



*A step toward the
Theory of Everything*

The Spacetime Model

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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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This theory was also published on November 30, 2006, on the two following sites: www.grand-theory.com and www.grande-theorie.com.

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Before reading...

Partitioning this document

Since spacetime is difficult to understand, to improve readability, this document has been divided into five parts:

- Part 1** Wave-particle duality, charge, matter
- Part 2** Mass and gravity
- Part 3** Quarks, antimatter, nuclear force
- Part 4** Electromagnetism
- Part 5** Nucleus, forces, the Universe

Each part may be read separately but it is advisable to start reading this document from the very beginning (Part 1) and to follow the different parts in sequence.

Some readers may prefer to refer directly to a particular subject, skipping the others. For this reason, each section begins with a two pages summary of the preceding parts. This summary absolutely must be consulted before continuing if the reader has not begun with Part 1.

Difficulty level

A good knowledge of quantum mechanics and general relativity is recommended, however, since this document doesn't use mathematics, its reading is not difficult.

Mathematics

Mathematics used in quantum mechanics and general relativity are not affected by explanations of basic phenomena covered by this document. Therefore, physicists can continue to use the well known theories in QM, such as the Schrödinger Equation, operator mechanism, Lie Groups, QED, QCD, tensors in GR ...

**There is no conflict between explanations given
in this document and QM/GR mathematics.**

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Introduction

We could think that the basic laws of physics are extremely complex since the mathematics of general relativity and quantum mechanics are.

Such is not the case.

Consider, for example, a drum. A 5 years old child intuitively knows the principle, namely that by striking it, he makes noise. On the other hand, the mathematical description of the surface waves requires Bessel Functions, which are at the Master level. It is thus advisable to distinguish the **basic phenomena**, generally very simple, from the **laws governing them**, or the mathematics, which may be extremely complex.

Modern physics shares the same principle. The basic laws of the universe are not imbedded in increasingly complex theories but on the contrary, in simplicity. It is obvious that

The universe, in its elementary state, was very simple. It is a necessity.

Scientists throughout the world agree with this point of view based on simplicity. For example, to detect any trace of life on Mars, the biologists will not seek complex beings but elementary molecules like H₂O.

The author entirely shares this point of view based on reductionism, which is logical and rational. That's why this document does not contain pages and pages of complex mathematical equations. **To solve the ToE (Theory of Everything) enigma, it is necessary to focus on simplicity.**

In other words, the solution to the ToE must be very simple, logical, rational, and in accordance with experimentation. So, the fundamental question is:

*If the simplest state of the universe is 4D spacetime¹,
how have leptons, quarks and forces been created?*

As you will see, the solution is very simple.

¹ There is no objection envisaging spaces with 5, 6, 7... n dimensions, but only as a last resort, after having exhausted all the resources of the traditional spacetime. Since everything is logically explained with spacetime (4D) in the Spacetime Model, it is not necessary to extend the number of dimensions to 5 (Higgs) or >11 (Strings). Indeed, this document shows that elementary particles, such as leptons and quarks, the charge, mass, gravity etc... are all expressed by equations of the form $f(t,x,y,z)$. Particularly in physics, we must keep in mind that "the simplest is the best".

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Abstract

The Spacetime Model presented here is based on spacetime discovered by Einstein in 1905. However, instead of limiting it to relativity, the author has extended it to all elements of the universe: particles, mass, charge, quarks, antimatter, forces...

In combination and relying on experimentation, these discoveries explain, in a perfectly logical and rational way, up to 53 enigmas of quantum mechanics:

- The mystery of the wave-particle duality,
- The constitution of light and why its velocity is constant. What is the photon?
- **The charge and constitution of particles, or "matter",**
- The mechanism of waves and particles creation. Examples: e-e⁺ production from a gamma and e⁺e⁻ annihilation in two 511 KeV gammas,
- **An explanation of mass and gravity,**
- The internal constitution of quarks; origin of their charge -1/3 +2/3,
- Interactions, extension of the Standard Model. Example: the pion decay,
- What is the neutrino?
- The internal structure of leptons, mesons and baryons,
- Why the charge of the proton is exactly equal in absolute value to that of the electron?
- A logical explanation of the Schrödinger Probability Concept and of the E₀ level,
- The origin of the strong nuclear force,
- **The location of antimatter in the universe,**
- The mechanism of electromagnetism,
- An explanation of the EPR, Young's slits, Heisenberg Uncertainty Principle,
- **The unification of the basic forces in two generic forces**

To summarize, the Spacetime Model clearly shows that

Spacetime is the key to the Theory of Everything

Other known theories solve one, two, sometimes three enigmas but are not verified by experimentation. Moreover, these theories are too complex to be credible. It is obvious that Nature is not so complex.

