

Dionysios G. Raftopoulos

**THE THEORY OF THE HARMONICITY
OF THE FIELD OF LIGHT**

The common mind's answer to geniuses...

VOLUME A

ATHENS – 2011

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ISBN

*"Time makes fools of us all.
Our only comfort is that
greater shall come after us".*

E.T. Bell, "Men of Mathematics"

DEDICATION

*To you that might be alive or not even born yet
and from whose mouth dissent will spring, I dedicate this to you.
Whether you are black or white, rich or poor I don't really care;
as long as the convictions of the herd will never you deter.
Just plough right ahead showing no fear or neglect,
'cause the infallible mind's time has surely not come yet.
The Principles is where the Fault lies buried deep,
and that's where I'll be waiting for you to come and meet.
But hurry not to reach your Ithaca too fast,
or Life's feast for you will certainly not last.
Just slowly sip the sweet adventure, drop by drop,
the bitter Knowledge too; and when at last we meet,
don't you complain of a youth squandered down the pit.
Because your risky trip in vast, untamed waters,
has provided for you my friend, all that really matters...*

Dionysios G. Raftopoulos

The Theory of the Harmonicity of the Field of Light is **dedicated**, from the bottom of my heart, to the one who will certainly one day overthrow it and replace it with a new, substantiated and better one...

A BRIEF PROLOGUE TO THE ENGLISH PUBLICATION

The emergence of the Theory of the Harmonicity of the Field of Light, thirty-one years ago, was induced by a rather simple question that had tortured me for a very long time: How could it be possible, according to Einstein's Theory of Special Relativity, for clocks moving in a uniform rectilinear translatory fashion to slow down, **on account of that motion alone** when, by hypothesis, the uniform rectilinear translatory motion of matter is relative.

The answer ought to be obvious: It cannot!

Because if the conclusion was valid, i.e. if clocks do slow down then, certainly, the one delayed would have to be the one that **moved absolutely**, a fact that comes into contradiction **with the hypothesis that dictates uniform rectilinear motion to be relative**. Hence, Einstein's Theory of Special Relativity contains a fundamental error, as one of its conclusions comes into direct contradiction with one of its hypotheses.

Thus, the driving force behind my continuing 30-year research endeavor has been simply the wish to restore Human Reason, as defined by Aristotle, and to defend Common Sense.

In addition, over the passing years, I also came to realize that modern day Physics has been (and is still being...) built in a totally "Babylonian" fashion, i.e. as a confused clutter of empirical observations, the coherent explanation of which requires the fabrication of a constantly increasing number of convenient, per case, "gods" or "demons".

A direct result of such an approach to Science is, to my mind, the emergence of disconnected and diverging disciplines such as the General Relativity and Quantum Mechanics theories, the unifying synthesis of which would most probably require yet another convenient "god" or "demon".

The Ancient Greek way of reasoning was, however, totally different:

It explained the phenomena on the basis of Primary Principles which are first and foremost stringently formulated, then safely "locked" and only then considered solid

enough to form on their own the basis for the synthesis, without the need to evoke any kind of “god” or “demon”.

This kind of reasoning prevails in this work, where I’ve tried to achieve in Theoretical Physics what Euclid, so long ago, had achieved in Geometry namely the reduction of Babylonian empirical observations to Primary Principles.

And the name I’ve chosen is in tune with its purpose as, according to Aristotle, *“Harmony” is the unity and completeness of the whole, is unity in diversity* (Ἔστιν οὖν Ἀρμονία πολυμιγέων ἑνώσις καὶ δίχα φρονούντων συμφρόνησις).

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Anavissos - December 2010

Dionysios G. Raftopoulos

This book is divided into four parts:

FIRST PART

Antithesis - 1st Fundamental Hypothesis

SECOND PART

Thesis - 2nd Fundamental Hypothesis

THIRD PART

Synthesis

FOURTH PART

Integration

Volume A contains the INTRODUCTION and the FIRST PART

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INTRODUCTION

1. WHAT “IS” PHYSICS

The object of this research is the world surrounding us as well as our interaction with it. It has generally prevailed that the description of the world be considered as the scope of the so-called “Physical Science”.

But how, in reality, do we define “Physical Science”?

Prior to reaching a consensus definition, let us first consider certain examples:

Let us consider the statement:

“Napoleon was braver than Admiral Nelson.”

Could this be considered a "Physics" proposal?

It is very likely that the French would accept it, but equally likely that the British would not. However, “Physical” proposals, if we are to consider Physics as a Science, ought to be equally acceptable in both Paris and London, regardless of nationalistic, philosophical, or political views.

I am therefore forced to reject the above statement from the set of “Physical” proposals, on the basis that we still cannot or have not yet agreed on a single-way of measuring "bravery".

Therefore, following the above example, an essential requirement ought to be that “Physical” proposals **must** refer to **measurable** relations. That is to say, to relations that can be tested repeatedly in a strictly predetermined way.

But relations between what?

Let us now consider the statement:

“Zeus is the one that causes lightning bolts.”

This statement does not refer to measurable relations, i.e. it does not answer the questions of **where**, **when** and **how much**. It attempts however to answer the question of **how** or – in a more optimistic assessment – **why** lightning bolts are created.

Answer: They are created by Zeus.

However, for centuries now we climb Mount Olympus and other tall mountains and no one has ever "met" with Zeus. When I say met, I mean that no Zeus has ever entered into the **humanly perceptible space**; no Zeus was ever sensed by the human senses. Hence, it is very likely that Zeus doesn't even exist and thus the aforementioned statement is simply invalid.

I am therefore forced to also reject the second statement from the set of "Physical" proposals, on the basis that I am not sure whether Zeus exists or not.

Consequently, following the above example, an equally essential requirement characterizing "Physical" proposals ought to be that the elements they contain **must** be elements of the **humanly perceptible space**, that is to say elements accessible with the human senses, or at least unambiguous abstractions of concrete elements of the perceptible space.

Based on these two fundamental requirements and certainly not wishing to limit its scope any further, I will try and attempt a general first definition of Physical Science:

**Physics is the investigation of measurable relations
of the elements of the Humanly Perceptible Space.**

This definition is compatible with Plato's view that the fundamental element of knowledge acquisition, i.e. Science (not Philosophy), is **sense**: "*Οὐκ ἄλλο τι ἐστὶν ἐπιστήμη ἢ αἴσθησις*" (*Science is nothing but sense*)¹.

We have drawn a distinct line between Physics and Philosophy on one hand and Physics and other Sciences such as Logic, Law and Mathematical Science, on the other.

In Mathematics, the "truth" of a statement is checked only for consistency with the axioms and the postulates on which it was based, by the application of rules of reason.

¹ Plato's "Theaetetus" 151e.

In Physics, however, this is clearly not enough. Every physical proposal, as defined above, must also pass **the test of measurement**.

It thus follows that the set of all true physical proposals is of course poorer than the set of all true mathematical proposals. In other words, every mathematical "truth" is not necessarily also a physical "truth".

The requirement of the “measurability” of the relations between elements of the perceptible space that we have established for physical proposals happens to also satisfy the criterion of **falsifiability** for scientific proposals established by Sir Karl Popper, the 20th century Austrian (and later British) philosopher and epistemologist².

According to Popper, scientific proposals **must** be falsifiable* or, to put it differently: Any non-falsifiable statement **is not** scientific. In Science, no one is allowed to claim whatever they want, but must always formulate their proposals in such a way as to provide the possibility for someone else to prove them false, either through logical verification or through experimentation (measurement).** If neither logic nor the experiment can refute a Theory, then, so much the better for the Theory.

Following Popper's line of thought a bit further, I come to realize that scientific theories are not destined to be confirmed but rather condemned to be refuted. Whether we want it or not, the advancement of Human Knowledge will never stop with any single scientific super-theory. Whether we want it or not, Human Knowledge is **condemned to perpetually self-negate**.

And that, I believe, is what lends Science not only its greatness but mostly its charm.

² Karl Popper: “The Logic of Scientific Discovery”. The work that established falsificationism in Epistemology.

* *Although many will justifiably consider the falsifiability requirement as an excessive idealization, i.e. acceptable as a reasonable view, but very difficult to practically define, as "rebuttal" may not always be easy to prove.*

* * *This position ostracizes from Science many modern and rather fictitious propositions of cosmology, which lately have come very much in vogue. According to these, initially the Universe had the size of a tennis ball. Then came the «Big Bang»! I wonder where that first tape-measure that was used to measure the tennis ball came from and who was the one that measured it [...]
Moreover, “scientific” melontology has become rather upsetting. “During the next one thousand years, a virus will destroy everything on Earth” is a statement by a scientist, who has been deified by the scientific community...*

2. FUNDAMENTAL DISTINCTION -THE CHOICE OF GEOMETRICAL SPACE

I have previously claimed that the scope of Physics is the measurable relations between elements of the humanly perceptible space. Here, however, we ought to make a **fundamental** distinction between:

a. The **Perceptible Space**, which exists outside and regardless of us, in which we are born and spend our entire life.

b. The **Geometrical Space**, an altogether different space, which does not fall within our sensory perception and which exists only in our mind.

To clarify this fundamental distinction, I urge you to pay attention to the definition of the Geometrical Space that my late professor Panagiotis Ladopoulos at the National Technical University of Athens used to give:

*“The Geometrical Space constitutes a peculiar mental creation, completely different to perceptible space, the real elements of which we can access through the corresponding elements of the perceptible space, via an abstract, purely intellectual process.”*³

Allow me to elaborate at this point. Let us consider a pencil. This is a real "element" of the perceptible space, because we see it, touch it and, if we place it on our tongue, we can also taste it. It is therefore a true element of the perceptible space accessible by at least three of the human senses.

On this real element of the perceptible space, we now apply an “*abstract, purely intellectual process*” and we imagine that the pencil starts thinning-out continuously. What we can grasp with our imagination at the limit of the pencil’s thinning-out process we call a **straight-line segment**. If we choose to extend this segment on either side, using always our imagination, we arrive at the concept of the **straight line**. “Straight lines” do not exist in Nature. Straight lines are created by the human mind. The same holds true for the two other fundamental elements of the Geometrical Space, the **point** and the **plane**.

³ Panagiotis Ladopoulos, “Elements of Projective Geometry”, Volume I; A. Karavias Publ., Athens, 1966, p. 2.

Mathematical entities therefore are not approachable by the human senses. They can only be approached mentally. Thus, P. J. Davis and R. Hersh wrote:

*“If mathematical objects are conceptual beings in which reality lies in the common conscience of the human mind, then these common mathematical concepts can constitute the doctrine of mathematical faith.”*⁴

The human Mathematical Spirit, in its long history through the centuries, has founded many "Geometrical Spaces", and consequently many different corresponding "Geometries" with, quite often, contradictory conclusions.

For example, Euclidean Geometry maintains:

"The sum of the angles in a triangle equals π radians"

However, B. Riemann's Elliptical Geometry chooses to differ:

"The sum of the angles in a triangle is greater than π radians".

On the other hand, N. Lobachevsky's and J. Bolyai's Hyperbolic Geometry claims:

"The sum of angles in a triangle is less than π radians".

Which is "right"? Who is telling us the "truth"?

Presumably, one could stop the painful effort of trying to solve the problem theoretically, simply by drawing a triangle, measuring its angles and summing them up.

This, however, would be wrong. Why?

Because **“triangles”** simply **do not exist!** Triangles exist only in our imagination. In nature (perceptible space) triangles, as defined geometrically, do not exist. That is, because anyone with a microscope or even a magnifying glass can easily prove to us that what we call straight line (the side of the triangle) is in reality as wavy as the ocean waves, and what we call point (vertex of the triangle) is an entire football field for viruses and germs!

⁴ P. J. Davis - R. Hersh, 1981. "The Mathematical Experience"; Birkhäuser, Boston.

The question, however, still remains:

Which one of the above three opposing statements is true?

The answer ought to be evident:

All three of them! Because every single one is **logically consistent to the axioms and postulates on the basis of which it was produced.**

Since all Geometries are accepted in Mathematics as equally valid, it follows that the Geometry and the Geometrical Space one will choose to use as the framework for his natural description, is nothing more than a **matter of personal taste.**

Thus, in order to place the natural description of the world proposed by the **Theory of the Harmonicity of the Field of Light** within a geometrical frame, I select the **Projective Space** as my Geometrical Space and the **Projective Geometry** of J. V. Poncelet as my Geometry, wishing to emphasize that no particular "physical" reason influenced my choice.

I decided to select the Projective Space not only because it constitutes an entirely legitimate choice, as explained before, but also on account of the fact that, through the ideas of J. V. Poncelet and those of his precursors and successors, I came to witness the revival of the ideal of the Ancient Greek Geometers: **The Spirit of Synthesis.**

3. THE PROJECTIVE SPACE

Jean-Victor Poncelet (1788-1867) was a renowned French mechanical engineer and mathematician. He graduated in 1810 from the École Polytechnique de Paris. Having served as one of Napoleon's Engineer Corps officers, he was influenced by Gaspard Monge (1746-1818), the distinguished engineer, mathematician and professor at the Military School of Engineers and the École Polytechnique* (where he was a founding member), then in charge of the construction of fortification works.

Gaspard Monge, in order to tackle tricky design problems (where the issue, according Fortification Theory, was how to design all structures in such a way, that the fortifications would be minimally exposed to enemy artillery firing from a specific location) discovered a novel method: By projecting the work under construction in two mutually perpendicular planes, he succeeded in converting a complex solid geometry problem to a much simpler one of plane geometry. Thus, by solving the problem first in one plane, all he had to do was to follow the reverse road and reconstruct the work in three-dimensional Space. It was precisely then that **Descriptive Geometry** was born.

Impressed by its simplicity and originality, the French military authorities of the time of its conception (1770-80), classified Monge's method as a military secret. Only much later, in 1799, was G. Monge given permission to teach and publish articles on Descriptive Geometry.

G. Monge based his method on the following fundamental finding:

The graphical properties of geometrical shapes, i.e. the properties of the **positional** and **ordinance** relationships of the fundamental elements of geometrical shapes, remain unaltered during the transformations of projection and section.

This discovery of G. Monge influenced J. V. Poncelet very deeply.

Following the utter destruction of Napoleon's Great Army in November 1812, he was left wounded in the battlefield, was arrested by the Russians and taken to a concentration camp where, during his captivity, he conceived the fundamental ideas of **Projective**

* *Ecole Polytechnique* was founded in 1794 by a decree of the National assembly of the French Revolution. Its initial name was Central faculty of Public Works. Over a period of time, this institution was graced by the presence of Laplace, Legendre, Fourier, Lagrange, L. Carnot, Poisson, Cauchy etc. Some of its graduates, such as Ampère, de Coriolis, Gay-Lussac, Becquerel, Arago, Fresnel etc, were pioneers of Science.

Space. When freed, he returned to Paris, and in 1822 he published his famous work titled: “*Traité des propriétés projectives des figures*”, considered **the foundation of Projective Geometry**.

Projective Space is established with eight axioms and its Geometry with nine.

I quote them⁵ wishing to emphasize that **their comprehension is absolutely essential for the comprehension of the new physical description of the world**, as proposed by the Theory of the Harmonicity of the Field of Light:

A. Positional axioms

I. *Two points define a straight line, on which they lie.*

IV. *Two planes define a straight line, which lies on them.*

II. *Three points, not on the same straight line, define a plane on which they lie.*

V. *Three planes, not intersecting at the same straight line, define a point, which lies on them.*

III. *A point and a straight line, not passing through it, define a plane on which they lie.*

VI. *A plane and a straight line not lying on it, define a point which lies on them.*

B. The axioms of order and of the projective character of the direction of movement

VII. *If an element O is defined on a first degree formation^{*}, the remaining of its elements can be ordered in such a way so that element O precedes all others elements. In this*

⁵ Panagiotis Ladopoulos, “Elements of Projective Geometry”, op. cit., p. 49-50

^{*} *First degree Geometric Formation is the geometric formation whose elements in Analytic Geometry are defined by a single parameter. The fundamental first degree geometrical formations are:*

*a. The **straight-line point series** comprised of the set of points lying on a straight line. Any element of this point series (its point) is determined by its Cartesian abscissa in relation to another point of the same point series, arbitrarily designated as the origin of measurements.*

*b. The **pencil of raylines on a plane**, i.e. the set of straight lines on a plane intersecting at a certain point. Here the parameter is the ray angle in relation to another randomly selected rayline used as the origin of measurements.*

*c. The **sheaf of planes**, i.e. the set of planes in space intersecting at one line. Here too, the parameter is the angle. An example of a sheaf of planes is the set of possible places of a door pane in relation to the axis defined by the hinges.*

order, there is always an element preceding every other element and between two elements A and B of the formation, if A precedes B, there is always an element that comes after A and before B.

VIII. *In a first-degree formation there are two specific directions of movement opposite each other. If a first-degree formation results from another via a finite number of projections and sections, a specific direction of movement on the first corresponds to a specific direction of movement on the second.*

C. Dedekind's continuity axiom*

IX. *If AB is a first-degree formation segment on which there has been defined a direction of movement, and if this segment is divided into two parts so as that:*

- a. Every element of the segment AB belongs to one of the two parts.*
- b. A belongs to the first part and B to the second.*
- c. A random element of the first part precedes a random element of the second.*

There is an element C of the segment AB (which may belong to one of the parts) so that every element of AB preceding C belongs to the first part and every element after C belongs to the second part.

Remarks on the axioms of Projective Geometry:

(All remarks that I will attempt to make, with relation to the above axioms that establish the Projective Space, stem from the knowledge I acquired while studying “*Elements of Projective Geometry*” by Prof. Panagiotis Ladopoulos and from attending his famous lectures at the National Technical University of Athens in the late 60s. It goes without saying that I accept full responsibility for any errors, misunderstandings, or ambiguities).

* *The seeds of this axiom are found in the splendid Theory of Sections of Eudoxus of Cnidus (408-355 BC), the leading Ancient Greek Mathematician of antiquity. Julius Wilhelm Richard Dedekind (1831-1916) admits this in the preface of his work “Was sind und was sollen die Zahlen?” (“What is the nature and meaning of numbers”) which refers to Book V of Euclid’s Elements, which, according to the historians, is based on the research by Eudoxus. (see Great Soviet Encyclopedia, Akademos S.A. Publ., Athens, 1979, Lemma: Number).*

1. The six *positional axioms* were named so to emphasize the importance of “*position*”.

2. The axioms of Projective Geometry introduce **automatically** to the Projective Space also its elements “at infinity”, which are considered totally equivalent to those “not at infinity” and consequently undistinguishable. As a result of this introduction and equivalence, the fifth (parallelism) Euclidean postulate has absolutely no meaning in Projective Space.

3. The VII Axiom of **order** “closes” the straight line. The projective straight line is a closed line via its infinite point, as opposed to the Euclidean which is an open one. It follows that the Projective plane is also a closed surface via its straight line at infinity (ideal line).

**This is a staggering transformation, radically altering
the nature of both the straight line and space in general.**

In order to divide a Euclidean straight line into two parts, it is necessary and sufficient to define **one** point on it. This does not apply in a Projective one. To divide a Projective straight line into two parts, **two** points are necessary and sufficient (e.g. to separate a hoop into two parts, two and not one cuts are necessary and sufficient.).

In addition, to define the direction of movement in the Euclidean straight line, it is necessary and sufficient to name in a specific order **two** of its points. This does not apply in the case of the Projective Geometry. That is because when in the Euclidean Geometry we say A, B, the direction has been defined, whilst in Projective Geometry, it has not been properly defined, because you can go from point A to B either in the classical way (Euclidean direction) or in the opposite direction via its “point at infinity”; precisely as Christopher Columbus (urged by Aristotle)*, left from Spain to go to India traveling westwards and stumbled on America. Hence, to determine direction of movement on the Projective straight line, **three** points are necessary and sufficient.

