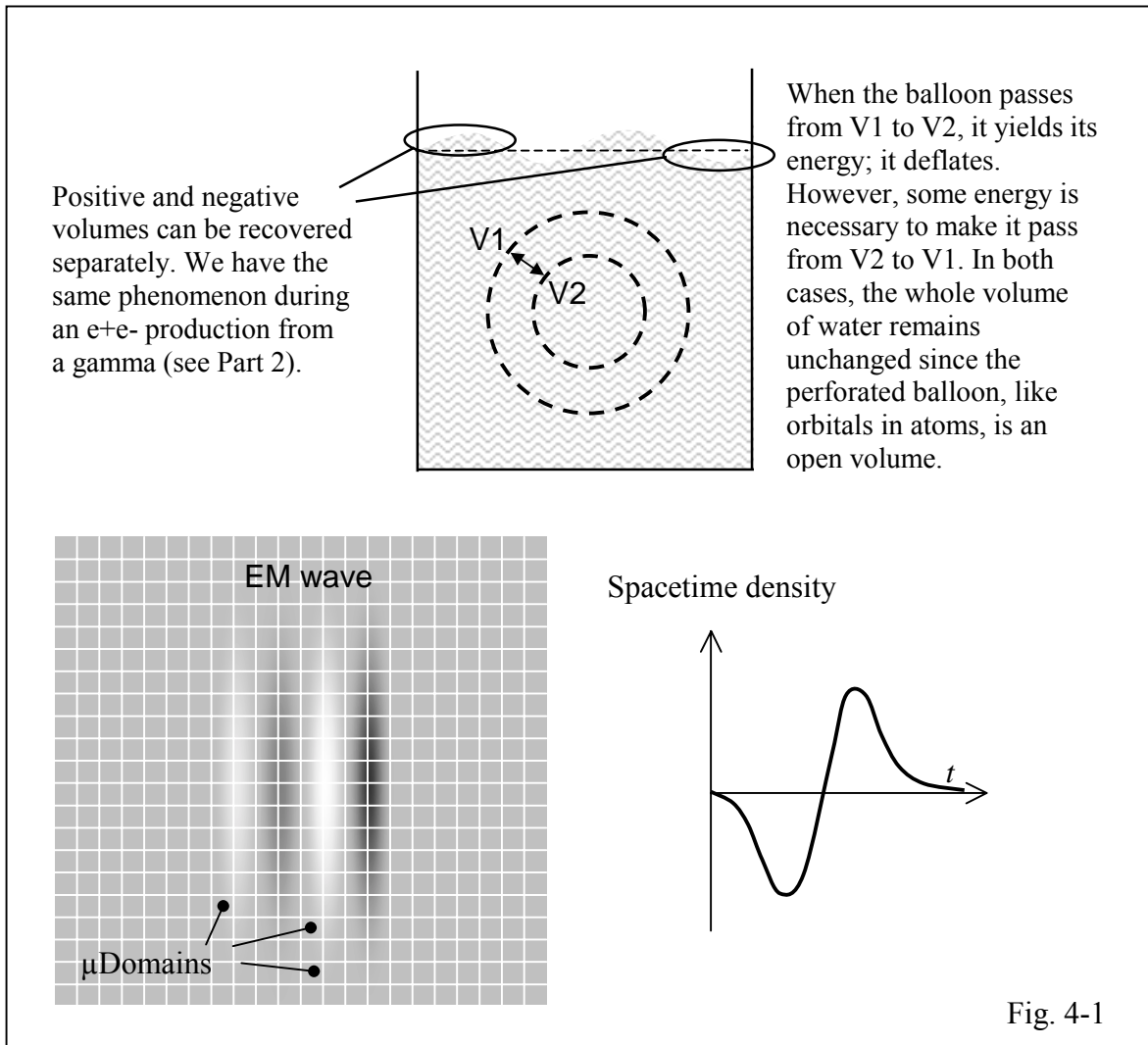
Closing your hand produces a wave of water, which carries some energy. We have exactly the same phenomenon in spacetime. An orbital change of electron produces a movement in spacetime, which is an EM wave, not a photon.

### 4.2 EM waves: Detailed explanation

A second example is given in figure 4-1.

