II.2 Relativity

Before the discovery of electricity, NEWTON's so-called classical mechanics dominated physics and astronomy. This discipline, based on the movement of material bodies, associated energy with mass via force or impulse. The advent of electromagnetism upset the world of physics at the time, by introducing a new form of non-material energy that propagated itself at the speed of light. This significant breakthrough in experimentation stimulated the theoreticians in their search for a new scheme of physics incorporating electromagnetism and, at a later stage, quantum energy.

For more than a century, the researchers multiplied their efforts without their achieving any real measure of success. In the first two decades of the twentieth century, Albert EINSTEIN maintained a thesis that became a veritable classic, one that provided the answer to several insoluble issues of the time. He imagined the space-time-matter interaction and built his theory (relativity) in two phases : "special" and "general". The first interprets the effects of acceleration in which the ratio $\frac{v}{c}$ becomes significant while the second creates a quadri-dimensional (quadri-variable to be precise) equation between the surfaces of gravitational equi-forces.

II.2.1 Special Relativity (see also A.4.2)

Reminder :

Mechanics, both rational and empirical[(1)], were introduced in 1638 by GALILEO and supplemented in 1686 by NEWTON. GALILEO was responsible for the relativity of movement *"a movement has no direction unless it is related to a defined system of reference"* and the first principle of invariance concerning the laws of movement.

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(1) rational (of thought) and empirical (of knowledge).

It is to him that the first group of conversions of coordinates between two reference points is owed, one being a translational rectilinear movement that is uniform in relation to the other.

The GALILEO Group remained unshakeable until 1872, the year in which MAXWELL (see A.5) established his equations concerning electromagnetism. These invalidated GALILEO's transformations (due to their variance) and encouraged LORENTZ to pursue research into a new group valid for the whole of physics, and for electromagnetism in particular.

The experiments conducted by MICHELSON-MORLEY in 1887 added a new embarrassment to the old laws of mechanics when he publicly and incontrovertibly demonstrated that the speed of light is both limited and non-additive. This overturned the traditional law of the vectorial composition of velocities.

In order to revive physics, LORENTZ simply renounced the fundamental concepts of Newtonian mechanics and formulated the second "principle" of invariance concerning the speed of light. He believed that space-time interacts with the movement of bodies and changes its properties in relation to the ratio $\frac{v}{c}$. This change was the basis for his own group of transformations established in 1903 and validated by the invariance of MAXWELL's equations.

LORENTZ's space-time model attracted the interest of MINKOWSKI who suggested the Euclidian quadri-dimensional continuum (vacuum) and complex[(1)].

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(1) The time dimension was considered to be imaginary so that the metric would remain invariable in the LORENTZ group. It is pitiful to see the relativists devalue the GALILEO group simply because GALILEO did not satisfy the invariance of the MAXWELL equations while they support the LORENTZ group to the detriment of the metric which needs to remain real.

Discussion :

Principles :

The first principle of special relativity is of an aesthetic nature since the laws of physics are, by their nature, independent of any form of expression.

As for the second "principle", the speed of light is an electromagnetic measurement in a vacuum. It is invariable in essence and unworthy of formulation in a principle.

Hypothesis : (The LORENTZ Contraction)

The LORENTZ Contraction is merely an arrangement of calculus. Let us consider a space shuttle equipped with an optical instrument for measuring length. According to the two principles of relativity, the length of the shuttle is measured when it is at rest and at very high speed $\ell = ct$ and $\ell' = ct'$ respectively. The $\ell' < \ell$ inequality is interpreted in the first degree, as a contraction of the shuttle. This hypothetical contraction must be independent of the direction of movement.

Implications :

1) Time does not dilate with acceleration, these are clocks that are slowing down.
2) The LORENTZ group, obtained as an example in (A.4.5), does not refer to any event and does not use any law as a criterion of validity. On the contrary, a system of transformation of coordinates must be transparent to all the laws including the fundamental metric (I.9).
3) The geodesics of space-time are independent of any movement.

Formalism : (MINKOWSKI metric)

The MINKOWSKI metric is a mathematical expression devoid of physical meaning(1). It should be specified that MINKOWSKI space is not four-dimensional but three-dimensional with a time parameter.