4. We have classified the positional axioms in two groups of three; the 1st group comprises of the first three, and the 2nd of the last three.

* Aristotle’s work “*On the Heavens*”, where the spherical shape of the Earth is proposed.

By comparing the two groups 1st to 1st, 2nd to 2nd etc., we observe that **the last three axioms result from the first three**, respectively one to one if, in the definition of each axiom, we respectively replace the word “point” with the word “plane” and keep the word “straight line” unchanged. Certain changes in the syntax would of course be required.

It seems therefore, that the concept of an infinitesimally small point **is equivalent** to the concept of an infinitely extended plane, (non-scientific comparisons notwithstanding), that is to say, a valid statement containing the concepts of points and straight lines, retains its validity if the two concepts swap their roles.

This property, introduced **automatically** in Geometrical Space by the formulation of the six positional axioms, is called **Principle of Duality in Geometrical Space**.

Moreover, since the formulation of axioms VII and VIII (establishing Projective Space) does not discriminate between “point” and “plane”, it follows that the Duality Principle, introduced by the first six axioms, remains valid also for those two.

Based on this Principle, from a true geometrical statement defining relations between points, straight lines and planes, we can pass on to an equally true geometrical statement if we interchange the roles of “point” and “plane”, while maintaining on both the “straight line”. Taking it a step further, the Duality Principle is also valid at the planar level, where it is the “**point**”↔“**straight line**” that now interchange their roles. Furthermore, the Duality Principle is also valid for any "Central Beam" (the set of all the lines and planes of space passing through a common point), where the concepts now interchanging roles are “**straight line**”↔“**plane**”.

I consider the Duality Principle in space, in combination with axioms VII and VIII, to be of **fundamental importance** to the Theory of the Harmonicity of the Field of Light, as they will eventually rid us of the particle-wave duality, a troublesome concept that has plagued modern Quantum Physics for so long, according to which matter and light are considered as being complementary but, at the same time, mutually excluding in nature...

Thus, in certain experiments, the electron appears to behave as a particle (photoelectric effect, Compton Effect), whereas in others it appears to behave as a wave (electron diffraction, interference, etc.).

I must stress that I, for one, consider this oppressive dualism* utterly unacceptable from a scientific point of view.

5. The six positional axioms were formulated utilizing three concepts: Point, straight line and plane. These concepts, however, were not defined. How could they be defined? The answer is obvious: These concepts are so rudimentary in nature that no simpler ones exist to define them with. Thus, the definition for “point”, given in certain scientific treatises, as “*a space of null dimensions*” is, to say the least, naive. These three fundamental concepts are **automatically** defined simply by stating the six positional axioms. It is not the “*mathematical entities*” that we define and investigate, it is **their relationships**.

So, what is a point?

A point is what we understood it to be simply by reading the six positional axioms. The same is true for the straight line and the plane. There is one thing for sure: All of us have understood **the same** thing and that is due to the strictness of the axioms.

6. Projective Space was established with the first eight axioms. Dedekind's continuity axiom does not contribute to the establishment of Projective Space, it was introduced however to Projective Geometry by F. Enriques to offer Projective Geometry autonomy and to help it overcome a certain weakness present in the proof of its fundamental theorem. Dedekind's continuity axiom, as formulated, constitutes the geometrical expression of the continuity principle of real numbers in Mathematical Analysis.

Based on this axiom, from a geometrical proposal establishing relationships between real elements of space, we can proceed, **in general**, to a function or an inequality of Cartesian coordinates with real coefficients.

Attention! The reverse is not valid in general.

e.g. consider the function: $x^2 + y^2 + 1 = 0$

This is a function of the Cartesian coordinates x, y on a plane with real coefficients.

What does it represent, however?

* So, what “is” in fact the electron? The well-known, ironic statement of pioneer physicist William Bragg (X-ray diffraction, crystallography) who claimed that each Monday, Wednesday and Friday he taught the particle theory and each Tuesday, Thursday, Saturday the wave one! Followed by the great American physicist **Richard Feynman** who added that, on Sunday we sit and wonder what “is” matter...

It represents the points on the circumference of a circle having the beginning of the axes at its center and a radius equal to the square root of -1. And what is the square root of -1? In other words, is there a real number which multiplied by itself yields -1?

Thus, the bridge established by Dedekind's continuity axiom, **is not always open** from Analysis to Geometry. Sometimes it is open and sometimes it is not.

This fact was sadly overlooked by Modern Physics; as a result many a time, while trying to grasp the explicit laws of Nature through analytical functions of the Cartesian coordinates with real factors, we inadvertently have slipped into **utopia** and **scientific mythology**, a typical example being the proposal of the Special Theory of Relativity according to which: *“The speed of light is the highest speed at which matter, energy and/or information can travel in Nature”*. And that is so, because, whereas the above statement is not included in the founding hypotheses of the Special Theory of Relativity, through the Lorentz transformation, i.e. through analytical functions of Cartesian coordinates with real coefficients, it “materializes” as a conclusion and a Law of Nature.

Specifically:

As the expression $\sqrt{1-\frac{v^2}{c^2}}$, appearing in the Theory of Special Relativity, for $v > c$ becomes an imaginary number, Einstein concluded **that such velocities have no n a t u r a l meaning** and was thus led to the conclusion that velocities greater than light **do not exist** in Nature.

That, however, is a **risky** conclusion.

We ought to be really careful!

That is, we ought to investigate **how** the analytical function with the real coefficients was derived.

Could it be that the expression $\sqrt{1-\frac{v^2}{c^2}}$ has a natural meaning **only** for $v < c$?

Could it be that the natural hypotheses (either explicit or implicit) on which we were based, inadvertently lead to the expression $\sqrt{1-\frac{v^2}{c^2}}$?

Could it be that simply by changing the hypotheses, we can end up with another expression?

In other words, could it be that the problem does not really lie with the imaginary numbers, but with the hypotheses leading to the above expression?

Could it be that we end up concluding our own hypotheses?

By now, having carefully laid down the foundations of our Geometry, after the great David Hilbert's urge that "*the Physicist must become a geometer*", **we are ready** to practice Physics.

And let us start at the beginning.

“Εἰ δὲ τις ἐξ’ ἀρχῆς τὰ πράγματα φύομενα βλέψειεν, κάλιστ’ ἀν θεωρήσειεν”

(*“If someone sees things right from the beginning, he will have the best view”*) as Aristotle advised in his “Physica”.



FIRST PART

ANTITHESIS

(To the Physics of the Angels...)

“A Beautiful, moral world, created in Heaven!”

Dionyssios Solomos, "To Francesca Fraser"

CHAPTER 1

KINEMATICS OF THE MATERIAL POINT

*“There is nothing concealed that will not be disclosed,
or hidden that will not be made known.”*

(Luke chap. 12: 2)

I define as "Physics of the Angels", that description of the world in which the statement: *“Body moving in a uniform rectilinear translatory fashion (with constant velocity)”* (a), is considered true. Such "Physics of the Angels" is a part of Newtonian Mechanics and Albert Einstein's Theory of Special Relativity, which is based on the validity of the Lorentz Transformation.

Since in reality, I have never really observed *“a body moving in a uniform rectilinear translatory fashion”* nor have I ever measured it in Practice (human experience), I am faced with the dilemma:

- Either to start with by completely rejecting "Physics of the Angels".
- Or to set it temporarily aside until the validity of statement (a) is ascertained in practice.

Since, however, "Physics of the Angels", in areas dealt by Newtonian Mechanics, has provided us with a satisfactorily working, approximate (to the limit) description of the World on one hand, and has greatly contributed to the promotion of Science and Technology on the other, I choose not to completely reject it from the start, nor to set it aside awaiting the verification of statement (a) but rather, thinking now myself in an "angelic" way, i.e. accepting **temporarily** its truth, I will try to demonstrate the deficiencies of Newtonian Mechanics and the plethora of errors and contradictions of the Theory of Special Relativity.

At the same time, I will try to bring forward and elaborate on the kind of novel ideas and fundamental new concepts that will eventually allow me, once and for all, to get rid of the "Physics of the Angels"* and move on to the "Physics of Humans", in consistency to the definition of Physics I gave at the beginning of this work.

* To avoid misunderstandings, I would like to declare right from the start that my effort to get rid of the "Physics of the Angels" does not mean, in any way, that I wish to also get rid of Angels. I do not dispute Angels. I dispute the arbitrariness of Science, which considered that the "Physics of the Angels" *coincides* with the Physics of Humans [...]

Physics grew distant from Geometry, the Mother of all Sciences⁶ which the Ancient Greeks⁷ first promoted to the level of science with Thales of Miletus (639-548 BC), from the moment that the parameter of **Time** was introduced into the observations and the measurements of the relationships involving elements of the perceptible space.

I will not try to formulate a philosophical "treatise" on Time, meaning I will not try to explain what Time "is" because, I admit it, I simply have no idea.

I will deal, however, with something much simpler: The measurement of Time.

So, how do we measure time?

With clocks, of course.

So, let us consider a factory that manufactures clocks. Like most factories, ours has a "Quality Control" department where, as each new clock passes in front of a special clock called the **standard** clock, it becomes synchronized with it.

The definition of "synchronization" we will use is none other than the one given by Einstein^{*}: Suppose that the standard clock is A and the new one is B, stationary relatively to it. We assume that a luminous ray leaves from A to B at time t_A . When the luminous ray arrives at B, the time at B is t_B . The ray is reflected on B and returns to A when the time at A is t'_A .

"The two clocks are by definition synchronized if $t_B - t_A = t'_A - t_B$ ".

Needless to mention that this check is not unique and it could also be conducted in the reverse, i.e. the luminous beam in question starts from B.

Let us now suppose that we have a large number, as large as we wish, of such "synchronized" clocks. It is obvious that, since each one of these clocks is synchronized with the standard clock, all are synchronized with one another.

⁶ Plato's, "Republic", book VII: "*Του γαρ αεί όντος η γεωμετρική γνώσις εστιν*" (*Knowledge of Geometry is an attribute of the eternal*).

⁷ Max Born: "Experiment and Theory in Physics" (Cambridge University Press), lecture at King's College at Newcastle-upon-Tyne; May 21, 1943: "*There is no doubt that the first geometrical knowledge of Sumerians, Babylonians and Egyptians were clearly empirical. The Greeks discovered the logical connections between the geometric truths and founded the first deductive science, as this emerges from Euclid's works*".

^{*} Albert Einstein, "*On the electrodynamics of moving bodies*" (*The principle of Relativity*, H.A. Lorentz, A. Einstein, H. Minkowski and H. Weyl), Dover Publications Inc., New York, p. 40)

We imagine that we distribute these clocks, at random places, along a straight line E.

This arrangement of synchronized clocks distributed at random places along a straight line E, from now on I shall call "**Linear Array of Synchronized Clocks (LASC)**".

We now imagine a **material point** moving on line **E** and affecting the clocks in such a way, that each clock stops when the particle is directly in front of it. Or, alternatively, if we do not want it to stop and we decide to use more sophisticated clocks, it continues working but, at the same time it records its reading when the material point passed in front of it, in the fashion of sport chronometers recording lap times of athletes passing in front of them.

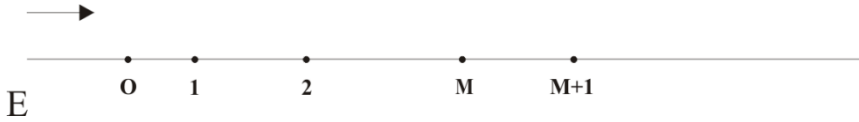


Figure 1.1.1

Definition :

We define the measure of average speed (or simply the average speed) of the material point traveling along a random interval M to M+1, (assuming that clocks are installed at points M, M+1), as follows:

$$v_{\text{average}} = \frac{x_{M+1} - x_M}{t_{M+1} - t_M} = \frac{\Delta x}{\Delta t} \quad (1.1.1)$$

Where x_{M+1} , x_M is the Cartesian abscissa of points M+1 and M respectively, measured by stretching out a tape measure on line E, with the zero of the tape placed on any random point O (which we arbitrarily consider the beginning of measurements) of this line, and t_{M+1} , t_M the displayed readings of the clocks at positions M+1 and M respectively. This, **by definition**, is the measure of the material point's average speed at the interval M to M+1 and is symbolized with the ratio $\frac{\Delta x}{\Delta t}$.

If now we imagine that we have a very-very large number of clocks, situated infinitesimally close to one another, and if the measurement of the average speed involves clocks at two adjacent positions, what we previously called average speed, we now call **momentary speed** of the material point in the "neighborhood of" M.

Momentary speed is the limit to which the ratio $\frac{\Delta x}{\Delta t}$ approaches, when Δt approaches zero, and is symbolized by $\frac{dx}{dt}$.

Having already defined the fundamental concept of Kinematics and Physics as a whole, particularly speed, not as an abstract mathematical or philosophical concept but rather as a **measurable magnitude**, we can now begin to study the Kinematics of the material point, i.e. the change of the distance traveled by a material point over time, a point which at first, for the sake of simplicity, will travel along a straight line E, i.e. we shall begin our study by examining **straight-line kinematics**.

But, wait a minute! **Where** shall we study the Kinematics of the material point?

From the comfort of our desk?

Certainly not!

We shall study it in **Practice**.

So, we shall need a volunteer.

Let us call him the **Observer** and let us ask him to position himself in a place in space such that he can fully monitor everything that happens in his perceptible environment. After we supply him with all the essential instruments provided by technology, we ask him to measure the change of the distance traveled by a material point moving on a straight line E, over time.

We ask him, that is, to study the Kinematics of the material point in its simplest form along a straight line but, careful, not the Kinematics **he "imagines"**, but only the one **he can witness with his eyes and measure with his instruments**.

Thus, by introducing the Observer, we move from the study of Kinematics **by insight** to the study of Kinematics **by sight**. By this simple decision, we take a small first step towards our eventual release, once and for all, from the "Physics of the Angels".

So, the Observer takes the position O (Fig. 1.1.2), away from straight line E for two reasons:

- a. To witness events from a grandstand point of view, and
- b. To avoid colliding with the moving material point.*

He begins by recognizing and arranging the instruments we have given him.

Immediately, however, he voices an objection:

- I cannot do it.
- Why not?
- Because I do not have a clock.

He is right, of course. To conduct Physics, one needs at least a ruler and a clock, in much the same way the Ancient Greek Geometers needed a straightedge** and a compass to conduct Geometry.

Thus, we provide the Observer with a ruler and a clock from the same lot where all the rest came from, i.e. a clock labeled "synchronized".

THEORY OF THE HARMONICITY OF THE FIELD OF LIGHT **(1st Fundamental Hypothesis)**

MATTER INTERACTIONS OCCUR IN THE **GEOMETRICAL SPACE** AT A SPEED THAT IS ESSENTIALLY CONSTANT AND INDEPENDENT OF THE RELATIVE SPEED OF THE INTERACTING ELEMENTS OF MATTER. MORE SPECIFICALLY, MATTER INTERACTIONS CONDUCTED THROUGH LIGHT, OCCUR IN **GEOMETRICAL SPACE** AT A SPEED ESSENTIALLY CONSTANT IN MAGNITUDE, INDEPENDENT OF THE RELATIVE SPEED OF INTERACTING ELEMENTS OF MATTER AND EQUAL TO THE SPEED OF LIGHT WHICH, HOWEVER, **I MEASURE** IN MY **PERCEPTIBLE SPACE** AT THE PLACE WHERE I AM LOCATED.

So, let us suppose that the Observer measures the speed of light where he is located and he finds it equal to C ***.

* *Later, we shall understand the physical importance of this.*

** *The "ruler" of the Ancient Greeks Geometers was not marked, i.e. was used only for drawing straight lines; it was a straightedge. The Physicists' ruler is marked based on the standard meter.*

*** *With C we symbolize the speed of light in "void". If the intermediary between the interacting elements of matter is not the so called "void", then in the place of C is placed the measurable value of speed of light in the means.*

Let the material point move along straight line E, with its direction defined as in Figure 1.1.2, with a constant speed v measured with the LASC. Let $v < c$.

Let the material point be **now**, at position A.

Where does the Observer see it **now**?

Where does he measure it **now**?

Where does he record it **now**?

And, first of all, what does "**now**" mean?

"**Now**" is what the clocks display. Any other definition of **now** is not scientific.

"**Now**" is **only** what the clocks display.

(We should be grateful to A. Einstein for this the fundamental clarification).

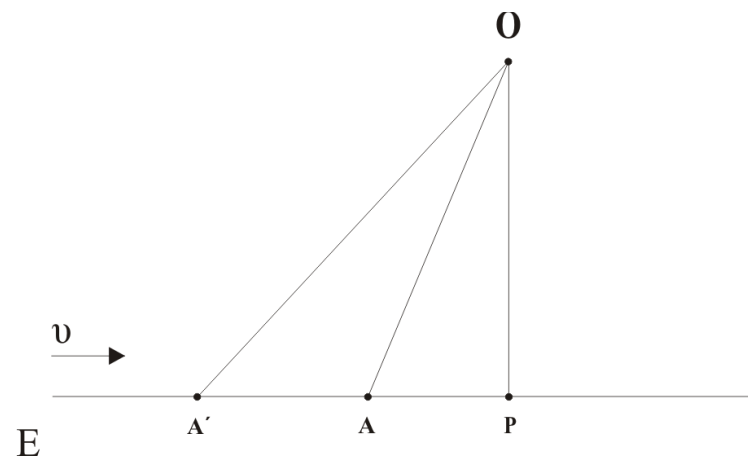


Figure 1.1.2

The material point is **now** located at place A.

However, the observer positioned at O does not see it **now** in position A, nor does he measure it nor does he record it at position A, but rather at a **previous** position A', such that:

During the time it took for the material point to travel from A' to A, at that same time the luminous interaction (i.e. the light), traveled from A' to O. Thus we have:

$$\frac{A'A}{v} = \frac{A'O}{c} \Rightarrow \frac{A'A}{A'O} = \frac{v}{c} \quad (1.1.2)$$

Let us call Position A, where the material point is now located, simply **Position**.

I shall call Position A', at which the Observer **now** sees, records and measures the material point, **Conjugate Position**.

Our first hypothesis establishes two overlying sets of points, the set of **positions A** and the set of points of the **conjugate positions A'**, both of which have line E as their common carrier.

I will prove that:

For a given measure of speed v measured with the **LASC**, and a given direction of particle movement on line E, the elements (points) of the two overlapping sets of points **are connected one-to-one in the Euclidean Space**. In other words, in the Euclidean Space a given position A is associated with one and only one conjugate position A' and, vice versa, a given conjugate position A' is associated with one and only one position A.

P r o o f :

I will first prove the reverse proposal as it is easier (Fig. 1.1.3).