A perforated balloon is immersed into a container filled with water. The holes allow water to infiltrate the balloon. If its volume varies from  $V_1$  to  $V_2$ , or the converse, a wave of water is produced. However, since the balloon is perforated, the quantity of water remains unchanged.

The volume of water doesn't increase or decrease since these movements in water are bipolar (pressure + depression).



### 4.3 Matter waves: simplified explanation

*A balloon is immersed into a container filled with water (fig. 4-2 A). Using a pump "P", a vacuum is made, instantaneously, inside the balloon (fig. 4-2 B).*

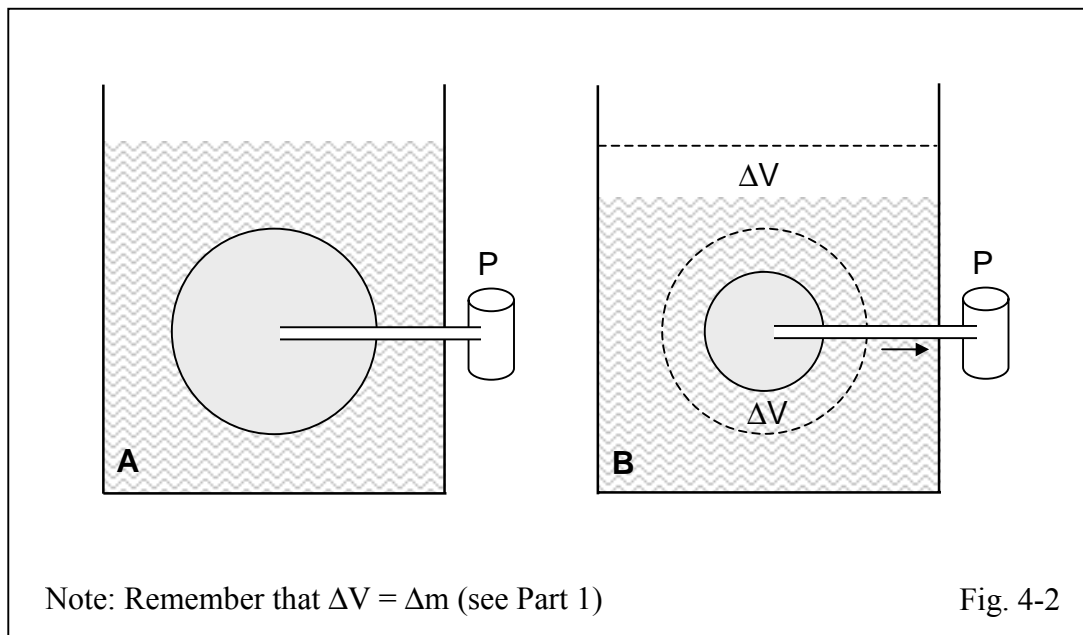
*The difference  $\Delta V$  of the balloon volume produces a wave.*

*When the wave reaches the surface, it is transformed back into a volume of water  $\Delta V$  identical to the decrease of the balloon's volume  $\Delta V$ .*

This experiment describes exactly how a mass, or a volume, can be transformed into a wave, also a volume, and may be transformed back into a mass, which is another volume, and so on.