II.2.2 General relativity (see also A.4.3)

Reminder(2) :

Albert EINSTEIN, who was aware of the inadequacy(3) of the Newtonian theory of gravity and enthusiastic about LORENTZ's "relativist" ideas, embarked on the search for a spectacular but more general alternative(4). He was inspired by two principles, an ancient one dating back to the Greeks and a new one. The first, borrowed from DESCARTES via MACH, saw space as a support for matter, the second (1907) claimed to create the equivalence between Galilean inertia and the gravitational force.

EINSTEIN, in his Special Theory of Relativity, generalised the principle of invariance : *"all of the systems of GAUSS coordinates are equivalent for the formulation of the laws of nature"* and gave it a mathematical formulation (the covariance principle) : *"the laws of nature need to be co-variant in relation to any continuous transformations of coordinates"*. He predicted some of the effects of gravity and reached the pinnacle of his achievements by demonstrating that NEWTON's theory was just a limitation(5) of his own.

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(1) since the formulation of nature must be real.
(2) We will concentrate exclusively on the original version of relativity without taking account of extrapolations added subsequently.
(3) such as the inexplicable precession of the perihelion of the solar planets which is particularly notable in the case of Mercury.
(4) valid at any point in space-time, regardless of the distribution of matter and the movement thereof.
(5) The two theories agree at points distant from the source of the field.

The effects of gravity :

EINSTEIN stipulated the distortion of light passing close to a heavenly body : "*a ray of light in a gravitational field must become curved similarly to the curvature of the trajectory of a body thrown through a gravitational field*". He realised there would be a loss of energy (the spectral shift to the red) of radiation in a gravitational field : "*an electromagnetic wave emitted by a massive body at a given frequency will propagate in space at a frequency that is shifted downward*". He claimed that clocks would slow down if exposed to a strong field : "*clocks will run more slowly if they are located in the vicinity of a heavy mass*" and specified : "*the frequency of an atom on the surface of a celestial body is slightly smaller than the frequency of an atom of the same element that is found in free space or on the surface of a smaller celestial body*".

Success :

Relativity correctly explains the precession of the perihelion of Mercury and has passed all the tests to which it has been put.

Discussion :

Principles :

The MACH Principle contradicts the postulate **(P5)**. Despite the perfectly acceptable criticisms of the relativists, the Newtonian vision of the universe remains inevitable.

Covariance is cannot be defined as a principle, it is the tensorial property of invariance.

The "principle of equivalence" dedicated to the hypothesis of the curve of space is an argument of a proposition, valid uniquely as a model. The heavenly bodies are subject to a balance of forces and are not free nor are their movements inert.

Hypothesis : **(**curve of space)

Mass does not cause space to curve, since interaction between different natures is prohibited. As for the distortion of light, considered to be proof of the theory, this is the result of interference between the gravitational, electrical and magnetic fields. It should always be remembered that the curve of space, if it exists, would never be perceptible to man.

Formalism : (field equation)

$$\text{The equation} \quad \frac{1}{2} g_{\mu\nu} R - R_{\mu\nu} - \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \qquad \text{(II.9)}$$

is insoluble in this form since the coordinates(1) of its left and right members are unknown. EINSTEIN overcame this difficulty by resorting to the preliminary data (initial conditions) leading to the (special) solutions approached. This type of manipulation attacks the generality of the theory.

Moreover, the dimension $[S^{-2}]$ of the above equation implies a two-dimensional curve of nature (s). This is a surface that is manifestly closed, replacing the vectors of gravitation equi-forces at its extremities. This surface, whose topology depends upon the quantity of enclosed matter and its movement, confirms the laws of the conservation of matter and of impulsion, consequently nullifying the divergence of the right member and then the left member of the equation (II.9). Finally, it should be noted that the metric in this equation is a generalisation of that of MINKOWSKI.

In fact, any extension of the equation (II.9) into different energy states of matter-impulsion or into geometries of a higher order than four is a mere mind game. It would have been more relevant to seek the geometry of gravity (surfaces of equal gravitational force) in conventional space-time instead of playing with importunate (non-linear and complex) equations.

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(1) The left member is devised on the basis of the components of the right member and the latter is referenced to the geometry of the left member.

Serious errors :

In summary, the relativists commit two unforgivable errors (of physics and mathematics), expressed as negatives :

1) Universal space cannot comprise an imaginary dimension ;
2) The dimensions of any space cannot be dependent.

Proposition :

It is a good idea to look for equations in the gravitational field of a five-dimensional architecture.