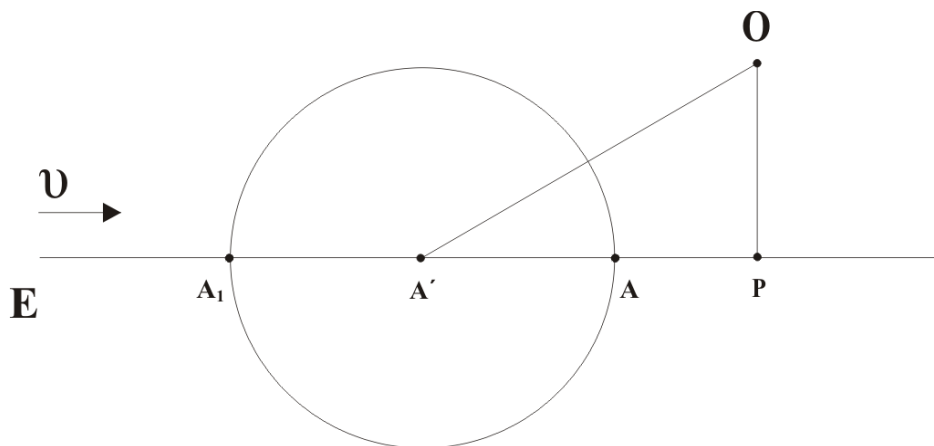


Figure 1.1.3

We consider that conjugate position A', the direction of movement and the speed v , measured with the LASC, are all given. We are asked to find Position A.

From equation (1.1.2), we have:

$$A'A = \frac{v}{c} \cdot A'O \quad (1.1.3)$$

Magnitudes in the right part of the equation (1.1.3) are all known, therefore the distance A'A is also known. Thus, using A' as the center and a radius equal to A'A as calculated from (1.1.3), I draw a circumference, which intersects line E at points A₁ and A.

Point A is the position having A' as its conjugate, for speed ν and direction of movement as indicated in figure 1.1.3, whereas A₁ is the position having A' as its conjugate for speed of the same measure ν but for opposite direction of movement. Observe that positions A and A₁, having both A' as their conjugate for the same measure speed ν and for opposite directions of movement, **are symmetrical** with regards to the conjugate.

Proving the direct proposal is a bit more complicated.

It is position A that is now given, as well as the direction of movement and the measure of speed ν measured with the LASC. We are asked to locate conjugate position A'.

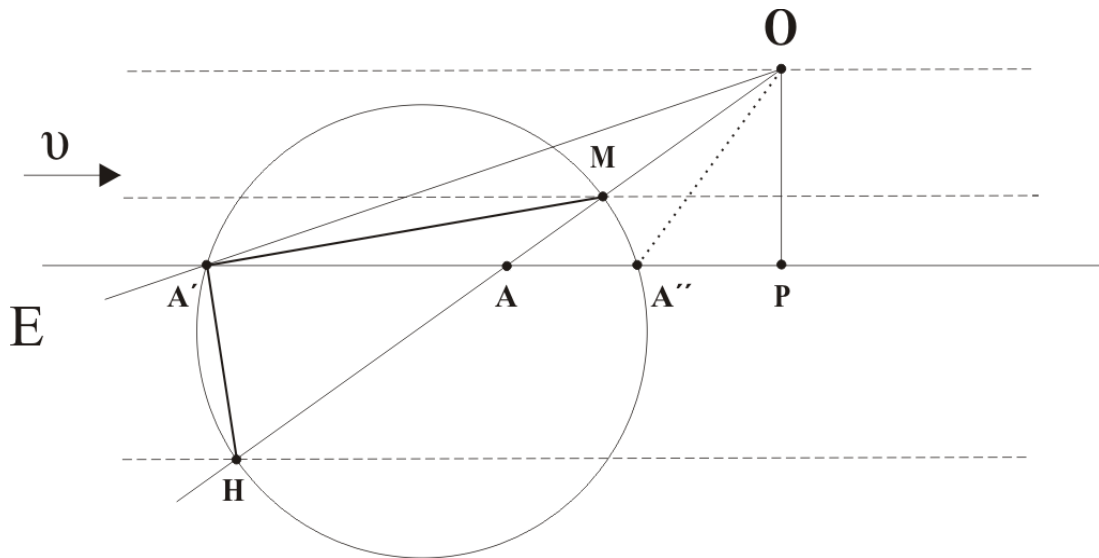


Figure 1.1.4

Let us for a moment assume that A' has been located. In triangle OA'A I draw the internal bisector of the angle A'. Suppose that said bisector crosses OA at point M. I also draw the external bisector of angle A', which crosses the extension of OA at H. MA' is perpendicular to A'H. From the angle bisector theorem, it holds that:

$$\frac{MA}{MO} = \frac{HA}{HO} = \frac{A'A}{A'O} = \frac{\nu}{c} \quad (1.1.4)$$

Thus, given the position A, I draw OA and extend it. I divide OA internally in a $\frac{\nu}{c}$

ratio. There **is one and only one point** M so that: $\frac{MA}{MO} = \frac{\nu}{c}$

I divide OA externally in a $\frac{v}{c}$ ratio. There is **one and only one point** H so that

$\frac{HA}{HO} = \frac{v}{c}$. With diameter MH, I draw the **Apollonian Circumference** (Apollonian Circle), which crosses line E at points A' and A''.

A' is the conjugate position of A for a measure of speed v and direction of movement as per figure 1.1.4, whereas A'' is the conjugate position of A for the same measure of speed v and opposite direction of movement. This is so because the so defined **Apollonian Circumference**, i.e. with MH as its diameter, is the geometric locus of points (on a plane) whose ratio of the distances from the given points A and O is the given one (v/c not equal to 1)⁸.

Observe that the two conjugate positions A' and A'' of position A, for the same speed measure v and for the two opposite directions of movement, **are not symmetrical** with regards to it. Here, we have forfeited symmetry. We have, however, discovered something else. We have discovered **Harmony**. This is because the four points H, M, A, O, constitute a **Harmonic Tetrad**. We observe that the double ratio (with signs):

$$(HMAO) = \frac{(HA)}{(AM)} : \frac{(HO)}{(OM)} = \frac{(HA)}{(HO)} : \frac{(AM)}{(OM)} = \frac{v}{c} : \left(-\frac{v}{c}\right) = -1$$

equals -1, which constitutes the **necessary and sufficient condition for a harmonic tetrad**. Let us now consider the three lines, parallel to E, passing through points H, M, O.

This bundle of lines together with line E, constitute a harmonic tetrad, independent of position A. Based on this bundle, we can now quickly locate the conjugate: As any random moving ray OA_i crosses the other two elements of the bundle at points M_i and H_i, if we draw the **Apollonian Circumference** with diameter M_iH_i, its crossings with line E give conjugates A'_i and A''_i. Thus, we discover that **“space” as conceived by the intellect (conscience)**, what the ancient philosopher Parmenides and later Plato called **“TO EINAI”**, **“TO NOEIN”**^{*}, i.e. the **“space” as it exists only in our head** (set of points A), is connected to the **“space” as conceived by the senses**, (I see what **“is”**, I measure what **“is”**, set of points A'), the **“space” found outside of our head NOT ACCIDENTALLY**, but through this **HARMONIC BUNDLE**.

⁸ Petros G. Tongas, “Theoretical Geometry”, Petros Tongas Publ., Athens, 1957, p. 331-332

^{*} *“Because what you conceive is the same with what is” (To γαρ αυτό νοεῖν ἐστὶν τε καὶ εἶναι); Parmenides, excerpt III.(see Panagiotis Thanassas, “The first ‘second’ voyage”; University of Crete Publ., Heraklion, 1998, p. 240).*

Human Consciousness *, (corresponding to the Physics of the Angels), is related to **Human Perception**, (corresponding to the Physics of Humans), not in a random but rather in a **HARMONIC** fashion.

The **Theory of the Harmonicity of the Field of Light** takes its name mostly on account of this breakthrough which is exceptionally critical not only for understanding the **Big Mistake**, but also for resolving the **Big Issues** of modern Physics.

It would be now interesting to examine, what happens when the moving material point is found in a position of its orbit that is the closest to the Observer, i.e. is found at the foot of the perpendicular P (Fig. 1.1.5).

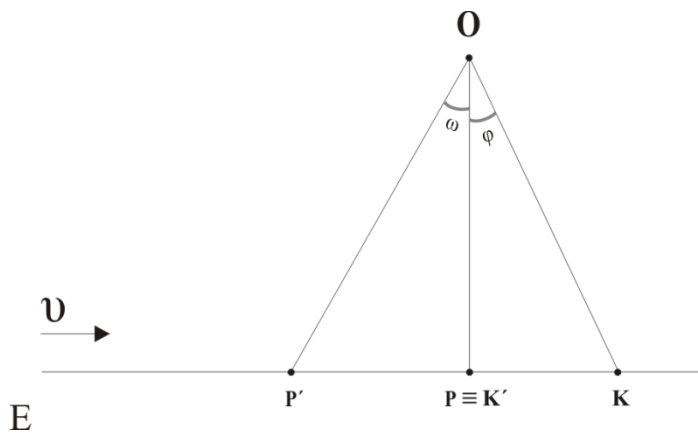


Figure 1.1.5

So, let the material point **now** be at the foot of the perpendicular P drawn from O to line E. The Observer **now** does not see, nor does he measure, nor does he record the material point at position P, but rather at its conjugate P' such that, in the time it took for the material point to travel from P' to P, light traveled from P' to O. Thus:

$$\frac{P'P}{P'O} = \frac{v}{c} = \sin\omega \quad (1.1.5)$$

* "...While contemplating what consciousness is precisely, one is deeply impressed, admiring how something that happens in the world outside of us, simultaneously causes an internal image to be created, as if this event, somehow, happens inside us as well, in other words, became part of our consciousness." Carl G. Jung. Cited by John Ziman in his work: "Reliable Knowledge - An Exploration of the Grounds for Belief in Science", Cambridge University Press.

The key word here is "simultaneously". The Theory of Harmonicity with its First Fundamental Hypothesis abolished "simultaneity". Einstein of course came first, but then he headed towards other directions [...]

Let now the material point be found at such a position K, so that the Observer sees it at P. Meaning that P is the conjugate of K, or $P \equiv K'$

We have again:

$$\frac{PK}{PO} = \frac{v}{c} = \tan \varphi \quad (1.1.6)$$

In this case, light has traveled its **minimal** route.*

Thus, when the material point is found at P, the Observer sees it and measures it at P' and when the material point is found at K, the Observer sees it and measures it at P. In other words, when the material point travels the interval PK, the Observer sees it and measures it traveling the interval P'P. Thus, when the material point **is moving away** from P, the Observer sees it and measures it as **approaching** P.

It is interesting to find the relationship between these two intervals:

$$\frac{PK}{P'P} = \frac{OP \cdot \tan \varphi}{OP \cdot \tan \omega} = \frac{\tan \varphi}{\tan \omega} = \frac{\tan \varphi}{\sin \omega} \cdot \cos \omega = \sqrt{1 - \sin^2 \omega} = \sqrt{1 - \frac{v^2}{c^2}} \quad (1.1.7)$$

Because, $\sin \omega = \tan \varphi = \frac{v}{c}$.

Guess what: **We have stumbled upon the Lorentz Contraction Factor
of the Theory of Special Relativity !!**

After we recover from the shock, we start wondering. What is happening?
Could it be that we, by being faithful to the Spirit of the Ancient Greek Geometry, have discovered the Lorentz Contraction following an entirely different path, the Geometric one?

Is it simply a coincidence?

Or is it that some big secret is hidden somewhere around here?

Who is in a position to answer?

* Attention is called for here! Without realizing it, we are already at the entrance hall of Quantum Theory, and face to face with one of its well known "mysteries".

I believe that research in Physics is nothing but a “dialogue” between the Man and Nature. A position, I think, most of you would agree with if by research I meant basic, experimental research. For it is there that the “dialogue” becomes all the more obvious: Upon setting up the experiment and asking the question, Nature's answer is always returned, imprinted in the results of the experiment.

Could, however, this be also true for purely theoretical research?
How, in that case, could such a “dialogue” really take place?

I believe it could if Nature’s role is taken by our imagination, provided that our imagination gives us answers that are 1. **compatible with** the answers that Nature itself would give during the basic, experimental “dialogue” and, 2. definitely logical, i.e. non-contradictory **answers**. This last pre-requisite springs from my belief that the Creator is not insane or, in any case, that when He created (or continues to create) the world (and us) He was (and continues to be) sober...

Thus, “dialogue” takes place in both cases.

I believe however that this is a dialogue where **the real difficulty does not so much lie in how to get the Answer, as in how to correctly phrase the Question** for it to make sense either to Nature, or to our Imagination.

And questions such as:

- Is it simply a coincidence?
- Or is it that some big secret is hidden somewhere around here?

do not make sense to Nature or to our Imagination.

To do so, I would need to rephrase the Question.

So I proceed with the following:

Knowing in advance the position O from where the Observer will take all his measurements, the speed v at which the material point will travel, measured with the LASC, and the direction of movement, at night, when the Observer is asleep and all Nature rests, I dress-up in black and using a flashlight, so that I remain unnoticed, I go to point O, draw the perpendicular on to E, and thus I determine point P.

There, I nail a pole with a small red flag.

Then, using OP as a side and towards the direction where the material point will come from, I construct angle ω , such that $\omega = \arcsin (v/c)$, I determine point P’ and there I nail a pole with a small green flag.

Next day the Observer, reporting for work, wonders why all this flagging:

- I want you to measure **with your clock**, how long it will take for the material point to travel the distance between the pole with the green flag and the one with the red flag.
- Consider it done! Answers the Observer and gets on to work.

Soon, the material point appears traveling at a speed ν , measured with the LASC, and soon, the moment it reaches the pole with the small green flag (P'), the LASC clock there registers:

« $t_{straight\ line}$ » Start

At that moment, the Observer's clock what does it register?

It registers nothing that is of interest to us, because when the material point is at P', the Observer sees it at a **previous** position (at the conjugate of P'), and thus the experiment has not even started for the Observer. For the time being, the Observer can read his newspaper.

The material point advances and, at some time, it reaches the pole with the small red flag (P); at that moment the LASC clock there registers:

« $t_{straight\ line}$ » End

Therefore, the time required for the point to travel the interval P'P, measured by the LASC is:

$$\Delta t_{straight\ line} = (\text{« } t_{straight\ line} \text{ » End}) - (\text{« } t_{straight\ line} \text{ » Start}) = \frac{P'P}{\nu},$$

by the definition of ν .

However, when the LASC clock registers "End", i.e. when the material point is at P, the Observer sees it at P' and thus **his** clock registers:

« $t_{observer}$ » Start

The material point continues its course and at some time reaches K.

At that moment, the LASC clock there registers something that is of no real interest to us, the Observer's clock however registers:

$$\ll \mathbf{t}_{observer} \gg \mathbf{End}$$

because it is **now** that the observer, sees the material point at P. Thus, the time required to travel the interval P'P, measured by the Observer's clock is:

$$\Delta \mathbf{t}_{observer} = (\ll \mathbf{t}_{observer} \gg \mathbf{End}) - (\ll \mathbf{t}_{observer} \gg \mathbf{Start}) = \frac{PK}{\nu},$$

by the definition of ν .

The experiment is by now over and the conversation with the Observer begins:

- Mr. Observer, what is the time you recorded?

The Observer gives us a number equal to $\ll \Delta \mathbf{t}_{observer} \gg$ i.e. equal to $\frac{PK}{\nu}$.

- Follow me please. Let us go and check what the LASC clocks recorded for the same event.

First we go to the pole with the green flag (P'), take a note of the clock reading there, then we go to the pole with the red flag (P), where we also take a note of the clock's reading, then we subtract the two readings and come up with: $\ll \Delta \mathbf{t}_{straight\ line} \gg = \frac{P'P}{\nu}$

Now wait a minute!

- Mr. Observer, the time you measured with your clock is not the same with the time measured by the LASC clocks on the line **for the same event!**

Actually the ratio of the two measurements is:

$$\frac{\Delta \mathbf{t}_{observer}}{\Delta \mathbf{t}_{straight\ line}} = \frac{PK/\nu}{P'P/\nu} = \frac{PK}{P'P} = \sqrt{1 - \frac{\nu^2}{c^2}} \quad (1.1.8)$$

- How do you explain this?

The Observer is completely dumfounded.

He scratches his head a little, and then, with a decisive movement, takes his watch off his wrist, and throws it in the trash can complaining at me:

- How many times do I need to tell you, to always bring quality clocks when we conduct serious Physics experiments!

After I reassure him that his clock is every bit as good as the LASC clocks on the straight line, I repeat the question:

- Tell me. What explanation can you give?

The Observer thinks about it again and answers profoundly:

- I'll tell you what:

Had any of the clocks been moving, I could claim that we had just proved experimentally "time dilation"* due to movement, as predicted by Special Relativity. But, by God, **all** clocks were relatively stationary...

- What did you say?

You prefer a moving clock? All right, I'll get you a moving clock!

To resolve all his wondering, on the front bumper of a fast dragster I secure one of the clocks labeled "synchronized", identical to all the previous ones; I also make sure that the bumper stays always in contact with line E throughout the movement. On the clock, an appropriate mechanism is mounted with two independent display screens and programmed so that when the clock goes past each of the two flag-carrying poles, at points P' and P of the course, the corresponding time readings are recorded independently on the two displays.

* I must admit that I have never understood this strange expression "Time Dilation", which unfortunately haunts nearly all modern textbooks of Physics circulating at Universities and Research Centers and is preached worldwide by "High Priests" of all sorts, thereby propagating "The Dogma".

Not having yet fully understood what "**Time**" **really is**, we tend to assign to it weird & exotic characteristics and behaviors! If we wish to be taken seriously, until such time that we **do** understand, I suggest **we speak ONLY about what the clocks do!**

The dragster departs on its journey along line E and soon we get one more Δt measurement. Thus, we now end up with three independent Δt measurements:

- a. The measurement of the **moving** clock mounted on the dragster.
- b. The measurement of **the stationary Observer's clock** at point O.
- c. The measurement of the clocks distributed along the straight line (**LASC**).

The following happens:

1. Measurement c. **differs** from measurement b. (As explained earlier)
2. Measurement a. **agrees** with measurement c. (Moving clock synchronized with LASC)
3. Measurement a. **differs** from measurement b. (As propositions 1 & 2 are true)

Therefore, the question arises:

What could possibly be the **cause of this discrepancy?**

Could it be the motion?

Or could it be the **distance** of observation?

Could it be the motion?

Or could it be the **locality of** the measurement?

Could it be the motion?

Or could it be the **delay in propagating the interaction**, due to the finite speed of light?

Well, I believe ENOUGH is enough!

For an entire century now, we have been violently raping **Reason** and consequently **Common Sense**, both of which most certainly do not tolerate contradictions of any kind.

We have stood speechless witnesses all while **Logic was being atrociously insulted**, when uniform linear motion suddenly became endowed with magical and, at the same time, extremely contradictory attributes, such as:

*“Clocks moving in a uniform rectilinear translatory fashion, **slow down (!!!)**, (...only slow down), due to their motion **alone**, motion which nevertheless is **relative**”.*

*“Rulers moving in a uniform rectilinear translatory fashion, **contract** (!!!), (...only contract), due to motion **alone**, motion which nevertheless is **relative**”.*

*“Masses moving in a uniform rectilinear translatory fashion, **increase** (!!!), (...only increase), due to motion **alone**, motion which nevertheless is **relative**”.*

Enough...!!!

The reality of course is that none of these contradictory, voodoo claims is valid. None of the above "Academic Mythologies" with which, unfortunately, four entire generations of Physicists were raised, is true.

What **INDEED** is true is simple!

Unbelievably simple!

Irritatingly simple, I would add.

We had agreed to measure one thing and, in REALITY, ended up measuring another!

We had agreed to measure with our clock (the Observer's clock), how long it would take for the material point to travel from the pole with the green flag (position P'), to the pole with the red flag (position P).