~~Mass  $\leftrightarrow$  waves  
Illogical explanation~~

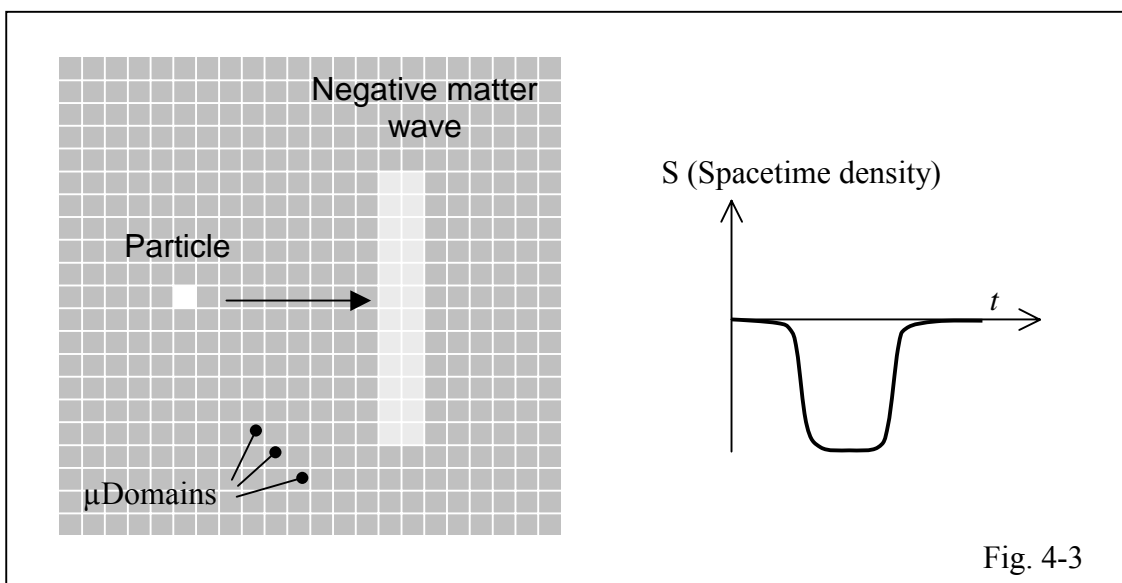
Volume (particle)  $\leftrightarrow$  volume (wave)  
Easy to understand, consistent



### 4.4 Matter waves: detailed explanation

The figures 4-3 and 4-4 show negative and positive matter waves. That which is called a “matter-wave” is a moving particle having its charge, or spacetime density, distributed in several  $\mu$ Domains.

When a "matter-wave" is moving, each  $\mu$ Domain transfers to the other ones some quantity of additional spacetime, in positive or negative charges. These  $\mu$ Domains become charged during the period of the wave and act like a "partial" electron or positron.



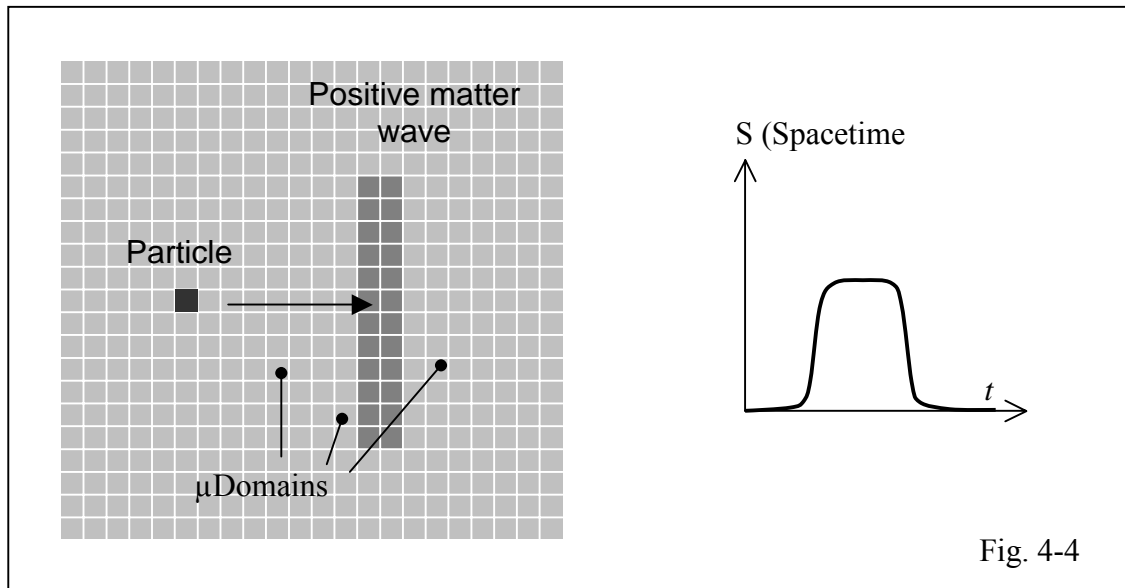


Fig. 4-4

### 4.5 Differences

The difference between "EM waves" and "matter waves" is only a question of charge. Let's examine the following figure 4-5.