The Spacetime Model solves more than 50 enigmas of quantum mechanics, in a logical and rational way. It is also in perfect accordance with experimentation, with no contradiction. Moreover, it is a very simple theory that matches the simplicity of Nature.

For all these reasons, the Spacetime Model proposed here is much more realistic than all other known models. This new theory contains many good ideas concerning the explanation of the basic phenomena of quantum mechanics.

This Spacetime Model probably contains some errors but the main ideas developed, which are nothing but the extension of the spacetime concept, are fundamentally correct.

Following are the contents of the five parts of the Spacetime Model:

Part 1

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 leads to the constitution of matter and waves, which are nothing but spacetime.

This deduction may be disconcerting since spacetime is a virtual concept and we are trying to understand this idea from the perspective of a material world.

In fact, we know that 99.999% of an atom is a vacuum, and the remaining 0.001% is nothing but waves (De Broglie) or matter-energy ($E=mc^2$). A vacuum, waves, or energy are virtual concepts.

Since 1927, we have known that we are living in a virtual world (99.999% + 0.001% = 100%) but, as strange as it seems, we still have great difficulty acknowledging this reality, even if it is confirmed by many experimentations ¹.

¹ We encounter the same difficulty trying to understand how 99.999% of a hammer is a vacuum, even if it is confirmed by experimentation.

Part 2

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

The Spacetime Model demonstrates that spacetime is not curved by mass but by volume. This phenomenon is the same as when you immerse a ball into water. It is not its mass, which produces the displacement of water, but its volume.

Therefore, the volume of particles (not their mass!) produces a displacement – or a curvature - of spacetime, which produces a pressure force on volumes. This force tends to bring particles closer to each other. The result is gravity, **which is not an attractive force between masses, but a pressure force (Hooke Force) exerted by spacetime on volumes.**

Please note that these very simple deductions are in perfect accordance with the theories of Newton and Einstein, and with the Wheeler Intuition. Moreover, this logical and rational explanation of mass and gravity doesn't require extra dimensions. Indeed, mass (more exactly the volume) and gravity may be expressed with only four dimensions: x, y, z and t. For example, the Schwartzchild Solution to EFE may be expressed with only four variables, replacing "m" by "k.v" (k = 6.256×10^{17} kg/m³ approximately).

Part 3

Quarks

The Spacetime Model 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 this part). 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 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% correct for all 2930 known isotopes**. This calculation validates the entire Spacetime Model.

Nuclear force

This discovery leads to another important deduction: 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".

Part 4

Electromagnetism

The mystery of the wave-particle duality, as explained in Part 1, leads to a full knowledge of electromagnetism. This phenomenon is quite simple to understand. In short, when a charged particle is motionless, its electric field has a spherical symmetry. When it moves, it becomes a wave and its spherical symmetry disappears. Its 1D space is transformed into a 2D/3D space. A magnetic component (2D/3D) is added to the electric field (1D) of the particle. This phenomenon is exactly what experimentation proves ($\Delta q/\Delta t$).

Part 4 also covers a logical explanation of EM waves, the photon, the EPR, Young's slits and the Heisenberg Uncertainty Relation, time dilatation (GR) and $E=mc^2$ enigmas.

Part 5

Complements

Part 5 covers miscellaneous subjects. For example, everybody knows the formula $E = mc^2$ but no one can explain it. A rational explanation of this well known formula is given here.

The unification of forces is also covered in Part 5.

At the end of part 5, 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. The Spacetime Model offers two suggestions regarding the creation of the universe. There may be other solutions, but the Big-Bang Theory is not fundamentally correct since it doesn't solve the "electron mystery".

Conclusions

Finally, this document demonstrates:

1. **Simplicity:** The basic laws of quantum mechanics are not imbedded in increasingly complex theories but, on the contrary, in simplicity.
2. **"All is spacetime":** Indeed, the basic laws are fully explained with spacetime.
3. **The need for only four dimensions:** All particles (electrons, quarks...) and all basic phenomena of quantum mechanics (gravity, strong nuclear force, magnetism...) are fully described in 4D with expressions of the form $f_{(x,y,z,t)}$. Therefore, it is not necessary to add extra dimensions (String Theory, Higgs field...).

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