However, **we were condemned** instead to measure how long it took the material point to travel from position P to position K, as this is how long it took for **the conjugate of the material point** (its "ghost"), the **only one** we can see and measure, to travel from position P' to position P.

In reality, all we see and measure are only “Shadows”!

Just as Plato very brilliantly perceived some 24 centuries ago,⁹ and just as Paul warned us¹⁰. The object of our Physics is not **“The Being”**, but the "shadow" of **“The Being”**...

⁹ Plato's: "Republic" Book VII. The example of the humans, who are prisoners in a cave with their backs turned to its entrance and thus forced to see only the shadows (projections) on the walls, of those passing outside it.

¹⁰ Paul: "Corinthians 1 chap. 13: 12" "...For now we see in a mirror dimly, but then face to face; now I know in part; then I shall understand fully, even as I have been fully understood"

What we see and measure are ghosts.

That's all.

Nothing curious, nothing magical, nothing that will necessitate the toppling from its imposing pedestal of the crystal-clear Galilean-Newtonian Kinematics (and Mechanics) and its replacement with the blurry Kinematics (and Mechanics) of the Theory of Special Relativity, which is full of contradictions.

Thus, J. Goethe's reasoning in Faust, which is associated to the subtitle in the beginning of this chapter, is rendered timely:

*“Because a perfect contradiction remains
for both the wise and the clueless covered in mystery”¹¹*

There is no doubt that Galilean-Newtonian Kinematics (and Mechanics) is incomplete. It is so, because it is in part Physics of the Angels. However, it is not contradictory. **On the contrary, Einstein's theory of Special Relativity is contradictory.**

Prior to underlying, however, with more emphasis its various contradictions, let us proceed with our experiment. We ask the Observer to measure **with his clock** the average speed of the material point in the interval from the pole with green flag to the pole with red flag, i.e. the interval P'P.

So, here is what the Observer writes: $|v|_{Observer} = v_{ob} = \frac{P'P}{\Delta t_{Observer}}$

Attention: The denominator is the time that the Observer **measured with his clock** and not any time he either **imagined** or was measured by Gods, Spirits or Angels...

Thus:

$$v_{ob} = \frac{P'P}{\cancel{PK}/v} = \frac{v}{\cancel{PK}/P'P} = \frac{v}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.1.9)$$

[as results from (1.1.7)]

¹¹ Translation by Konstantinos Hatzopoulos

Conclusion: In the neighborhood of the foot of the perpendicular, the speed of the moving object measured with **the local clock** is **greater** than the speed of the moving object measured with the LASC (always for $v < c$).

And as, by definition, the momentum of a body, weighable or elementary, is given by its mass-by-speed product, it follows that the momentum of the particle point **measured by the Observer (local clock)** is:

$$P_{ob} = m_0 \cdot v_{ob} = \frac{m_0 \cdot v}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.1.10)$$

So here it is the famous **Relativistic Momentum** that we, **Humans** measure today in the laboratory, in the "elementary particle" accelerators!

It is here, however, that we split ways with the Special Relativity Theory once and for all. That is because, according to the Special Relativity Theory (SRT), this increased momentum, relatively to the one calculated by Newtonian Mechanics ($m_0 v$), is due to an increase in the moving object's mass with speed, **due to motion alone**, which motion is nevertheless relative (!)

This increased mass equals: $m_{(v)} = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ *

Whereas for us, this increased momentum relatively to the Newtonian one, is not caused by any **magical** increase of the moving object's mass due to motion alone (...which, nevertheless, is relative), but is simply due to **the fact** that the local clock

* Moreover this formula of the Special Theory of Relativity has never been proved experimentally (as they claim). No one has **ever** measured the mass of an object moving in a straight line. What is measured in the accelerators is only the momentum and the energy. Even at a theoretical level, however, the expression $m_{(v)} = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ does not have a solid foundation. Much "alchemy" is needed in order to

$$m_{(v)} = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

arrive at the above formula via the axioms of the Special Theory of Relativity or via the Lorentz transformation.

I suggest to the SRT's followers to attempt to theoretically produce the above formula and I can reassure them that they will be in for a big surprise; they will probably end-up having to invent arguments that are irrelevant to Mechanics. Others, again, may attempt to justify their case by claiming that Einstein's "mass" has a different meaning to the "mass" of Newton. To this claim, however, my simple answer is that in that case we would have no right to keep calling it "mass"; we ought to invent a new name, e.g. "ssam" might be a good candidate [...]

(the Human Observer's clock) measures a higher speed to the one measured by the LASC (Angel's clock), thus increasing the object's momentum.

And let us not forget that the only **clock that exists*** is the one we wear on our wrist, the one hanging on the wall i.e. any clock situated in **our locality** and, for that, called a **local clock**.

So finally, after all this trouble, we have arrived at the answer to the Question we asked in page 27: Is it a coincidence or not?

No! It is definitely not a coincidence.

The Theory of the Harmonicity of the Field of Light is neither a substitute nor a second edition, even an updated one, of the Special Theory of Relativity. The Theory of the Harmonicity of the Field of Light introduces a **novel** view of the Cosmos, an entirely **new description of Nature**, and I believe that soon it will constitute a **new "Paradigm"** in the sense of the term given by Thomas Kuhn, the great American physicist (Ph. D in Theoretical Physics, Harvard), epistemologist, philosopher and historian of Science, in his book "*The Structure of Scientific Revolutions*"¹², a work that truly knocked the socks off the angelic world of Modern Science.

At the outset, it should be stressed that the "*Paradigm*" that is proposed by the Theory of the Harmonicity of the Field of Light is **not compatible** with the "*Paradigm*" of the Special Theory of Relativity. This is, perhaps, not the right moment to fully explain the substance of the incompatibility (being too early), as it will gradually become more evident in the pages that follow, I would however like to succinctly note this:

Albert Einstein, while composing the Special Theory of Relativity (SRT), attempted (just like Isaac Newton) to describe the Human **Perceptible World** through concepts

* I use the verb "to exist" with its physical (scientific) meaning. What exists is what I feel and what I can measure and not what I imagine or am able to imagine. By "if", say the French, you can put Paris in a bottle (Avec "si" tu mets Paris dans une bouteille). However, a bottle that would contain Paris simply **does not exist**.

Here, I ought to declare that my existentialist perception is compatible with the respective philosophy of the great German mathematician Leopold Kronecker (1823-1891), which is founded on the statement: "Of the human inventions only those that can be constructed exist". An evolutionary result of this statement was the philosophical theory of Constructivism, founded by the mathematician L. E. J. Brouwer

¹² Thomas S. Kuhn: "The Structure of Scientific Revolutions", 2nd Edition; Chicago University Press, 1970.

corresponding to Human **Consciousness**. In the Lorenz transformation, the speed v is clearly a concept of consciousness and, since as such it is not **always** directly measurable (by humans), the affirmative proposal (formulated by humans) that this speed is permanently constant, is not **always** valid.

No one can actually flood space with clocks. The only thing one can do is to imagine such a thing happening (Angel's clocks). Thus, the Special Relativity Theory (SRT) correlated two **completely different descriptions**:

- a. The **Consciousness** description of the World (Physics of the Angels)
- b. The **Sensory** description of the World (Physics of Humans)

The two descriptions are generally incompatible; Galileo and Newton, however, did not face this problem of incompatibility, because the speeds they examined in their Kinematics and Mechanics were minute in relation to the speed of light, and thus, the differentiation was not obvious to them. Position A and its conjugate A' are not distinct for them because they practically coincide.*

Einstein, on the other hand, although he ventured into much higher speeds, neglected to point out the differentiation between A and A', which takes place when you are dealing with them. By this serious omission, Einstein equated **arbitrarily** the Physics of the Angels with the Physics of Humans and then, while trying to reconcile the irreconcilable, he started "tinkering" with clocks, rulers, masses (...and Common Sense), **demolishing in the process Rationality which allows no room for contradictions**.

By contrast, the new "*Paradigm*" of the Theory of the Harmonicity of the Field of Light, by recognizing the fundamental difference between the two descriptions, develops in an entirely different way: Speed v , measured by **the LASC** (which is usually located in our head, in our Consciousness) is one thing, whereas speed v_{ob} , measured by the **local clock that we wear on our wrist or hangs on the wall**, is completely another.

It should be stressed that the difference between the "*Paradigm*" of the Special Relativity Theory and the "*Paradigm*" of the Theory of the Harmonicity of the Field of Light, is both **fundamental and revolutionary**. The Revolution brought about by the latter "*Paradigm*" lies in the fact that the Theory of Harmonicity "relegates"

* See Figure 1.1.2, p. 22

Physics from its Angel status to a Human one and “relocates” it from the field of **Consciousness** to the field of the **Senses** initiating, at the same time, a more precise and, dare I say, a more coherent description of the World: **A world, as seen and measured and not as imagined by Humans.***

But, for good or bad, scientific research resembles the Lernaean Hydra. Thus a **second question** arises: How is it that the mathematical formalism of the Theory of Harmonicity happens to coincide with the mathematical formalism of Special Relativity, **only** at the foot of the perpendicular?

We should take into consideration that, of the two, the mathematical formalism of the Theory of Harmonicity is more complicated. That means, that if the two flag bearing poles were not positioned at the foot of the perpendicular P and its conjugate P', but rather at a random position A and its conjugate A', then the velocity $v_{obA'A}$ would not be a function of v alone, but also of the distance OA.** Even worse, if the two poles were positioned at random places A and B. then the velocity v_{obAB} would be a function of v , the distance OA and the distance OB.***

The velocity v_{ob} becomes independent of the distance between the moving particle point and the Observer **only** at the foot of the perpendicular provided the two poles are placed at conjugate positions. Also, if X' is the Cartesian abscissa of the conjugate position and X is the Cartesian abscissa of the position, then the function $X' = f(X)$ is not linear. Therefore, in order to answer the aforementioned question, we will have to dig deeper in the analytic derivation of the Lorentz transformation, which happens to constitute the backbone of the Special Theory of Relativity.

In doing so, I do not intend to deal with presumable "experimental data" that already existed before the composition of the Theory, (i.e. the Michelson - Morley Experiment), neither am I going to occupy myself with its prehistory, and that's because I strongly believe that all the nebulous philology and meta-philology that is consistently and deliberately kept alive by the Academic Status Quo for so many years, obviously (but

* *Let us not rush here. After death we will certainly have an eternity in front of us to study the Physics of the Angels. For the time being, let us study Human Physics. Ancient Greek sophist philosophers (Protagoras) knew very well what they were talking about by saying: “Πάντων χρημάτων μέτρον ἄνθρωπος, των μεν ὄντων ως ἐστι, των δε μη ὄντων ως ουκ ἐστι” (Plato, "Protagoras").*

** *In reality, not a function of the distance OA, but of the angle formed between the moving ray OA and the perpendicular OP.*

*** *To put it more correctly, if we consider OP constant, a function of the above two angles of the moving rays with the perpendicular (see next chapter).*

also quite conveniently for some...), **disorients** researchers, Physicists and Historians alike. Instead, I intend to examine directly the proposals and logical structure of the Theory, limiting myself to **Kinematics and Mechanics** while intending to deal with Electromagnetic effects later in another chapter. We must not forget that the Special Theory of Relativity, although originally conceived in order to describe Electromagnetic effects, unfortunately ended up "tinkering" with Newton's and Galileo's Mechanics and Kinematics. I consider this action an **inadmissible** induction.

So let us start:

In the beginning, there was the Galilean Transformation:

$$X' = X - v \cdot t \tag{1.1.11}$$

$$t' = t \tag{1.1.12}$$

The above Transformation calculates the spatial and temporal coordinate of an event in a frame S' (X' , t'), as a function of the spatial and temporal coordinate of the same event in a frame S (X , t), when the frame S' moves on a straight line with a constant speed v relative to S and in the direction of its positive values.

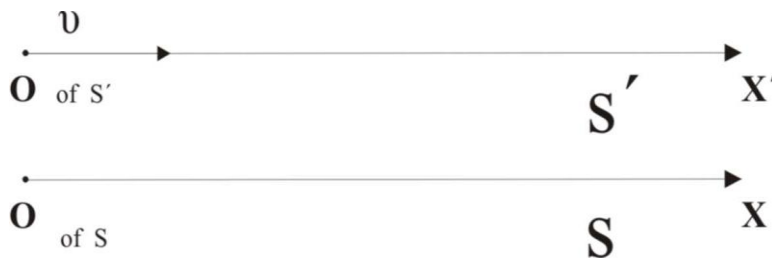


Figure 1.1.6

The Galilean transformation takes the simple form above, **only** under a fundamental condition: That we have agreed to zero the clocks of the two frames, (start of time measurements), at the moment that the zeros on the axes of both frames coincide, (start of length measurement). In case the above condition is not fulfilled, the Galilean Transformation does not have such a simple form anymore, as some constant factor is introduced into it.

And I will be more specific with the following example:

Imagine that at a distance of 200km from the central train station, practically next to the train lines, there is a maternity clinic. Suppose that at this maternity clinic, on May 1st of this year, at one o'clock AM sharp, the following event took place:

Maria gave birth to a little baby girl.

The space and time coordinates of the event "*Maria gave birth to a little baby girl*" relative to the Central Station stationmaster is:

$$x = 200\text{km}$$

$$t = 1^{\text{h}} \text{ AM, May 1st}$$

Imagine now that, exactly on the stroke of midnight on April 30th, (**the conventional start of time measurement**), a train passes in front of the Central station, (**the conventional start of lengths measurement**), traveling at a speed $v = 120 \text{ km/h}$ relative to it, (the train, however, does not stop there), on its way towards the maternity clinic. Maria's husband, going to meet his wife, is on that train. Question:

Which are the space and time coordinates of the event "*Maria gave birth to a little baby girl*" relative to Maria's husband?

This is the answer given to us by the Galilean Transformation.

So here we go:

$$x' = x - v \cdot t = 200 \text{ km} - 120 \text{ km/h} \cdot 1\text{h} = 80 \text{ km}$$

$$t' = t = 1^{\text{h}} \text{ AM, May 1st}$$

Therefore, whereas the space and time coordinates of the event "*Maria gave birth to a little baby girl*", **relative to the stationmaster** (S frame) are ($X = 200\text{km}$, $t = 1\text{AM}$ on May First), the space and time coordinates of the same event **relative to Maria's husband** (S' frame) is ($X' = 80\text{km}$, $t' = 1\text{AM}$ on May 1st). This being entirely reasonable of course, as from the start of time measurement (midnight April 30), up until the moment of the event, Maria's husband has already covered the first 120 km that separated him from the place of the event, and there remain only 80 km more to get there.

This alone is the natural meaning of the Galilean Transformation. This natural meaning however, also necessitates another prerequisite, which we usually don't bother to mention at all, as we consider it present a priori:

The **metrics of space and time** in both frames S and S' **must be the same**.

In the opposite case, the natural meaning of the Transformation is the following:

When the space and time coordinates of an event relative to S (X, t) **measured from S** are known, then, from equations (1.1.11) and (1.1.12), we get the space and time coordinates of the same event relative to frame S' (X', t') **measured AGAIN from S**, when the speed of S' measured from the S is equal to $+v$. That is to say, equations (1.1.11) and (1.1.12) do not correlate the space and time coordinates of the event, measured from the two reference frames, but instead they correlate the space and time coordinates of an event relative to the two frames of reference **measured from the SAME frame of reference**, (in this case we chose S).

Now, in the special case that the metrics of space and time are the same in both frames, the natural meaning of the equations (1.1.11) and (1.1.12) is simplified as follows:

When the space and time coordinates of an event relative to frame S (X, t), measured either from S or from S' are known, then, from equations (1.1.11) and (1.1.12) we get the space and time coordinates of the same event relative to frame S' (X', t'), measured either from S or from S', when the speed of S' relative to S is equal to $+v$. (The $+$ sign means that S' moves along the positive direction of S).

In this special case alone of **Space and Time metrics identicalness** in both frames, the transformation, as written, can be considered as correlating the measurements of an event from one frame to another.

However, what does **Space metrics identicalness** mean?

It means that, by agreeing that two **identical rods** from S and S' respectively will be used for all measurements, the derived distance of two random points A, B located anywhere in space will come out the **same**.

And what does **the Time metrics identicalness** mean?

It similarly means that, by agreeing that all time measurements will be performed with two **synchronized clocks** from S and S' respectively, the derived duration of two random events anywhere in Space will come out the **same**.

Of course, the measurable duration of the event as well as the measurable lengths in the two frames, are subject to the “consequences” of the Theory of Harmonicity applying to frames moving relative to each other. Thus, the measurable duration of the event by each local clock will have to be “translated” to a duration measured by the clocks of Angels. The same applies to length measurements.

However, for this “translation” to occur, it is not sufficient to know only the relative speed of the two frames. It is **absolutely necessary** to also know the distance of each and every frame (Observer) from the event's location.

The rods' **identicalness** and the clocks' synchronization can only be checked by overlapping and direct observation respectively, when the rods and the clocks are relatively immobile relative to the checking Observer. It is obvious that the distance AB cannot always be measured with the rod, because A and B can be located anywhere in space. Thus, in this case, the measurement is conducted via the light, i.e. by measuring how long it takes light to travel the distance AB, having first measured the speed of light with our rod and our (local) clock.

S u m m a r i z i n g :

Natural proposals resulting from the Galilean Transformation that are considered as correlating measurements of events **from two frames**, have a natural meaning **only** when there exists **metrics identicalness** for Space and Time in both frames. If this is not so, then the Galilean transformation correlates coordinates of events relative to the two frames measured, however, **from one of them**.

In the example of the train, the metrics of space and time are identical in both frames, (the same distance between two random points A, B is measured by both the stationmaster and Maria's husband; moreover, time as measured by the stationmaster e.g. that it takes a stone to fall from the roof of the train onto the floor, is the same with the one measured by Maria's husband for the same event).

This however, even though it sounds reasonable, is not always valid.

Imagine that an astronaut lands on an asteroid with a gravity field much smaller than that of a planet with dense matter where a colleague of his is. Nothing would guarantee that the metrics of space and time will be found the same by the two astronauts, even though they were provided with identical rods and clocks, checked and synchronized in a common control center from where the two astronauts started their trip. Because it is entirely possible, that their clocks can become desynchronized (e.g. period of mathematic pendulum), or that their rods can stop having the same length (e.g. tidal gravitational effect).

Due to the validity of the Galilean Transformation in the aforementioned form we, common mortals, draw the right to add and subtract collinear velocities of objects numerically because:

If we divide the equations (1.1.11) and (1.1.12) by sides then we have:

$$\frac{X'}{t'} = \frac{X}{t} - U \quad (1.1.13)$$

But what does $\frac{X}{t}$ represent?

Does it not represent the speed (U_S) relative to the S frame of an object which, at the start of the times measurement, was located at the start of the lengths measurement of S?

Thus $\frac{X}{t} = U_S$. And what does $\frac{X'}{t'}$ represent?

Does it not represent the speed (U_S) of **the same object** relative to the frame S'?

Where now, there is no need to mention anymore that the object, at the start of the times measurement, was located at the start of lengths measurement of S' as, based on the initial condition for the validity of the Galilean Transformation, at the moment of the origin of times, the origin of the lengths measurement of two frames coincided, hence, as the object was located at the origin of the lengths measurement of S, it would also be located at the origin of the lengths measurements of S'.

So $\frac{X'}{t'} = U_S$.