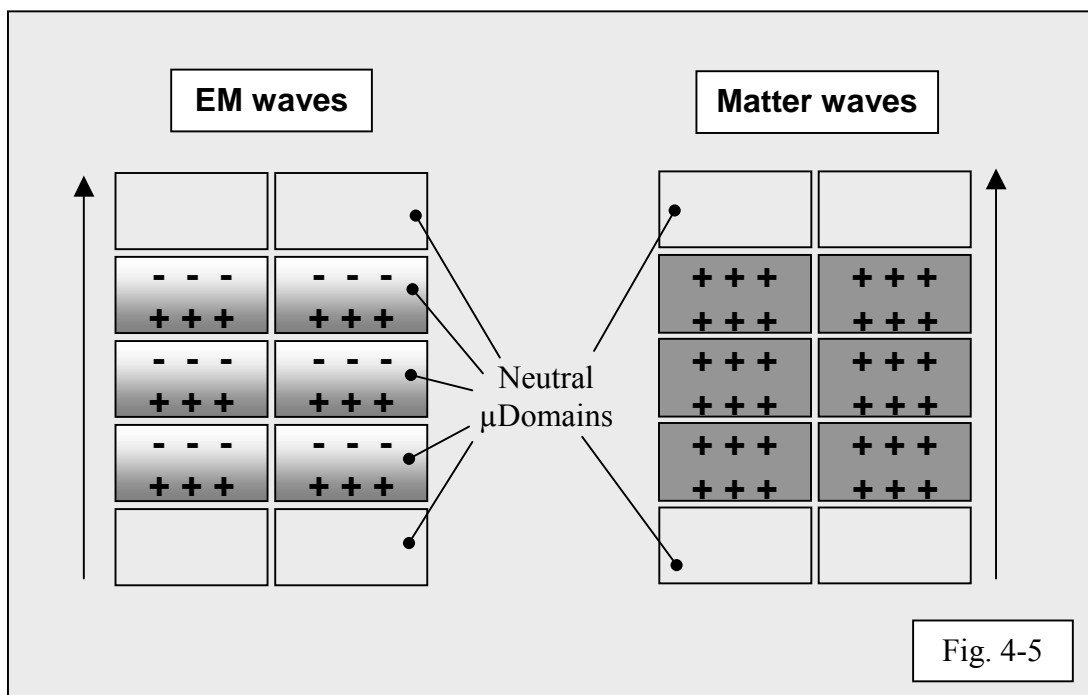


Fig. 4-5

- **EM waves:** The charge is bipolar, alternatively positive and negative. The charge moves gradually **inside** the  $\mu$ Domains. As a result, EM waves produce some variations of the internal polarization of the  $\mu$ Domains. The charge of a  $\mu$ Domain, which is neutral, remains neutral for the full period. In this case, the  $\mu$ Domain doesn't

get mass since it has no additional charge (+ or -). The velocity of the propagation is a function only of the permittivity  $\epsilon_0$  and permeability  $\mu_0$  of spacetime.

- **Matter waves:** Each  $\mu$ Domain receives, during a short period of time, an additional charge. Since the charge is transmitted from one  $\mu$ Domain to another, each involved  $\mu$ Domain becomes charged and gets mass. The example of figure 4-5 shows a positive charge like a "positron wave".

## 4.6 $E = h\nu$

To understand this formula with  $\mu$ Domains, according to the equality Mass = Volume, let us consider again the first experiment, which you can carry out yourself.

*While having your legs lengthened in your bathtub, quickly close your hand. You will note that the wave is more or less pronounced according to the velocity of the movement of your hand.*