Therefore, (1.1.13) becomes:

$$U_{S'} = U_S - U \quad (1.1.14)$$

Based on the above equation, when we cruise on a sailing yacht (S' frame) at a leisurely speed of $U = 8$ miles/h relative to the surface of the sea (frame S) from Patras to Ancona and a Superfast Ferry* overtakes us moving at a speed $U_S = 29$ miles/h relative to the surface of the sea (frame S) in the same direction also from Patras to Ancona, **we are entitled to say** that the Superfast Ferry moves relatively to our yacht (frame S') at a speed:

$$U_{S'} = U_S - U = 29 \text{ miles/h} - 8 \text{ miles/h} = 21 \text{ miles/h}$$

And if the "Superfast" system moves in the opposite direction, i.e. from Ancona to Patras, the minus sign of the above equation becomes + (absolute values) and thus $U_{S'}$ equals 37 miles/h.

The above equation (1.1.14) is the physical key in the Galilean View of the World, as a direct consequence of the **Principle of Relativity of the Uniform Translatory Motion** (experimental Principle founded by Galileo) which requires:

A body (*Superfast Ferry*), moving with a constant speed U_S relative to a frame S (*sea*) has to move at constant speed $U_{S'}$, relative to a frame S' (*our yacht*), provided that S' is moving in constant speed U relative to S (*sea*).

The Galilean Transformation, based on the Principle of Relativity of the Uniform Translatory Motion, a Principle solidly founded in Galileo's superb experimental work**, is logically consistent, functional and does not contain contradictions. It presupposes, however, the **instantaneous** transmission of information and realization of measurement thus, while not being erroneous, it is nevertheless incomplete, as **its validity is absolute only in the realm of the Physics of the Angels** who, among others, have also the unique privilege not only to receive information from events instantaneously, but to also execute all needed measurements instantaneously.

* *Superfast Ferries are the ultra-modern high-speed red boats, of the "Attica Group" of companies operating between Greece and Italy covering the distance in record time.*

** *Apart from all other reasons, I consider Galileo's work superb, for the added reason that this magnificent person dared to carry out experiments in Physics not even having a clock and thus being forced to... sing in order to keep the time!*

At the limit, (when $v/c \rightarrow 0$), the Galilean Transformation becomes valid also for the physics of Humans, because then the delay in the transmission of information has no practical meaning.

This inherent weakness of the Galilean Transformation was first recognized by Albert Einstein who tried to replace it for the purpose of “curing” this weakness. However, in his effort to heal a wound, Einstein opened up another one much deeper [...]

Einstein thought:

I need a new, valid Transformation, to replace the Galilean Transformation in Physics. This new Transformation* I will compose based on the following **two hypotheses alone**:

“1. *All the Inertial frames of reference are equivalent for all the laws of Physics* (Principle of Relativity).

2. *The speed of light in a vacuum is constant and has the same value c .*^{13 / 14}”

The first of Einstein's **hypotheses, as far as Kinematics is concerned**, surely does not contain any kind of innovation.

It is simply a more general** formulation of the Principle of Relativity of the Uniform Translatory Motion, which is inherent in the Galilean Transformation.

* *The Lorentz Transformation was derived by Einstein, who named it in honor of the great Dutch physicist Hendrik Antoon Lorentz, (already prominent in 1905), who even before Einstein assumed that lengths must contract by a factor of $\sqrt{1 - \frac{v^2}{c^2}}$ to “interpret” the Michelson - Morley experiment.*

Of course, at about the same time (actually, in 1892), the Irish physicist George F. Fitzgerald, working independently had also assumed the same contraction. Thus, in many textbooks, the Transformation is called (more appropriately) as the Fitzgerald - Lorentz transformation. Lest we forget also the G. F. Fitzgerald [...]

¹³ A. P. French (professor at M.I.T.), "Special Relativity"; W. W. Norton; New York, NY, 1968.

¹⁴ Constantinos Goudas (Physics Professor, University of Patras, Greece), “Special Relativity Classes”, Technical Chamber of Greece Publications, Athens 1972, p. 39.

** *Here, in addition to “more general”, I could perhaps characterize the formulation regarding Inertial Systems “literary” and somewhat “vague”. And this because, never forgetting that I am a **Human and not an Angel**, I have yet to come across any “Inertial Systems” in **Practice** [...]*

Einstein's revolutionary contribution is to be found in his second hypothesis, which requires the **constancy of the speed of light**. This indeed is true Revolution!

This second hypothesis disputes, directly and without any reservations, equation (1.1.14), i.e. the ability of numerical addition and subtraction of collinear velocities, to which we were led based on the Galilean Transformation. Thus, Einstein's "**knock-out punch**" to the Galilean Transformation was delivered by his revolutionary 2nd hypothesis.

Following that, it is generally being taught that the development of the Special Relativity Theory (SRT) and the derivation of the new Transformation ^(13, 14) proceeded as follows:

I consider that the frame S' is moving to the positive side of the X frame S with speed v relative to S (p. 39, Fig. 1.1.6).

As the new Transformation sought, must satisfy the Principle of Relativity in Kinematics (1st fundamental hypothesis), the Transformation ought to be **linear**, just as the Galilean one is also linear. Thus, it has to take the form:

$$X = a_1 \cdot X' + b_1 \cdot t' \tag{1.1.15}$$

$$X' = a_2 \cdot X + b_2 \cdot t \tag{1.1.16}$$

Where a_1, b_1, a_2, b_2 are constant, unknown coefficients remaining to be determined. Substituting $X' = 0$ in equation (1.1.16) we have:

$$0 = a_2 \cdot X + b_2 \cdot t \tag{1.1.16a}$$

which represents the movement of the beginning of S' (zero of S') relative to S. So, from this we get:

$$\frac{X}{t} = -\frac{b_2}{a_2} \tag{1.1.16b}$$

But $\frac{X}{t} = v$, is the speed of the start of S' (and of the entire S' of course) relative to S;
therefore:

$$\frac{b_2}{a_2} = -v \quad (1.1.16c)$$

Similarly, by substituting $X = 0$ in (1.1.15) it becomes:

$$0 = a_1 \cdot X' + b_1 \cdot t' \quad (1.1.15a)$$

and represents the movement of the start of S (zero of S) relative to S'.

From this we get:

$$\frac{X'}{t'} = -\frac{b_1}{a_1} \quad (1.1.15b)$$

But $\frac{X'}{t'} = -v$, is the speed of the start of S (and of the entire S of course) relative to S', therefore:

$$\frac{b_1}{a_1} = v \quad (1.1.15c)$$

Thus, the Transformation (1.1.15) and (1.1.16) becomes:

$$X = a_1 \cdot X' + a_1 \cdot v \cdot t' \quad (1.1.17)$$

$$X' = a_2 \cdot X - a_2 \cdot v \cdot t \quad (1.1.18)$$

However, because of the symmetry, (as no frame is privileged*), equation (1.1.18) must result from (1.1.17) if in the latter we replace X' with $-X$ and t' with t , and with some simple calculations, it follows that: $a_1 = a_2 = a$

* Meaning that a statement like "Look Mum, the port is moving", is **equally true** to the statement "No David, it is the boat that is moving".

Thus, the Transformation (1.1.17) and (1.1.18) becomes:

$$X = a.X' + a.V.t' \quad (1.1.19)$$

$$X' = a.X - a.V.t \quad (1.1.20)$$

Consequently, in order to solve the problem, **it is necessary and sufficient** to determine the coefficient a .

From here on, the Transformation proceeds as follows:

Considering that a **light signal** moves towards the positive end of X in frame S, **based on the 2nd fundamental assumption**, it has to obey relative to the S the kinematics equation:

$$X = C.t \quad (1.1.21)$$

Moreover, the same **light signal** considered from the S' frame, based also on the 2nd fundamental assumption, must obey relative to the S' the kinematics equation:

$$X' = C.t' \quad (1.1.22)$$

Therefore, by placing the above values of X and X' in (1.1.19) and (1.1.20), we have:

$$C.t = a.C.t' + a.V.t' \Rightarrow C.t = a.(C + V).t' \quad (1.1.23)$$

$$C.t' = a.C.t - a.V.t \Rightarrow C.t' = a.(C - V).t \quad (1.1.24)$$

from which, by sidewise multiplication, we get:

$$C^2 = a^2.(C^2 - V^2) \quad \text{or} \quad a = \frac{1}{\sqrt{1 - \frac{V^2}{C^2}}} \quad (1.1.25)$$

and, by replacing the value of the coefficient a in (1.1.19) and (1.1.20), after a few simple calculations we get:

$$X' = \frac{X - v \cdot t}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.1.26) \quad \text{and} \quad t' = \frac{t - \frac{v \cdot X}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.1.27)$$

which is none other but the famous "Lorentz Transformation", that transforms the space and time coordinates of an event relative to frame S (X, t) to the spatial and temporal coordinates of the **same event** relative to the system S' (X', t'), thereby replacing the Galilean Transformation.

At this point, I would like to emphatically remind that:

This is the Lorentz Transformation on which **Einstein based his entire Special Relativity Theory**, with all its known mythological and particularly **contradictory** conclusions about lagging clocks (...only lagging), contracting rulers (...only contracting), increasing masses (...only increasing), astronauts aging slower (...only slower) than their twin brother, **all these, let it be said, due only to uniform translatory motion, which however is RELATIVE (!)**, the limited nature of the speed of light etc. And, last but not least, to top-off all these myths, the creation of that **monstrosity** so called "*Space-time*"[...].

On all the above, let me, straight away, raise **two basic** objections:

A. I believe that the reasoning that led Einstein to the analytical derivation of the Lorentz Transformation contains **an unacceptable logical leap**, a proposal that not only has not been proven, but has rather, literally, in true magician style, literally "popped-out from the hat"

B. The equations that led to (1.1.26) and (1.1.27), characterized by some typical "Sneaky Stock Exchange Accounting Practice"* (profits are profits and losses are... profits too), contain a well hidden but, nevertheless, **enormous fundamental error**.

* I call "Sneaky Stock Exchange Accounting Practice", the accounting alchemies practiced by some companies on the verge of going broke which, in order to become listed in the respective Stock Exchange or to proceed in equity capital increases, in their information bulletins usually present fictitious profits aiming to attract gullible investors.

And let us start from the error:

I accept, **for the time being**, the linearity of the new Transformation sought, which means that I am also compelled to accept equations (1.1.15) and (1.1.16). Furthermore, by applying the initial conditions, I also accept equations (1.1.17) and (1.1.18) and finally, after the application of the Symmetry Condition, I also accept* (1.1.19) and (1.1.20).

And now, let us move on first to (1.1.21).

The fans** of Special Relativity maintain that a light signal traveling towards the positive end of the X in frame S, subject to the 2nd fundamental assumption, has to obey, relative to S, the kinematics equation:

$$X = C \cdot t$$

And they are absolutely right!

And they would continue to be right, had they not, with (1.1.22), simultaneously claimed that **the very same light signal**, considered from frame S', subject **again** to the 2nd fundamental assumption, must obey, relative to S' the kinematics equation:

$$X' = C \cdot t'$$

Because this **is not True!**

Or, alternatively, if I want to be more precise:

It is True only half of the times, and the other half is Not True.

* Although I do have many and serious doubts with regards the **natural necessity** for the Symmetry Condition. I don't believe that Nature is governed by Symmetry, but rather by Harmony, and (in general) Harmony is certainly not synonymous to Symmetry. However, these doubts are not relevant here (see Chapter 5 about the collapse of the Symmetry Condition).

** Unfortunately, with Einstein being no longer with us, I feel obliged to challenge the numerous fans of his Theory. Had he been alive, maybe he, **as a true pursuer of truth**, would have "understood" me already by 1979, so I wouldn't have to struggle for twenty eight odd years now, with all the High Priests of the "Dogma" and the ever omnipresent (according to Orwell) "Thought Police"

And that is because:

It must, once and for all, become clearly understood that the analytic functions of the Cartesian coordinates **have absolutely no NATURAL MEANING, without previously establishing their geometrical equivalent which, however, is correlated with the natural hypotheses, that are valid during the preparation of the aforementioned analytic functions.**

It must be finally understood that the “bridge” created by Dedekind's* Continuity Principle, **is not always open** from Analysis to Geometry. **Sometimes it is open and others it is not.** Thus, in our effort to **always** establish the absolutely necessary "geometrical equivalent", we are **always** obliged to investigate beforehand, whether the bridge installed by the Continuity Principle is open or not.

There is no other choice!

So, let us again examine the claims of the proponents of the Special Theory of Relativity, regarding the analytic derivation of the Lorentz Transformation, in the light, however, of the above two basic conditions:

I n v e s t i g a t i o n :

1. Let the speed v of frame S' relative to S , be **less than** ($v < c$) the speed of light c , which is assumed to be common for both frames.

Then in fact a light signal moving towards the positive end of X in frame S and obviously, relative to S , obeying (1.1.21), by moving faster than the zero of S' (start of the S' axis) relative to S , it follows that it **leaves behind** the zero of S'** , in other words the light signal in question is moving towards the **positive** end of X' of S' . Therefore, the Observer in S' , respecting the 2nd fundamental hypothesis, is entitled to write:

$$X' = c.t'$$

as in the case of $v < c$, X' is **positive**.

* See Introduction.

** The word "behind" here has a pure Euclidean meaning.

2. Consider, now, that the speed v of the frame S' relative to S is **greater** ($v > c$) than the speed of light c , which is common for both frames by assumption.

Then a light signal moving towards the positive end of the X in the S frame and obviously, relative to S , obeying (1.1.21), as it is **now** moving slower than the zero of S' (start of axis of S') relative to S , **it follows that it trails behind the zero of S'** , in other words the light signal in question moves towards the **negative end of X'** in S' . Therefore, in this case, the observer in S' , respecting the 2nd fundamental hypothesis, now **must** write:

$$X' = -c.t' \quad (1.1.22\alpha)$$

as in case $v > c$, X' is **negative!**

And, it should be stressed, that he is **definitely obliged** to place the minus (-) sign in the equation, as t' is **always** positive.

And why t' **must always be positive?**

For two fundamental reasons:

A. Because, first of all, at a theoretical level, no one has ever succeeded in giving a **logically coherent** definition of "*Negative Time*".

B. Because, additionally, at the empirical level, it can be safely argued that no one has ever **seen clocks running backwards on their own**. In other words, whilst I really cannot fathom the meaning of certain time-symmetrical equations in Theoretical Physics, I do know very well, that in the **Human practical experience**, i.e. in the human perceptible world, Time has definitely an *arrow** which means that clocks** **have one and only one direction of rotation**.

Consequently, our investigation leads us unavoidably to the following conclusions:

* The term "*Time arrow*" belongs to the renowned British astronomer Sir A. Eddington.

** When I'm referring to "clocks", on a deeper level, in reality I refer to "natural events", as clocks manifest their operation **solely through these events**. Thus, no one has ever witnessed a clock running backwards on its own, just as no one has ever witnessed a plate, having fallen from a table and shattered to pieces, reassembling itself and magically returning onto the table, safe and sound.

1. By combining equations (1.1.19), (1.1.20), (1.1.21) and (1.1.22) **which are valid only for $v < c$** , we **can** formulate the Lorentz Transformation as we know it.

2. On the other hand, by combining equations (1.1.19), (1.1.20), (1.1.21) and (1.1.22a), which are valid for $v > c$, we cannot formulate any **valid** Lorentz Transformation.

F u n d a m e n t a l C o n c l u s i o n :

The Lorentz Transformation, as we know it, is valid **ONLY for $v < c$** . In other words, $v < c$ is an **essential precondition** for the analytic derivation of the Lorentz Transformation; and, as we all know, absolutely no one is authorized to “**dish-out**” as **conclusions** anything that **is** in the slightest shape or form **inherent in his hypothesis**, as, apart from all the rest, such a thing would surely make Aristotle turn in his grave!

F u n d a m e n t a l S u b - C o n c l u s i o n :

The famous proposal of Special Relativity, that apparently the speed of light is the absolute speed limit for matter, energy and information in Nature, a proposal that came up as a logical consequence (conclusion) of the derivation of the Lorentz Transformation¹⁵, has in fact **never been truly proven, as it is inherently concealed in the derivation hypothesis**. And, as said proposal is the very one requiring proof, **IT IS WRONG**.

The above explain **the enormous fundamental error**.

¹⁵ “The rigid rod in motion is, therefore, shorter than itself while standing, and its length indeed decreases as its speed increases. For $v = c$, $\sqrt{1 - \frac{v^2}{c^2}}$ would be equal to zero; for still greater speeds, the radical would be an imaginary number.

From this we conclude that in the Theory of Relativity, the velocity c plays the role of the speed boundary that no real body will ever reach, let alone exceed. Moreover, the role of speed c as a speed boundary is concluded by the same equations leading to the equations of the Lorentz transformation, because they are meaningless for values of v greater than c ”.

Albert Einstein, The Theory of Relativity; Korontzis Publ., Athens, p. 36-37 (in Greek)

The underlining is mine. Einstein’s error here is obvious: he concludes his own (concealed) assumption!! I remember a professor of Mathematics at senior high school who, whenever we made similar type mistakes, usually in Geometry problems, would give us hell shouting "Aristotle is now turning in his grave", as we had committed the logical sin of "proving that which we initially had hypothesized as being true"... i.e. we had ended up proving our assumptions. May he rest in peace...

Let us now proceed to the **unacceptable logical leap**, i.e. the proposal that, in true magician style, literally “popped-out from the hat”:

So, the followers of Special Relativity claim,^{16,17} that **because** the sought new transformation must satisfy the 1st fundamental hypothesis, i.e. the Principle of Relativity in Kinematics, **it ought to be linear**. However, prior to us accepting the above statement, the followers of Special Relativity must first prove to us that:

ALL non-linear Transformations do **NOT** satisfy the Principle of Relativity in Kinematics, i.e. that it is linear Transformations and **ONLY THESE** that do satisfy the above principle. And, as far as I know, neither Einstein nor anyone else has ever proved that "**ONLY THESE**".

Indeed, the linearity of the Transformation is a **sufficient** condition.
Indeed, linearity satisfies the Principle of Relativity in Kinematics.

However, what we need to establish here is not merely the **sufficiency** of the condition. We need to also establish its **necessity** and this necessity **has never been proved by anyone**.

And to make our point, out of my infinite stock of **non-linear** Transformations that do, however, **satisfy** the Principle of Relativity in Kinematics, I draw one at random.

$$X' = \frac{\beta \cdot (X - v \cdot t)}{X - \beta} \quad (1.1.28)$$

$$t' = t \cdot \frac{\beta}{X - \beta} \quad (1.1.29)$$

Where β is a constant length quantity ($\beta \neq 0$), independent of space and time coordinates.*

This Transformation, although non-linear, does **satisfy** the Principle of Relativity in Kinematics because:

By sidewise division, we have:

¹⁶ A. P. French. op. cit. p. 83

¹⁷ Constantinos Goudas, op. cit. p. 44

* *The functions of X' and X (transformations) of this form, are known as "Projectivities"*

$$\frac{X'}{t'} = \frac{X - U \cdot t}{t} = \frac{X}{t} - U \quad (1.1.30)$$

But $\frac{X}{t} = U_s =$ the speed, relative to S, of an object which at the start of time measurement was located at the start of S. And $\frac{X'}{t'} = U_{s'} =$ the speed of the same object relative to S'. So (1.1.30) becomes:

$$U_{s'} = U_s - U \quad (1.1.31)$$

Hence, the constant speed of a random moving object (U_s) relative to S, is thus transformed to a constant speed ($U_{s'}$) relative to S', as long as the speed U of S' is constant relative to S.