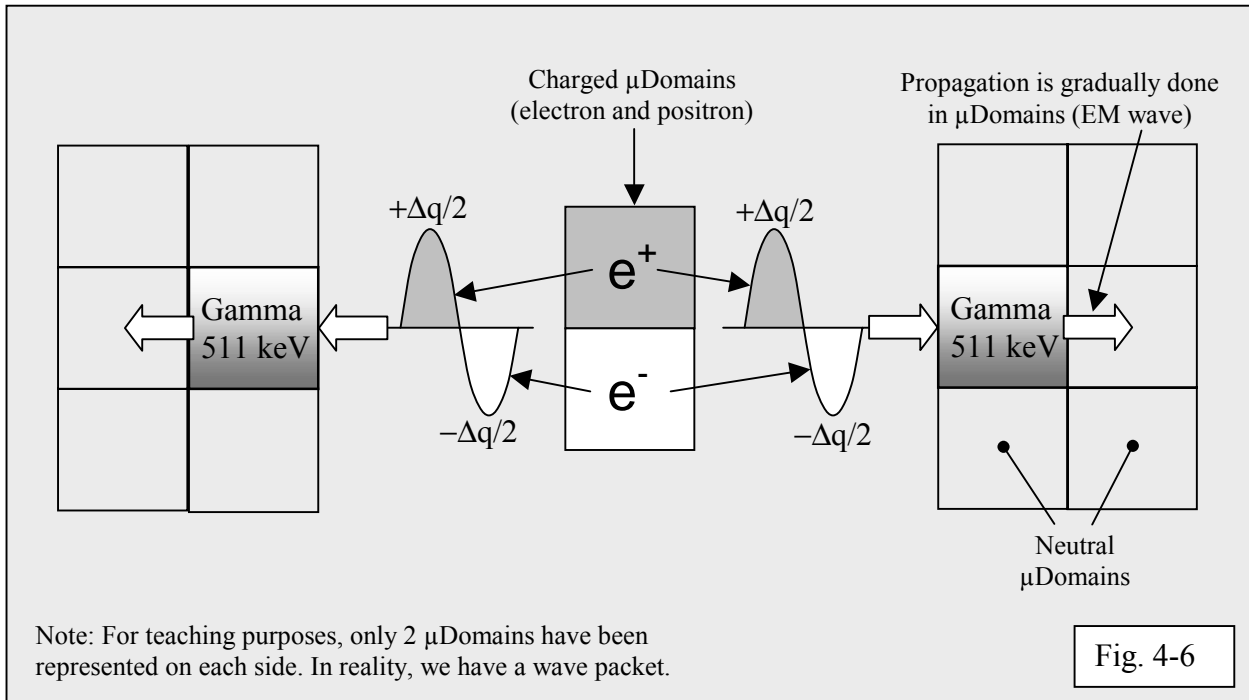
This reaction is exactly the same as the quantum phenomenon described by:  $E=h\nu$  or  $E=h/T$ . The shorter the period of time, or the more quickly your hand is closed, the greater the energy produced.

## 4.7 $e^+e^-$ annihilation

This phenomenon is an enigma with regard to its comprehension: "how can a mass ( $e^+e^-$ ) be transformed into two gammas?".

We have already explained the  $e^+e^-$  annihilation in Part 2 "Constitution of Matter". We give below another explanation (fig. 4-6), taking into account the equality Mass = Volume. Let's consider that the electron and positron are both motionless, that is to say, the magnetic component of the EM field does not exist.

- When an electron meets a positron, the excess spacetime in one particle moves inside the other.
- The annihilation of the two charges is assimilated to a double  $\Delta q/\Delta t$ . Indeed, the charge of the positron passes from +1 to 0, and that of the electron from - 1 to 0.
- The annihilated electron and positron become two ordinary  $\mu$ Domains.
- This annihilation produces two movements in spacetime, or EM waves.
- These movements, resulting from the double  $\Delta q/\Delta t$ , are propagated gradually through adjacent  $\mu$ Domains.
- The EM radiation will not be propagated like a photon, but like an EM wave, quantified, if necessary, and called a "gamma".
- And finally, as seen in chapter 6 of Part 2, if this gamma passes near a nucleus, it may be split into a negative and a positive part, if its energy allows.



## 4.8 Mass and energy

Before explaining the  $E=mc^2$  enigma, it is useful to reconsider the mass - energy equivalence.

It is often stated that Mass = Energy. This is not exact and there is a subtlety to this equation. The dimensional quantity of the mass is [M] while that of energy is  $[ML^2/T^2]$ .

These two quantities are different. The  $E=mc^2$  formula is homogeneous because it has a dimensional quantity,  $c^2$ . This constant has the dimension  $[L^2/T^2]$ .

In other words, **a mass, or a volume, can produce energy, certainly, but never "Matter = Energy"**. Saying "Matter = Energy" is scientific nonsense since mass and energy are two different dimensional quantities.

## 4.9 $E = mc^2$

This formula is fully verified using mathematics and experimentation. However, no one is able to explain it using logic and good sense. The solution is quite simple within the Spacetime Model. Let us take again the figure 4-2 which, slightly modified, becomes the figure 4-9.

The overall process is as follows. In parenthesis and italics, the equivalent in quantum mechanics is given:

- The balloon (*the particle*) is filled with air. It doesn't have any energy.
- The balloon deflates during a  $\Delta t$  time ("*Matter*" disappears, like in the  *$e+e-$  annihilation*). This decrease in volume produces waves, which are  $\Delta V$  variations.

These waves are moving in water (*in spacetime*) and carry some energy, which is a function of  $\Delta t$ , at the time of the balloon's deflation (*in the same way, the wave energy is  $E=h/T$* ).

- When the waves reach the surface, they are converted back to a volume (*a gamma may produce  $e+e-$  pairs*).

It is important to note that energy appears ONLY in phase 2, when the volume is in its wave state. When the volume is in a particle state, as in phases 1 and 3, energy doesn't exist or, more exactly, we have a sort of "potential energy".

This energy comes from the speed "c" of gammas, which are the result of decays. **Only a movement can produce energy.** A motionless particle only has a "potential energy". In other words, the  $E=mc^2$  formula simply means that energy appears only when the volume of the particle becomes waves, or gammas (fig. 4-9, phase 2).

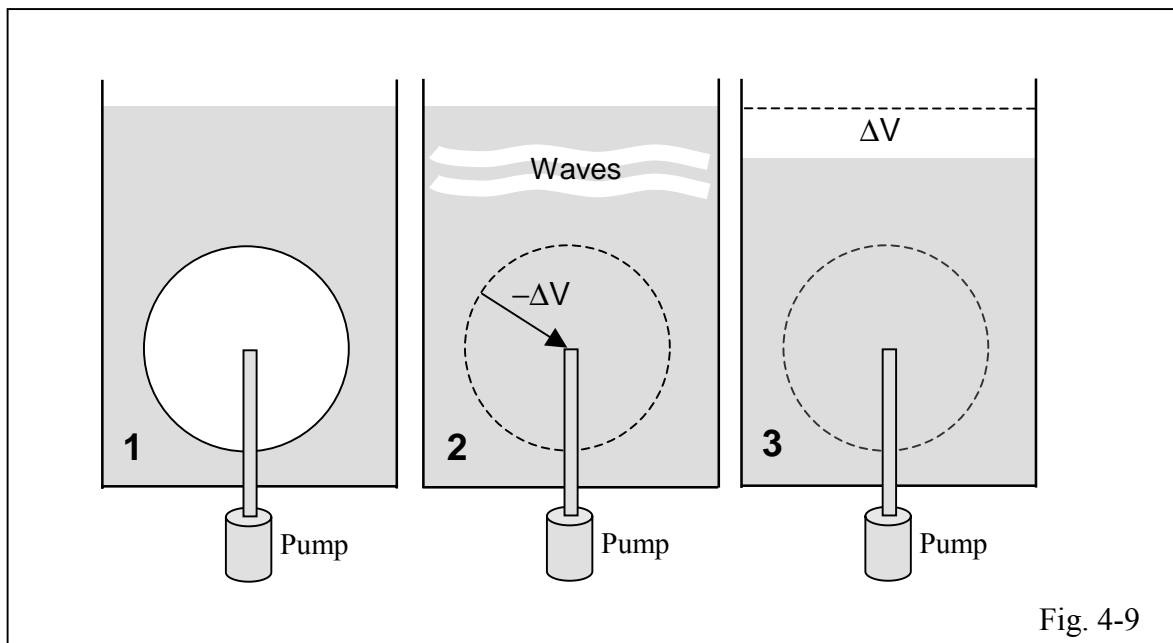


Fig. 4-9

Finally, the  $E=mc^2$  formula is very simple to understand (fig. 4-10) if we keep in mind these three points:

- There is a relationship between mass and volume (see Part 1).
- The particle may become a wave and the converse (see Part 2). Both, particles and waves, are made up of spacetime.
- Energy is not embedded inside the particle as we think. A particle is an area of spacetime, nothing more. Energy appears when the particle is destroyed and when this area of spacetime becomes a wave, as in the  $e+e-$  annihilation. Energy is carried out by these EM waves, which move at the speed  $c$ .