C o n v e r s e l y :

The above transformation relative to S becomes:

$$X = \frac{\beta \cdot (X' + U \cdot t')}{X' + U \cdot t' - \beta} \quad (1.1.32) \quad t = t' \cdot \frac{\beta}{X' + U \cdot t' - \beta} \quad (1.1.33)$$

Side-wise division yields:

$$\frac{X}{t} = \frac{X' + U \cdot t'}{t'} = \frac{X'}{t'} + U \quad (1.1.34)$$

And based on the preceding steps:

$$U_s = U_{s'} + U \quad \text{Q.E.D.} \quad (1.1.35)$$

Here, one could raise the point that, although the above non-linear transformation does satisfy Einstein's 1st Hypothesis i.e. the Principle of Relativity in Kinematics, it does not, however, satisfy his 2nd Hypothesis, the one referring to the constancy of the speed of light.

Thereupon, I would like to stress that proposing a new Transformation does not constitute an ambition of mine as, in the new **Physics for Humans** that I endeavor to compose, this kind of transformations have no meaning.

I simply wish to prove that Relativity DOES NOT NECESSARILY impose Linearity!

A second point could also be raised however:

This Transformation is also "irregular". For $X = \beta$, both X' and t' approach infinity!

Well! So what?

Are J. C. Maxwell's equations "normal" at the **distal tip** of our car radio aerial?

Are Maxwell's equations "regular" at **the distal tip** of our cell phone aerial, at the tip of the radio or television broadcasting station aerial, or at the **distal tip** of the lightning rod when it is struck by thunder?

No! Of course they **are not** "normal".

Nevertheless, radios, cell phones and lightning rods have always worked faultlessly.

I believe that "irregularities" do not exist in Nature!

"Irregularities" exist only in our minds, in our imagination.

They are nothing but the "irregularities" of our mathematical description, of the "mathematical language" that we use. Or, wishing to be precise, not any structural "irregularities", of the language itself, but rather the various "irregularities" that often result from the **reasoning inconsistencies** that we occasionally fall prey to while utilizing it.

And, in my opinion, explicitly demonstrative among examples of such a type of **reasoning inconsistency** that quite often leads us to a variety of "irregularities" and "dead-ends", is the **biased** manner in which we insist to handle the concepts of "Zero" and "Infinity".

In other words, the fact that while "we are not "perplexed" at all by the notion of Zero we are, on the contrary, "perplexed" by the notion of Infinity.

Acting, as if Zero was somehow more "real" than Infinity* .

To this **prejudiced** approach, however, I'm totally against!

Until such time as when, later, we shall start to examine Quantum space at a **primary level** (just as the Ancient Greeks approached it), and the concepts of "Zero" and "Infinity" will be thus ostracized from our natural description, **we are obliged be logically consistent** while dealing with them:

We either reject them both, or accept them both!

No double standards allowed here!

Because such lack of logical consistency is that leads us to mathematical irregularities, e.g. to push (1.1.28) and (1.1.29) to infinity, we need to set $x - b = \text{exactly zero}$. Setting it to "**exactly zero**" in Mathematics might be easy. In **Practice**, however, it is exceptionally difficult, maybe even impossible. Zeno of Elea** was the first to realize this.

In any case, in the Projective Space of the Theory of Harmonicity of the Field of Light there are no mathematical irregularities, as all Space elements at infinity are incorporated (conceptually) in Space and are altogether equivalent to those elements not at infinity and, consequently, indistinguishable from them.

To make this structural property of Projective Space more comprehensible, I will demonstrate how a proposal from the Euclidean Space can be transformed to the Projective Space, while remaining continuously true:

In the Euclidean Space, the following concept applies:

"Two coplanar straight lines either cross or are parallel".

* A likely explanation for this could possibly be the "finite" nature of the human experience. In human experience, everything has a "start" and an "end". For humans that is, everything **appears** to "exist" **only** in the closed interval from Zero (beginning-creation) to Zero (destruction-death). No one is comfortable with the idea that everything (in the form of its component parts) could have ALWAYS existed and will continue to ALWAYS exist, simply through a perpetual change of form and composition.

Infinity, as a concept, cannot be easily approached by man, with natural results the discovery of "irregularities", where none exist, the application of "Procrustean" logic in their resolution, the insistence of providing the Universe with "dimensions" and "duration" [...], the creation of outrageous theories of the "Big-Bang" kind and so on and so forth...

** But we misunderstood him [...]

If now in this Euclidean Space we also add the elements at infinity, thus proceeding to the Extended Euclidean Space (Affine Space), the previous proposal is transformed to:

“Two coplanar straight lines either cross at a point not at infinity, or cross at a point at infinity”.

And if from this we move on to the Projective Space, where the already annexed elements at infinity are **altogether equivalent** to those not at infinity and, consequently, indistinguishable from them, then the previous proposal is transformed to:

“Two coplanar straight lines always intersect”. –

In the Extended Euclidean Space (Affine Space), the introduction of the elements at infinity is achieved analytically via the homogenous point coordinates (in the case where we consider the point as the generating element of geometrical shapes). The homogenous point coordinates is a tetrad of ordered real numbers (X_1, X_2, X_3, X_4) , from which one at least is not zero, connected to the Cartesian coordinates x, y, z as follows:

$$x = \frac{X_1}{X_4}, \quad y = \frac{X_2}{X_4}, \quad z = \frac{X_3}{X_4} .$$

Thus, the beginning of the axes of the Cartesian system x, y, z , corresponds to the tetrad $(0, 0, 0, 1)$, the unit point of the Ox-axis corresponds to the tetrad $(1, 0, 0, 1)$ of the Oy-axis to the tetrad $(0, 1, 0, 1)$ and of the Oz-axis to the tetrad $(0, 0, 1, 1)$. The elements of Space at infinity are entered as follows: The point at infinity of the Ox-axis corresponds to the tetrad $(1, 0, 0, 0)$, the point at infinity of the Oy-axis corresponds to the tetrad $(0, 1, 0, 0)$ and the point at infinity of the Oz-axis corresponds to the tetrad $(0, 0, 1, 0)$.

The Projective Space, in which the elements at infinity are indistinguishable from those not at infinity, is in turn structured analytically from the projective coordinates (X_1, X_2, X_3, X_4) i.e. via a tetrad of ordered real numbers, at least one of which is not zero, and which are connected with the homogenous point coordinates via the equations:

$$\begin{aligned} X_1 &= a_{11}X_1 + a_{12}X_2 + a_{13}X_3 + a_{14}X_4 \\ X_2 &= a_{21}X_1 + a_{22}X_2 + a_{23}X_3 + a_{24}X_4 \\ X_3 &= a_{31}X_1 + a_{32}X_2 + a_{33}X_3 + a_{34}X_4 \\ X_4 &= a_{41}X_1 + a_{42}X_2 + a_{43}X_3 + a_{44}X_4 \end{aligned}$$

Where α_{ij} are real numbers that fulfill the condition that the determinant of the matrix $[\alpha_{ij}]$ must not be equal to zero^{*}, in other words:

$$\Delta = \begin{vmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} \end{vmatrix} \neq 0$$

Thus, after a lot of hard but absolutely necessary work, we have finally reached the answer to the second question that we had posed on page 38:

How is it that the mathematical formalism of the Theory of Harmonicity happens to coincide with the mathematical formalism of Special Relativity, only at the foot of the perpendicular?

Because the Theory of Special Relativity, by deriving the linearity of the equations of the Lorentz Transformation in a true "conjuror-style"^{**} out of the proverbial hat, that is to say without the least of physical or logical support, ended-up **restricting itself** to describing the world **only** where space and time coordinate functions are linear, **only** where the measurements do not depend on the distance between the observed and the Observer, in other words **only** at the "foot of the perpendicular" that is led to the trajectory of the observed from the Observer's position, and where the distance between the two **is at its minimum**.

* See. P. Ladopoulos "Elements of Projective Geometry", op. cit. p. 22 and 35.

** *In fact Einstein himself, introduces this linearity of equations of the Lorentz Transformation literally in a "It-is-so-because-I-so-decide" way. In his original article on the Electrodynamics of moving Bodies, he writes: "In the first place it is clear that the equations must be **linear** on account of the properties of homogeneity which we attribute to space and time" (underlined by Einstein himself).*

This is Einstein's only (and rather obscure) "argument" about the linearity of the equations involved in the Lorentz Transformation. (Later, his followers managed to "garnish" this with the added requirement of the Concept of Relativity of Motion) [...]

See: "The Principle of Relativity", by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, Dover Publ. Inc. p. 44.

In due course, the fact will become evident that this entirely arbitrary introduction of linearity, prevented Einstein from composing a solid quantum relativistic mechanics theory, in other words prevented him from "killing two birds with one stone", i.e. on one hand fulfilling the dream of all twentieth century Physicists and, on the other, avoiding all the resulting contradictions, had he only located his Observer a tiny bit away from the straight-line trajectory of the moving material point [...]

And this self-inflicted restriction might work as a mathematic formulation (only) with regard to the description of the conditions of the electron, (and we will later see why this is so, when we begin to investigate the **Quantum concepts**), however in no case **does it either work, or is it correct** with regard to the description of the conditions of "the astronaut", of the "astronaut's clock" and in general of all ponderable bodies.

Because, I'm sure we shall all agree, the electron and the astronaut have very little in common...

I believe that the Theory of Special Relativity, synthesized via the Lorentz Transformation, at least as far as its Kinematics and Mechanics subject matter is concerned, **is logically inconsistent and contradictory, in other words incorrect and, thus, in no way fit to ostracize from Science and replace the Kinematics of Galileo and the Mechanics of Newton.**

I agree that the two aforementioned theories of Galileo and Newton might be incomplete. **However, they are not self-contradictory!**

In everyday practice* they work fine for low speeds ($v \ll c$), they agree with experimental data and in any case, I repeat, they do not lead to contradictions.

They do not need to be replaced, but simply to be supplemented.

They must be supplemented, however, only after the basic concepts have been generally "morphed" by another theory, and this Theory is **not** the Theory of Special Relativity.

Since, however, it is very likely that the large numbers of followers of the Special Relativity Theory might still not have been fully convinced, let me deal here with a well-known "paradox", which cannot but cause a sever irruption of allergy to all that posses practical **Common sense**:

I am referring, of course, to the famous "Twin Paradox".

* *Anyhow, it was with Newton's theory that we went to the Moon and back and not with Einstein's. (Always, of course, I refer to the Theory of Special Relativity only).*

In short, the Special Relativity proponents claim the following:

If we have two twin brothers, John, a tailor and Jim, an astronaut, and if Jim travels to space with speed relative to Earth close to the speed of light, then, when he returns he will be **younger** than John, while his clock will be **delayed** compared to his brother's.

In other words, if we suppose that at the time of the spaceship's launch, the twins are 30 years old and that by the time Jim returns to Earth he will be say 32, then John, the tailor, will be definitely older, let's say 35 years old. The age difference, they claim, depends **only on** the speed v of Jim relative to Earth, as is defined by the factor $\sqrt{1 - \frac{v^2}{c^2}}$.

Moreover, Jim's clock will have recorded that 2 years have passed from the launch, while the clocks on Earth (including that of John) will instead have recorded that the elapsed time is 5 years!!

And I, in my turn, claim that all the above are contradictory and consequently foolish academic "myths" that **brutally offend Human Common Sense** *.

First and foremost, we must all agree as to **WHICH ONE** is the "astronaut".

Maybe the one that "took off"?

But which is the one that "took off"?

As much as Jim "left" relative to John, that much John also "left" relative to Jim.

As much as John "saw" Jim leave, that much Jim also "saw" John leave.

* *Not only Human but "Divine" as well, also to remember Schiller's famous verse:
"When it comes to foolishness even the Gods fight in vain".*

Admire the "reasoning" and the unprecedented "audacity", with which a well known Physics author introduces the reader to the "Paradox of the Twins":

*"20.21 The twins paradox: The ideas of relativity are so **contrary to the usual** ways of thinking that many puzzles and "paradoxes" have been proposed that some of the best ones provide control **of the ability of each individual to think based on relativity**". (Kenneth Ford, "Classical and Modern Physics" (Vol. 3), 1974; John Wiley & Sons, Inc., New York, 1974.) (My underlining)*

*Excellent!! Let's forget what we knew. Let's throw to the bowels of earth the Logic of Aristotle, of Galileo, of Newton, of Descartes and of all those who taught us the "**usual**" ways of thinking. The True Light of the new "Dogma" awaits us! Do we deserve it, however? We most certainly do; provided we surrender our right "to split hairs" and forget that the devil has always had the way to "hide in the details"!*

What can I say? I can only invoke I. Kant's words that eventually "we will all have to answer to the court of Reason" [...]

So, which one is the **real** "astronaut"?

It becomes painfully obvious that we are in need of an objective criterion in order to decide **which of the two, is indeed the real "astronaut"**.

And this objective criterion is provided neither by the Lorentz Transformation^{*}, nor by the Theory of Special Relativity both of which refer solely to "inertial systems of reference", moving in a straight line and at a constant speed with regards to one another.

As this objective criterion is nothing else but the test of the "**spilled coffee**".

So, let us take two cups filled to the brim with hot coffee and place them one next to Jim in his spacecraft and the other next to John at his tailor's workshop. We will also install two TV monitors, so that both can see each other's coffee cups.

I think we shall all agree that, without a doubt, the "astronaut" will be the one whose coffee will spill during the "launch".

Therefore, **there is after all** an objective criterion that will **force** both Jim and John to **agree that Jim** is indeed the true astronaut.

However, this fleeting local disturbance of the reference system's gravitational field (i.e. this brief "earthquake"), absolutely essential for the purpose of determining who the real astronaut is, also automatically negates the characterization "**inertial frame**", transforming at the same time, even momentarily, the "Angelic" reference system, into a "Human" reference system.

The Theory of Special Relativity and the Lorentz Transformation both choose to ignore the objective criterion mentioned above.

One can only wonder why...

^{*} *A Transformation for the purpose of which, I repeat that, the statement "Look Mum, the port is moving", is **equally true** to the statement "No David, it is the boat that is moving".*

However, let us ignore this fact and believe, for a moment, what the SRT fans purport, i.e. that Jim will indeed return younger **as a direct result of his motion with regard to his twin brother**, even though said motion is **relative**.

We are of course entitled to also test, in our turn, “...*the ability of the followers of SRT to think based on relativity*”, (as we were prompted to do by the well-known Physics author...), proposing a similar "paradox" of our own¹⁸ .

Instead of twins, let us for a moment consider triplets. John, Jim and Jack.

Today, they are all 30 years old. John is a tailor, whereas Jim and Jack are both astronauts. The last two **lift-off from Earth simultaneously** towards different directions, moving at the same speed, close to C , relative to it.

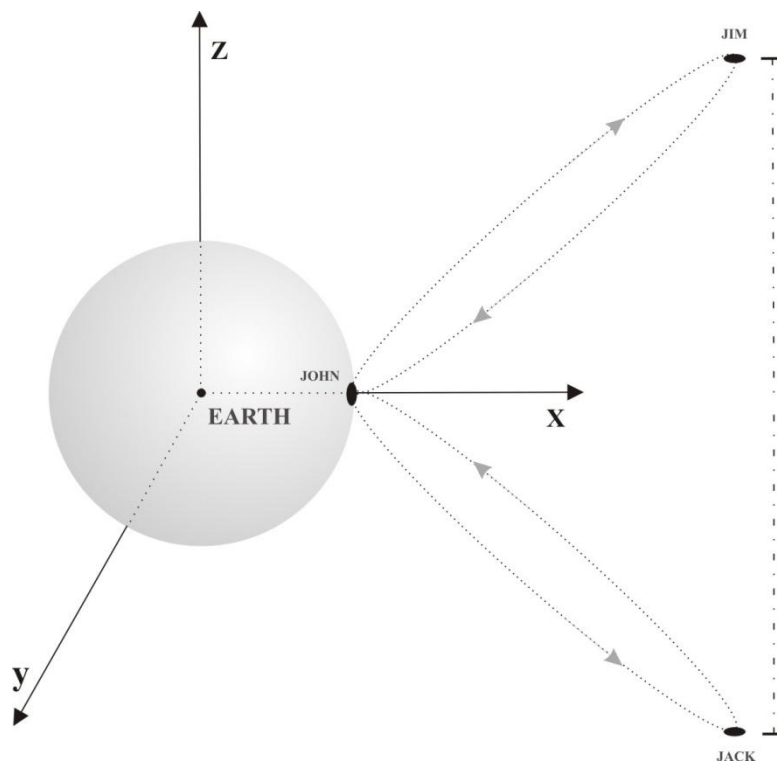


Figure 1.1.8

The motion of the two spaceships is monitored and controlled by a central computer on Earth, programmed to send the same exact commands to both spaceships.

¹⁸ Dionysios G. Raftopoulos, “Theory of the Harmonicity of the Field - Clarifications”, Bulletin of the Hellenic Association of Mechanical and Electrical Engineers, Issue 126, April 1982, p. 40-41

Jim and Jack return back to Earth simultaneously, after completing symmetrical orbits. According to the followers of the Theory of Special Relativity (twin paradox), when Jim returns he will be say 32 years old, while John will be 35 years old.

And of course the question arises:

How old will **Jack** be when he returns?

Taking into consideration that, relative to Earth, the movement of Jack is identical to that of Jim, according to the SRT Jack should also be 32 years old. However Jack **also moved** relative to Jim as Jim **also moved relative to Jack!** In fact (if the angle between their orbits is sufficiently wide), with a speed that would also approach C .

Linear motion is defined as the change in distance over time and both Jim and Jack **saw and measured** such a change between **them**. And as much Jim saw Jack fly away and return (hence moving relative to him), that much Jack saw Jim fly away and return (hence moving relative to him).

However, as **both** supposedly returned 32 years old, because relative to John, back on Earth, **both** "gained" 3 years, where did **their** expected age difference due to their **motion relative to each-other** go? And where did the difference on their clock readings go? Thus, it appears that the proposal of the Theory of Special Relativity: "*Uniformly moving clocks slow-down and this slowing-down is due to motion alone, which, nevertheless is relative*", while it holds true for the pairs John-Jim and John-Jack, **does not hold true for the pair Jim-Jack.**

In other words, it appears that the above proposal is in fact rather selective:

True in some instances, but not so in others [...]

If that, is not the very definition of a contradiction, then I wonder what is?

If we could only adhere to the rules of simple Logic, then it would not be necessary for me to have to devise the aforementioned "paradox of the triplets" in order to demonstrate, once and for all, **the contradiction** in the Theory of Special Relativity. Very simply, we would have to reject the Theory, right from the start, based on the fundamental Principle of Common Reason that dictates that "**The Conclusion should never contradict the Hypothesis**".

Inasmuch as the uniform rectilinear translatory motion is relative (*hypothesis*), how do the rectilinearly and uniformly moving clocks slow down (*conclusion*)? If they do slow down then, certainly, the delayed one would have to be the one that **moved absolutely**; hence the hypothesis **that dictates uniform linear motion to be relative** is negated!

Enough is enough! I do not intend to further occupy myself¹⁹ with "paradoxes" and other such foolish, contradictory concepts with which the Academic Establishment insists, **against all Reason**, to continue to oppress Physics for almost a century*.

Prior to moving to the next chapter however, and just in case voices are raised claiming in outrage that it is a heresy to call "*foolish*" and "*contradictory*" concepts that have withstood the trial of experimental proof over and over again, let us consider here one of the best known of those experiments which "proved beyond doubt" that moving clocks indeed do delay, **due to linear uniform motion and that alone**, just as the Theory of Special Relativity proclaims. Doing so, will also help us stay in touch with the so-called "physical reality", something that I deem absolutely necessary at all times.