Thus, although it amounts to the same thing, it would be more accurate to write:

*"The volume (mass) of the particle is converted into another volume, the EM wave, which moves at the speed  $c$ , and gets energy due to its speed"*

rather than: *"The mass is converted into energy".*

**Current theory**  
(Special relativity)

$$E = mc^2$$

How can a mass be converted into energy ???  
No one is able to explain this formula.

**Suggested explanation**  
(Special relativity and Spacetime Model)

When a particle (a spacetime volume) disappears, it becomes an EM wave (another spacetime volume). Whatever the interaction is, a **volume remains a volume**. Since the speed of gammas is "c", the original volume (the particle) gets some energy as it attains speed "c" ( $E=mc^2$ ), becoming an EM wave.

We must note also that replacing  $E=mc^2$  by  $E=kvc^2$  (when  $m=kv$ ) gives a homogenous formula since ALL is volume.

$$E = kvc^2$$

k = Mass per volume unit  
v = volume of the particle

Particle (volume)  $\longleftrightarrow$  Wave (volume)

A motionless particle has a "potential" energy

The gamma carries out energy:  $E = h\nu$

**Since we have only volumes, the proposed explanation is perfectly homogenous.**

Fig. 4-10

NOTE: When the particle disappears, as in the e+e- annihilation, it becomes an EM wave (gamma). This is why the term  $c^2$  is present in  $E=mc^2$ . In this formula, c is not related to the particle itself but comes from the speed of the light. This speed, c, which appears after annihilation, must not be confused with the speed of the particle, v, if the latter is moving. Please also note that this explanation doesn't modify calculations already in place.

## Complements

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### Predictions

- The spin disappears when the particle is motionless. The spin is not a "quantum value" attached to a particle but a value attached to the mode of propagation of waves: 0 = no spin, 1/2 = matter wave, 1 = EM wave (Chapter 2). However, it is possible that the spin of a particle may have a different value when it is moving at very low speed.
- The magnetic monopole doesn't exist (Paragraph 2.4).
- In the Young Slits experiment, we have a very slight probability that the energy of the incoming wave (the "photon") might be split, depending on the amount of energy. In such a case, each detector measures a part of the wave, close to 50-50%, for example 51% and 49%. This experiment must be done with a coincidence system (paragraph 3.10).
- The EPR enigma disappears at huge distances (Paragraph 3.12)

### 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](http://www.spacetime-model.com/mass.pdf)  
**Part 2** ..... Constitution of Matter ..... [www.spacetime-model.com/matter.pdf](http://www.spacetime-model.com/matter.pdf)  
**Part 3** ..... Quarks and Antimatter ..... [www.spacetime-model.com/quarks.pdf](http://www.spacetime-model.com/quarks.pdf)  
**Part 4** ..... Electromagnetism ..... [www.spacetime-model.com/electromagnetism.pdf](http://www.spacetime-model.com/electromagnetism.pdf)  
**Part 5** ..... Forces, the Universe ..... [www.spacetime-model.com/forces.pdf](http://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 3 – Quarks and Antimatter

### Quarks

This part demonstrates that we need two positrons to make three u quarks. A u quark with an electron becomes a d quark (please note that the rule of addition of fermions is covered in Part 4). This deduction, from the wave-particle duality and spacetime, has been extended to all particles. Finally, u quarks, d quarks, antiquarks, muons, antimuons, taus, mesons, baryons etc... can be made with only two basic particles: electrons and positrons.

.../...

.../...

## Antimatter

From this discovery, we can deduce that antimatter is not located at the bottom of the universe but right before our eyes, embedded in u and d quarks.

A simple calculation demonstrates that any atom is made up of an equal number of electrons and positrons, exactly  $2A$ , with  $A$  = atomic number. For example, the C12 is made of 24 electrons and 24 positrons, the latter being embedded in quarks.

The calculation is fully explained in this Part and is **100% accurate for all 2930 known isotopes**.

# 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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<sup>1</sup> Note: The author is a physics hobbyist and does not work in an institutional establishment. The writing of the Spacetime Model has been done entirely on his own money and time, with no help from the scientific community. If you find some error in this document, please let him know.

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