I am referring, of course to the famous experiment of Mount Washington²⁰.

In 1940, B. Rossi, N. Hilberry and J. B. Hoag and in 1941 B. Rossi and D. B. Hall, conducted measurements of incoming *muons* at two levels: At the summit of Mount Washington in New Hampshire U.S.A. and at sea level. The two points of measurements had an altitude difference of 2.000m. *Muons*, subatomic elementary particles of the so-called nuclear field of matter, are produced in the atmosphere due to the collision of cosmic radiation, which continuously bombards the Earth, with the individual nuclei of elements of air on the fringes of the atmosphere.

¹⁹ Dionysios G. Raftopoulos, "On the Harmonicity of The Field", Athens, 1979, National Library, Incoming Bulletin No. 1558 / 17.12.1979.

* *Besides the phenomenon is everlasting: "Woe to you the lawyers, because you removed the key of knowledge; you did not enter, and did those entering you blocked" (Luke 11' 52). "But they shall proceed no farther; for their folly shall be manifested to all men, as theirs also was" (Paul, to Timothy, II, 3: 9)*

²⁰a. A. P. French, op. cit.. 102 - 113.

²⁰b. Constantinos Goudas, op. cit. p. 58 - 64.

²⁰c. Tassos Tzanopoulos, "Beyond the Barrier of Time" Athens 1979, p. 146 - 148.

Many reactions occur there and a lot of elementary particles are generated, including *muons*, which are then directed very rapidly to Earth. *Muons* are exceptionally unstable electrically charged particles, that decay very rapidly and yield, depending on their charge, an *electron* (or a *positron*), a *neutrino* and an *antineutrino*.

Even though *muons* themselves are exceptionally unstable, their rate of fission is exceptionally stable, so that a number of decaying *muons* can play the role of an exceptionally precise clock, complying with the known statistical laws of radioactive fission.

With the help of charged particles detectors, both the arrival of the *muon* and the production of the *electron* (or *positron*) that emanates from its fission are recorded. In this fashion, we can measure the elapsed time between the arrival of *muons* and their fission and, in effect, the rate of fission of the *muons* considered at rest, as in order for a *muon* to be observed it should first "come to rest" i.e. "brake" in the detector and decay there²¹.

Thus, during the experiment, following a series of measurements conducted near the mountain summit for a period of one hour, they drew up the following table:

FISSION RATE OF *Muons* AT REST

Time elapsed (<i>μsec</i>) since the <i>muon's</i> arrival	Count of surviving <i>muons</i>
<i>0</i>	<i>568</i>
<i>1</i>	<i>373</i>
<i>2</i>	<i>229</i>
<i>3</i>	<i>145</i>
<i>4</i>	<i>99</i>
<i>5</i>	<i>62</i>
<i>6</i>	<i>36</i>
<i>7</i>	<i>17</i>
<i>8</i>	<i>6</i>

Table 1

²¹ A. P. French, op. cit. page 111.

The times in μsec (10^{-6} sec) that elapsed from the arrival up until the fission of *muons* are registered in the left column, while in the right one, the number of incoming *muons* that was recorded during the period of one hour and whose lifespan is greater than the time entered on the same line in the left column.

Thus the above table records the **rate of fission of *muons*** at rest. In other words, it shows that 195 (568 minus 373) *muons* had a lifespan of less than $1\mu\text{sec}$, 339 (568 minus 229) *muons* had a lifespan of less than $2\mu\text{sec}$, 423 (568 minus 145) *muons* less than $3\mu\text{sec}$ and so on.

Taking into consideration that the detector at the top of the mountain recorded arrivals of 568 *muons*/h, the scientists responsible for the experiment reasoned as follows:

Being subatomic particles, during their fall to Earth *muons* move at an enormous speed, roughly equal to that of light, $c \cong 3 \cdot 10^8$ m/sec. As the altitude difference between the mountaintop and the sea level is 2000m, it follows that the time needed by the *muons* to travel the above distance is:

$$\Delta t \cong \frac{2000m}{3 \cdot 10^8 \text{ m/sec}} \cong 6,5 \cdot 10^{-6} \text{ sec} = 6,5\mu\text{sec}$$

Therefore, as the number of *muons* reaching the mountain-top is 568 *muon*/h, it follows that the number of *muons* reaching sea level per hour is the number of the above table that corresponds to an elapsed time of $6,5\mu\text{sec}$ i.e. roughly 25 *muons*/h. (This is found by interpolation between the 36 *muons* that correspond to the $6\mu\text{sec}$ and the 17 *muons* that correspond to the $7\mu\text{sec}$). Therefore, if a similar charged particle detector was to be placed at sea level, we would expect roughly 25 *muons*/h to arrive and be recorded there.

The result however of the detector at sea level was **totally unexpected!**

The 2nd detector there recorded the arrival of 400 *muons*/h! What could the reason be for such a great discrepancy between the observed and the expected results?

The numerous proponents of Special Relativity hurried to gleefully cry out in unison: At last! Behold the **undeniable** experimental "proof"!

And did so because, super-anxious as they were to verify the theory in practice and mistaking **their wishes as "proof"**, they rushed to adopt the following way of reasoning:

The time $\Delta t = 6,5\mu\text{sec}$ that we **calculated** as the *muons* travel time, is the time measured **by us observers on earth**. However, *muons* constitute a very rapidly moving reference system, in which the concept of the Theory of Special Relativity applies:

“Moving clocks slow-down due to uniform linear motion”

Consequently, in the *muon* system of reference, the time it took them to cover the 2000m is not $6,5\mu\text{sec}$ **but much shorter**, such as to correspond to the 400 *muons*/h that were detected by the sea level detector.

From the Table of the Rate of Fission, for a measured number of 400 *muons*/h, we can calculate (by interpolation between the $0\mu\text{sec}/568$ and $1\mu\text{sec}/373$) the elapsed time $\Delta t' = 0,7\mu\text{sec}$. In other words, the time it took the *muons* to travel the distance from the mountain-top to sea level, measured in their system is only $0,7\mu\text{sec}$, whereas measured from the Earth system, it is $6,5\mu\text{sec}$.

In fact, from the formula of the Special Relativity,

$$\Delta t' = \Delta t \cdot \sqrt{1 - \frac{v^2}{c^2}}$$

(where $\Delta t = 6,5\mu\text{sec}$ and $\Delta t' = 0,7\mu\text{sec}$), we can calculate the ratio v/c which is roughly equal to 0,994 hence $v = 0,994 \cdot c$, a result which also "confirms" our hypothesis that the *muons* are moving with speed roughly equal to the speed of light!

Thus, for the proponents of SRT, the experiment of Mount Washington became the **ultimate "proof" that moving clocks do indeed slow down, due to uniform linear motion and that alone** and, having since entered into the annals of modern Physics, it continues to constitute a triumphant reference point for this theory!

Such Grandeur!

Yet, so sad and depressing...

Allow me here, to request your patience and undivided attention:

I ask you to remember the "fisherman" of the famous German philosopher Immanuel Kant, who always caught fish that were larger than his net mesh. Thus our fisherman, after many a fishing trip, thought he had discovered a new Law of Nature:

*"All the fish in the sea are larger than the diameter of my net mesh"*²²

I ask you to remember Henry Miller, that great visionary of American Literature who shook for real many vested ideas of his time, and who wrote some masterpieces. In one of them, *"The Tropic of Capricorn"*, he wrote: *"The Fact is the proof. However, the sole importance of proof is the one given by those that create the facts"*.

Last but not least, I ask you to remember the German philosopher Friedrich Nietzsche when he stated that: *"Facts do not exist, only interpretations"*²³.

Ripe words from some great Thinkers reaching us down the ages...

Allow me now to demonstrate how prophetic Kant and Nietzsche were and also how "dead on target" Henry Miller was.

In this endeavor, I will attempt to "retrace"* the reasoning of the followers of the theory of Special Relativity (regarding the Mt Washington experiment), cross-referencing it at the same time, purely for comparison, with some parallel reasoning of my own that utilizes roughly the "logic" of Kant's "Fisherman" and which, with a degree of mild sarcasm (self and otherwise...), I intend to call: *"The Reasoning of the Simpleton"*.

²² John Ziman, "Reliable Knowledge - An Exploration of the Grounds for Belief in Science", 1978; Cambridge University Press.

²³ Friedrich Nietzsche, "Genealogy of Ethics", Thessalonica Publ., p. 5, (Introduction by Lila Troulinos, taken from the unfinished work of the same "Will for Power").

* Here, I would like to note that the **inadmissible logical fault** that marred the interpretation of the unexpected results of the Mt. Washington experiment is not pointed out here for the first time. It was first revealed in a published work by the author 25 years ago but was summarily "buried" by the scientific community in Greece.
(Dionysios G. Raftopoulos, "Theory of the Harmonicity of Field - Experimental Agreements (I)". *Bulletin of the Hellenic Association of Mechanical and Electrical Engineers, Issue No. 134, December 1982 p. 41- 49*).

**THE REASONING OF THE
PROPONENTS OF THE THEORY
OF SPECIAL RELATIVITY**

Hypothesis: “The muons in the experiment of Mt Washington are moving towards Earth with a speed roughly equal to the speed of light $C \cong 3 \cdot 10^8 \text{ m/sec}$ ”.

Reasoning: As the muons move with a speed roughly equal to $C \cong 3 \cdot 10^8 \text{ m/sec}$ and as the altitude difference of the two detectors is 2000m, it follows that the time required by the muons to travel between the detectors is:

$$\Delta t \cong \frac{2000\text{m}}{3 \cdot 10^8 \text{ m/sec}} \cong 6,5 \mu\text{sec}$$

Additionally, as 568 muons/h arrive at the top of the mountain, I expect that the muons that arrive at sea level to correspond to the elapsed time 6,5μsec i.e., based on the table, 25 muons/h.

Question to Nature: How many are the muons that arrive at sea level?

Nature's answer (after we count them):
400muons/h ... Contradiction! Dead-end !

Question to myself: Could it be that moving clocks slow-down and by doing so, the time lapsed for the moving system of muons, is not 6,5μsec, but less, so that Nature's answer that 400muons/h (corresponding to less time) finally reach sea level, **is reconciled with my initial hypothesis** that the muons move with a speed roughly equal to the speed of light?

Conclusion: It follows that moving clocks slow-down!!!

**THE REASONING OF
THE "SIMPLETON"**

Hypothesis: “Consider a tall apple tree inside a very well fenced garden; the apple tree has 3 apples. In the garden, there exists only a short donkey, short enough so as not to be able to reach for the apples”.

Reasoning: As the garden is very well fenced and hence it is impossible for thieves to enter, as the apple tree has 3 apples and is very tall and as the only one present in the garden is the donkey, which is so short that it cannot reach the apples, it follows that when we look at the apple tree, we expect to count 3 apples.

Question to Nature: How many apples does the apple tree have on it?

Nature's answer (after we count them):
2 apples... Contradiction! Dead-end !

Question to myself: Could it be that donkeys can fly and as ours flew, he reached up and ate one apple, so that Nature's answer, that the apple tree has now got 2 apples, **is reconciled with my initial hypothesis** that the apple tree had initially 3 apples, that the garden was very well fenced and that the donkey was so short that he could not reach for the apples?

Conclusion: It follows that donkeys can fly!!!

Did you carefully follow the two parallel "reasonings"?

Have you seen how simple and crystal clear notions can become when, guided by "...the usual way of thinking", we decide to start "*splitting a few hairs*", freed from all kinds of "aphorisms" and nebulous "Dogmas"?

If yes, then let us all agree: **It is truly a Shame !!**

And do so, completely aware of what we are up against.

Because, my friends, it is truly a shame to so humbly swallow such huge chunks of un-chewed mental food, especially here in Greece, **under the same Sky where an Aristotle, the father of Logic and the founder of Human Natural Science, once pondered and taught...**

All this is fine, you might think, but **how do you interpret** the "strange" results of the Mt Washington experiment?

Now, that's a Good question.

So here is the answer:

Interpretation of the Theory of Harmonicity

What are the **direct measurements** of the experiment?

They are four **and only** four, the following:

1st Measurement: The difference in altitude of the two detectors, measured with our tape measure or with any other reliable means, is: $\Delta h = 2000\text{m}$.

2nd Measurement: At the mountaintop, the detector there records a quantity of incoming *muons* equal to 568 *muons* per hour, **time being measured by our clock.**

3rd Measurement: At sea level, the detector there records a quantity of incoming *muons* equal to 400 *muons* per hour, **time also measured by our clock.**

4th Measurement: The elapsed time **measured by our clock** as a function of the count of surviving *muons* of the particular *muon* group, which at $t_0 = 0$ corresponds to 568 *muons*, is given in Table 1 of page 66, a table drawn-up based again on **measurements with our clock.**

Therefore, since at the mountain-top the incoming quantity is 568 *muons* per hour, **time measured by our clock**, and at sea level the incoming quantity is 400 *muons* per hour, **time measured by our clock**, and since the lifespan of *muons*, **measured by our clock**, is given by Table 1, it follows that the time, **measured by our clock**, required by the *muons* to travel the distance between the two detectors, is the time that corresponds to 400 surviving *muons*. That is to say, based on the Table: 0,7 μsec . In other words, the time **measured*** by the Earth observers as the *muons* travel time is $\Delta t = 0,7\mu\text{sec}$.

And as, by definition, the speed of any particle, ponderable or elementary, is given by the distance traveled, **measured with our tape measure**, divided by the time required for this, **measured with our clock**, it follows that the speed of the *muons* in the experiment of mount Washington is:

$$\frac{\Delta h}{\Delta t} = \frac{2000m}{0,7\mu\text{sec}} = 2,857 \cdot 10^9 \text{ m/sec} = 9,52 \cdot C$$

And that means that, in the case of the Mt Washington experiment, **the particular *muons* moved relative to Earth at a speed, as measured however by Humans, roughly ten times the speed of light.**

Thus the particular experiment which the proponents of the Theory of Special Relativity, wiping-out Logic, invoke as supposedly having "proven" the slowing-down of moving clocks, **on account of uniform linear motion and that alone which however is relative**, the Theory of the Harmonicity of the Field of Light invokes as having "proven" its position (which after all was Isaac Newton's position all-along), **that there is no limit to the speed of matter, energy or information in Nature.**

Summarizing, in previous pages **I proved theoretically** that the proposal of the Theory of Special Relativity that:

*“The speed of light $C \cong 3 \cdot 10^8 \text{ m/sec}$
is the boundary speed of matter or energy in Nature”*

is unsubstantiated, i.e. **is totally deprived of theoretical support** .

* **M-e-a-s-u-r-e-d** ... and not "estimated" or "assumed"

Now, by revealing the "logical acrobatics" concealed in the interpretation of the results of the Mt Washington experiment, it should become effortlessly evident that **Special Relativity is also deprived of the experimental support** that its numerous supporters enthusiastically invoke for quite some time now.

Therefore, the aforementioned proposal is altogether erroneous.

And this conclusion is exceedingly significant, because it means is that we have just "broken" the heavy chains that Special Relativity **first placed around our dreams and aspirations** when, by laying a condescending hand on our shoulder, "convinced" us that:

Hey, Little Man! Stop gazing at the stars and stop daydreaming. They are much too far for you and you are not likely to ever get there! But even if you try to, moving at speeds close to the speed of light (but never over it as "the Theory prohibits it"), by exploiting the delay of the moving clocks (hence your own biological clock too), it will take you hundreds, maybe thousands of years to get there and back to Earth again! Your twin brother will have died, all your beloved ones will have died, so when you step into your spaceship, you might as well kiss them goodbye. For ever! And just between the two of us, it is not even certain that upon your return, the Earth will still be in its place [...]

Thus, this conclusion provides a fundamentally liberating advance to human evolution. Because, freed at last from "mathematical myths", we will be in a position to travel to the ends of the Universe, as far as we want, moving with speeds as high as the level of our technology allows us (without any limits)! And return! Return in whatever age we choose: younger, older, or the same age with our twin brother!

Uniform linear motion, **does not possess any magical attributes so as to delay clocks on its own**. The clocks rhythm depends **only** on the intensity of the gravitational field*. In other words, it depends **only on** the gravity that will be prevalent during our journey **inside the spaceship** and which gravity we can control to a very large extent, simply by controlling the rate of the ship's *self-rotation*.

* And this we know since Newton's time. See for instance the period T of the Mathematical Pendulum, which is also a "clock", $T = 2\pi \cdot \sqrt{\frac{l}{g}}$. When g changes, T , i.e. the tick-tack, changes too.

Thus, the explanation of many experiments in which differentiations in clock rhythms are observed, should be attributed to the gravitational field, whose intensity is **indeed affected** by relative speed (see Chapter 3).

Careful, though!

We may exceed the speed of light ($\cong 300,000\text{km/sec}$), but **in our race with it, we will always come second** and this because Space in the Theory of the Harmonicity of the Field of Light is not Euclidean, **it is Projective** and, as we know, in Projective Space you can go from A to B, not in one, but in **two** ways: The classic (Euclidean), and the reverse one (movement in the opposite direction) via the plane at infinity*. Light would follow precisely this reverse path, if we were to move at speeds greater than its own, so that it would always stay "ahead" of us.

The advantage of this, however, is that we will never lose our telecommunications connection with Earth!

And this because, as we move away from Earth at speeds greater than light ($v > c$), signals from Earth, which we logically would expect to "chase us from behind" and never reach us, will now "collide with us head-on"; meaning we "will capture" light coming from spaces we have not yet reached, as the light's **direction of movement** on the abscissas axis in our system of reference will have changed.

Therefore:

**In the Projective Space of the Theory of the Harmonicity of the Field of Light,
we can exceed the speed of light, but we maintain telecommunications.**

And this of course is extremely important, as we achieve that without violating the crucial **Principle of Causality**, i.e. the one that dictates that "*the effect always follows the cause*".

How does this happen?

It is known that a number of theoretical physicists, even though they accepted the Theory of Special Relativity, they steadfastly refused to accept its position (which we have proven to be wrong), about the speed of light being an unsurpassable limit.

What did they do then?

* *Seventh axiom of order, see **Introduction**.*

They “devised” certain theoretical elementary particles, to which they gave the Greek name "*Tachyons*" and which possessed the unique property of moving at speeds greater than the speed of light. However, in order for the Theory of *Tachyons* to be compatible with the Theory of Special Relativity (which they accepted but which specifically prohibits such a thing), the *Tachyons* ought to (following a totally "Procrustean" logic), also possess an additional and exceedingly weird attribute: To be able to move against the *arrow of Time*, in other words to be able to move ...**from the future towards the past!**

If however this "exotic" *Tachyon* theory applied, (which even as a concept collides brutally with Logic and human experience to date), then we could theoretically, utilizing these tachyons "tamper" with the past and... murder our grand mother before she even gave birth to our mother!

“Murdering” at the same time the Principle of Causality!

Which for thousands of years now struggles to "restore order", reminding us that it is totally **impossible** for someone to be able to close a drawer, lock it, and... manage to lock the key inside as well!

I think that's far enough!

Tachyons do not exist, **because simply there is no need for them to** *.

Thus, "journeys"*** and "interventions" in the past we can forget.

What was done was done! Nothing that **already** did happen can ever change...

* Since certain theorists of mythology recently understood that with tachyons “things” do not move on, they hesitated not to obligingly come with a new plat du jour: "Wormholes". Sometimes I can't help but get the feeling that "scientific mythology" is a bottomless pit [...]

** Many are led to believe in Time travel, ever since Hermann Minkowski, Einstein's Math professor, based on the Lorentz transformation and on the mistaken proposals stemming from it, introduced the "monstrous" concept of the "**Space-time**" attributing a geometrical texture to time, in other words considering it as the "fourth dimension". This because, as a consequence of the L/T, the formula $S^2 = x^2 - c^2 \cdot t^2$ remains constant from one moving system to the other, a fact referring to the attribute of Pythagorean Theorem, if we consider the variable of Time (t) as an imaginary number ($i^2 = -1$). In other words, this function represents a "Space-time Interval" squared. Generally, Minkowski observed that Time (measured with imaginary units) appears symmetrically with Space in Physics equations. From this mathematical observation, however, to the concept of "Space-time" and the implied **natural equivalence of Space and Time**, there is a huge mental leap [...]

I for one, believe that the meaning of "Space-time" is loosely founded and has no relation to the **measurable** physical Human reality. To put it simply, it is but a convenient concept to which the proponents of the "Dogma" resort in order to substantiate their mythological positions. Any resemblance to the (**spatial only**) Pythagorean Theorem has another deeper natural meaning that we will approach analytically later (see next chapter).

Therefore to summarize, in **the Projective Space** of the Theory of the Harmonicity of the Field of Light:

1. We can exceed the speed of light, but we will **always** trail "behind" it.
2. While doing so, we maintain normal telecommunications with our base.
3. **We do not violate** the Principle of Causality.

At this point and prior to moving on, I feel compelled to pause for a while and by borrowing an example from Electromagnetic applications in practice, assist the reader in comprehending once more the degree of "scientific fogginess" that alas continues to afflict the minds of the "disciples" of modern Physical mythology:

Consider a coil, which we stimulate with the voltage of the PUBLIC POWER CORPORATION, in other words we plug it in the mains.

Then we observe the following phenomenon:

Alternate electric current runs through the coil.

The revolving diagram of Voltage - Intensity is as follows:

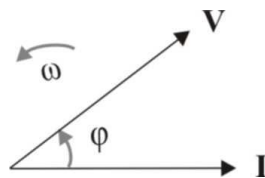


Figure 1.1.9

This diagram revolves (conventionally) counterclockwise. First comes the stimulating voltage **V** (*cause*) followed by the result of the excitation, the electric current of intensity **I** (*effect*). Angle ϕ is the famous "phase difference", which is a function of:

1. The angular frequency ω^* of the Public Power Corporation.
2. The self induction **L** of the coil.
3. The wire resistance **R**.

* $\omega = 2\pi \cdot \nu$, where ν is the frequency of the energy utility, which is 50 Hz in Europe and 60 Hz in the USA.

So far so good and all is perfectly reasonable.

The cause (electric voltage) is time-wise ahead and the **effect** (electrical current) follows, with delay φ .

If, however, instead of a coil, we use a capacitor and stimulate it with the voltage provided by the PPC, something very strange happens:

The revolving Voltage - Intensity diagram is reversed and becomes:

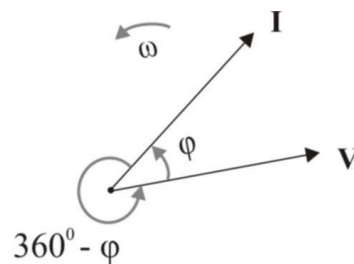


Figure 1.1.10

For it is now the electrical current of intensity **I** that is ahead, followed by voltage **V**. Angle φ is again the "phase difference", which is now a function of:

1. The angular frequency ω of the PPC.
2. The capacity **C** of the capacitor.
3. The wire resistance **R**.

It appears therefore that in the case of the capacitor **the Principle of Causality is violated**, since the electrical current (*effect*) now precedes the PPC voltage (*cause*)!

But does this really happen?

Does the capacitor indeed violate the Principle of Causality?

Of course not!

What happens is the following: The capacitor manifests a big delay in responding to the stimulating voltage originating from the PPC and, in the time it takes it to deliver an electric current, the voltage of the PPC has already completed almost a full rotation.

In other words, the phase difference now is not angle φ , but the very wide angle $360^\circ - \varphi$, where the stimulating *cause* (electric voltage) precedes and the *effect* (electrical current) follows with big delay, equal to $360^\circ - \varphi$. Electrical engineers however, when

calculating the **active energy** that runs through electric networks and appliances, commit no error when they consider angle φ and not angle $360^\circ - \varphi$ as the phase difference, and that is so because $\cos(360^\circ - \varphi) = \cos \varphi$ *

It would therefore be an **enormous conceptual error** for someone to think that the capacitor reverses the Principle of Causality. If the above explanation is not satisfactory, with regard to why this is so, we could very well give the following as a second explanation:

Consider that in a revolving diagram similar to the above, voltage V does not represent the voltage of the PPC, but the voltage between the plates of the capacitor, hence now, a diagram such as that in Fig. 1.1.10 is correct (with angle φ as the phase difference), without reversing the Concept of Causality. And that is so because in this case, *cause* and *effect* have switched roles **. Now, the electrical current is the *cause* and the voltage between the capacitor plates is the *effect* ***, as the electrical current must go through **first**, the electric charges must then be distributed on the capacitor plates, **and finally** the voltage (secondary voltage) will appear across them.

Either explanation will reveal one thing for sure:

The capacitor doesn't violate the Principle of Causality!!

Since Nature has not violated (... even if some times "it may appear" that it has) the Principle of Causality yet, a principle solidly based on **Common Sense**, why is it that certain theoretical Physicists attempt to do so by "inventing" *tachyons*?

Their wish and effort to exceed the speed of light, albeit theoretically, is to be respected but, wouldn't it be much better if, instead of attempting with mindless "intellectual alchemies" to **force Nature to balance on her head**, they were to first take another, more critical, look at the proposals of the Theory of Special Relativity and the details of the Lorentz Transformation analytical derivation? Were they to do so, they would perhaps be able to understand that said Transformation leads to some erroneous conclusions, as for example the boundary speed of light.

* The active power $P = V.I.\cos\varphi$, where V and I are considered to be the active (r.m.s) values. It should be remembered that only the active energy is converted to work. As a matter of fact, PPC charges domestic consumer **only** for this energy, because **only** this energy corresponds to primary energy consumption (e.g. fuel).

** Let us remember the Principle of Dualism in Space (see Introduction).

*** Attention! **Not** the PPC voltage.

This pause and the seemingly irrelevant, for now, reference to electromagnetism was not for the purpose of brushing-off the “peculiar” *Tachyon* Theory and the various other related (and equally disrespectful to Causality, unfortunately) "theories" that appear from time to time* .

No! The reason is far more serious:

I did so, in order to shed light to a much deeper and rather difficult to comprehend facet of the fundamental error in the Theory of Special Relativity.

And let me explain myself:

Einstein never understood that the famous Lorentz Contraction Factor $\sqrt{1-\frac{v^2}{c^2}}$ is **nothing but the simple cosine (cos) of the "phase-difference angle"**, as defined by **the moving rays corresponding to *position* and *conjugate position***; the physical meaning of this angle is that it constitutes **the measure of the delay in interaction or information transmission at the foot of the perpendicular**.

In other words, this angle is **the measure of the inertia of the system and the sensory or measuring instrument** or, otherwise, it constitutes the measure of the "time-distance" between *cause & effect*, as measured by Humans, the exact moment when the observed is located at its minimum distance from the Observer or his measuring instrument. Who knows, it may have been this particular misunderstanding that is also responsible for Einstein's ultimate failure to comprehend and accept the "Orthodox Interpretation" of Quantum Mechanics (Copenhagen School), an interpretation which is a direct **consequence** of precisely this existence of the “phase difference angle”.

It should be noted, the fact that:

- (a) The moving particle is at one position but is measured at another (*positional error*), and
- (b) v and v_{ob} are distinct (*momentum error*), as the Theory of Harmonicity claims and, as proposals, comprise the theory's main arguments against the Theory of Special Relativity, **ultimately constitutes the underlying mechanism of Werner Heisenberg's Uncertainty Principle** which, incidentally, was never accepted by A. Einstein as a fundamental Principle of Nature.

* Here, I would like to point out that Einstein did never dispute, not even with a hint, the Principle of Causality.

This **fundamental misapprehension of the Physical meaning** of the Lorentz Contraction Factor could be possibly "forgiven", had Einstein been a theoretical Physicist. After all, it is well known that some of them are frequently "bewitched" by the "elegance" of certain equations, to the extent that they may overlook the **all-important Physical meaning** (i.e. the representation of the real elements of Space) behind the symbols and, more to the point, **in what way what their symbols represent will be measured in Practice.**

However, Einstein was not a Physicist!

He had a diploma in Electrical Engineering from the Federal Polytechnic Institute in Zurich*. Electrical engineers on their part have all deeply felt **the Physical meaning of this "phase- difference angle"**. And this because, every power utility pesters them to no end with the infamous "**cosine correction**" (i.e. decrease of the angle), constantly forcing them to install reactive power compensation capacitors or electrical motors (compensators) in industrial installations to "correct" (enlarge) the cosine, i.e. to make the angle smaller. And as if this wasn't enough, electrical engineers receive many complaints from their business clients who, justifiably enough, refuse to accept that they should pay large sums of money... just for an "angle" to become smaller.

This is how things are today and, I am sure, they were no different during Einstein's time...

Here, the long pose we took on page 76 and our brief reference to Electromagnetism comes to an end. We shall return to it, more analytically, in the following chapters.

* Today, the Institute is abbreviated as E.T.H. (Eidgenössische Technische Hochschule). Einstein graduated in 1900, from the theoretical department VI, whose graduates were entitled to teach Mathematics and Physics.

**CRITICISM AND IN-DEPTH ANALYSIS OF EINSTEIN'S DISPUTED ORIGINAL
ARTICLE (1905) DEMONSTRATING THE SOURCE OF THE ERROR
OF THE THEORY OF SPECIAL RELATIVITY**

Prior to closing this first chapter, I consider it very important to point out and analyze more deeply for the reader, the source of the fundamental error in the Theory of Special Relativity. It should be noted that this error is not mathematical in nature. Einstein's Mathematical reasoning in his original article (*"On the Electrodynamics of moving Bodies"*) is beyond reproach! The error is truly fundamental and sufficiently "**subcutaneous**", so as to partly explain why it did not become immediately evident^{*}, although said theory has been thoroughly crosschecked by some of the greatest minds of the twentieth century. Before we proceed however, it would be useful to first define three utilitarian "concepts":

1. The concept of "**Angels**".

Angels are beings, not only bodiless but also, by not being confined to any single locality, enjoying the unique privilege to be simultaneously present anywhere and everywhere and consequently to have **INSTANTANEOUS** access to all information concerning the events.

2. The concept of "**Bodiless Humans**".

Bodiless Humans are beings restricted by locality, in other words lacking the ability to have instantaneous access to all information concerning the events, but able to practice Physics (i.e. observe and measure the world) positioned, without any problem, **PRECISELY ON** the trajectory of the observed entities. Those very specific kind of observers, from now on, I propose to call "**Restricted on Trajectory**" (**RoT**) Observers.

3. The concept of "**Normal human beings**".

Normal human beings are material beings, not only restricted by locality (and thus not having instantaneous access to the information concerning the events) but, moreover, because they have material bodies, obliged to study Physics positioned **NOT PRECISELY ON** the trajectory of the observed and measured entities but just off of it, out of fear of collision with them.

Having defined those three concepts, let us now move to Albert Einstein's article "*On the Electrodynamics of moving Bodies*".

^{*} *The fact that many scientists did not readily accept this Theory, especially when it was first introduced, mainly due to its inherent contradictions, does not mean that these scientists necessarily understood where **precisely** its fundamental error was located.*

There, having first defined the concept of the synchronization of two clocks (residing both in the same reference system) as well as the speed of light^{*}, he proposes (in PART 2 of the article) two distinct methods of measuring the length of a moving rod:

“Let there be given a stationary rigid rod, and let its length be l as measured by a measuring-rod which is also stationary. We now imagine the axis of the rod lying along the axis of x of the stationary system of co-ordinates, and that a uniform motion of parallel translation with velocity v along the axis of x in the direction of increasing x is then imparted to the rod. We now inquire as to the length of the moving rod, and we imagine its length to be ascertained by the following two operations:

(a). The observer moves together with the given measuring-rod and the rod to be measured, and measures the length of the rod directly by superposing the measuring-rod, in just the same way as if all three were at rest.

(b). By means of stationary clocks set up in the stationary system and synchronizing in accordance with §1, the observer ascertains at what points of this stationary system the two ends of the rod to be measured are located at a definite time. The distance between these two points, measured by the measuring-rod already employed, which in this case is at rest, is also a length, which may be designated "the length of the rod".

*In accordance with the principle of relativity the length to be discovered by the operation (a) – we will call it “the length of the rod in the moving system” – must be equal to the length l of the stationary rod. The length to be discovered by the operation (b) we will call “the length of the (moving) rod in the stationary system”. This we shall determine on the basis of our two principles^{**}, and we shall find that it differs from l . Current kinematics tacitly assumes that the lengths determined by these two operations are precisely equal, or in other words, that a moving rigid body at the epoch t may in geometrical respects be perfectly represented by the same body at rest in a definite position.*

^{*} Two clocks at positions A and B in the same system are synchronized, according to Einstein’s definition, when $t_B - t_A = t'_A - t'_B$, where t_A is the reading of the clock in A when a ray of light starts from A towards B, t_B the time displayed on the clock in B when the ray reaches there and is reflected, and t'_A the time displayed on the clock in A when the ray returns there.

The speed of light is defined as:
$$c = \frac{2 \overline{AB}}{t'_A - t_A} .$$

(These definitions are included in Part I of Einstein’s article).

^{**} The two principles (hypotheses) to which Einstein refers here, are formulated above in the excerpt which I quote:

“1. The laws by which the states of physical systems undergo change are not affected, whether these changes of state are referred to the one or the other of two systems of coordinates in uniform translatory motion.

2. Any ray of light moves in the "stationary" system of co-ordinates with the determined velocity c , whether the ray be emitted by a stationary or by a moving body. Hence, Velocity = light path / time interval where time interval is to be taken in the sense of the definition in §1.”

We imagine further that at the two ends A and B of the rod, clocks are placed which synchronize with the clocks of the stationary system, that is to say that their indications correspond at any instant to the "time of the stationary system" at the places where they happen to be. These clocks are therefore "synchronous in the stationary system".

We imagine further that with each clock there is a moving observer, and that these observers apply to both clocks the criterion established in § 1 for the synchronization of two clocks. Let a ray of light depart from A at the time* t_A , let it be reflected at B at the time t_B , and reach A again at the time t'_A . Taking into consideration the principle of the constancy of the velocity of light, we find that:

$$t_B - t_A = \frac{r_{AB}}{C - v} \quad (I) \quad \text{καί} \quad t'_A - t_B = \frac{r_{AB}}{C + v} \quad (II)$$

where r_{AB} denotes the length of the moving rod-measured in the stationary system. Observers moving along with the moving rod would thus find that the two clocks are not synchronous, while the observers in the stationary system would declare the clocks to be synchronous.

So we see that we cannot attach any absolute significance to the concept of simultaneity, but that two events which viewed from a system of co-ordinates, are simultaneous, can no longer be looked upon as simultaneous events when envisaged from a system which is in motion relatively to that system".²⁴

And now, having first quoted verbatim a passage from Einstein's disputed original article, it is time for my own remarks:

To start with, method (a) of measuring the length of the rod is quite straightforward. The length of the rod in the moving system measured by an Observer in the same system with his measuring instrument (ruler) will be found l , in much the same way the overseer of a group of craftsmen **measures the same length of a steel pipe** that his team has installed in the garage of a ferryboat, regardless of whether the ferry travels in calm seas, or is docked in the harbor (Principle of Relativity of uniform linear motion by Galileo).

However, with the second method (b) of measuring the length of a moving rod, I raise a serious objection: This measuring action can **only** be realized if the Observer to whom Einstein assigns the job is an **Angel**, i.e. omnipresent. Had he been a **Normal**

* "Time" here denotes "time of the stationary system" and also "position of hands of the moving clock situated at the place under discussion" (Verbatim quote from Einstein).

²⁴ Einstein Albert, "On the electrodynamics of moving bodies", (The principle of Relativity, H.A. Lorentz, H. Minkowski and H. Weyl), Dover Publications Inc., New York. p. 41 - 42 - 43.

Human being, he would definitely err in "defining" the ends of the moving rod on the X-axis, as Humans cannot be omnipresent.

If, on the other hand, Einstein assigned the job to **two** Normal Human beings (at a distance l from each another in the stationary system and both at the same distance r_0 on the perpendicular on the X-axis, so that the moving rod would not "ram" them), and gave them orders to monitor only one end of the rod each, then these two people would each mark the rod in the **wrong position**, but when they would measure the distance between the two marks they would come up with the **correct length l** , as **their errors would cancel each-other out**.

Finally, if Einstein assigned this job to two **Bodiless Humans (RoT Observers)**, at a distance l from one another in the stationary system, they **would not err**, i.e. they would mark the length of the rod (between the marks) in such a manner that the length would be correct, and also the position of the rod at time t would be portrayed correctly on the X-axis, if the marking action took place when **the two ends of the bar coincided with the two observers respectively**.

1st Conclusion :

The precise measurement of the length of the moving rod with method (b) is not feasible by a **sole** Normal Human being. That is to say, if it is carried out, said measurement **will have no physical meaning whatsoever** because, in such a case, the two "spotted" ends of the rod will be "irrelevant" to one another, as **not corresponding to the same moment of time t** .

Moreover, the "spotting" error will vary depending on whether the rod is approaching or moving-away from the Normal human being **as well as** on its distance from him* .

* I must admit that, in order to better formulate this particular conclusion, besides simple logic, I tried to use some mainstream "contractor" logic: I imagined for a moment myself to have been hired by Einstein to paint the rod and having agreed to get paid "by the yard". As Einstein had asked for the measurement to be carried out with the rod moving but us in the stationary system, then Albert and I would surely have a problem. I would insist that **2 persons would be required** to mark the ends of the moving rod for the measurement to be as honest as possible. If, however, Einstein insisted to use only one of his people as the observer, (whom we would have to supply with a state of the art photographic camera, and ask him to take pictures of the rod moving in front of a "calibrated background" located in the stationary system), then no way would I accept those shots to be taken while **the rod was moving-away** from the photographer-observer as in that case the moving rod would be portrayed in the background **contracted** and thus Einstein would end-up paying less than he should. On the contrary, I would insist for the rod to be photographed while **it was approaching** the photographer-observer as in that case the moving rod would be portrayed in the background **elongated** and thus it would be me who'd get the better deal (see next chapter about the mathematical formulation).

One could argue, of course, that this is an error in the application of the Theory, correctable in practice, rather than an inherent fault of the Theory per se; and in any case, alone it cannot account for the fundamental logical contradictions presented in it.

Where do those logical contradictions stem from then?

Mostly, they stem from **the fundamental error concerning the physical meaning** of r_{AB} , that appears in Einstein's equations, **and also** from the following, presented in greater detail:

Einstein imagines a moving rod of length l , measured in the moving system with method (a); the rod is moving uniformly at speed v on the rest-axis X. From the end A of the rod, where an Observer and a clock are located, a light ray is emitted which begins to "chase" end B, where another Observer, a clock and a mirror are located. After the light is reflected on B, it returns to A. Furthermore, while writing equations I and II (where all magnitudes are measured from the stationary system), Einstein **assumes** that all the t_i symbols, apart from referring to times in the stationary system, they also refer to readings of the clocks at the two moving ends of the rod, A and B.

In other words, he puts forward as a working hypothesis that the displays of the clocks at points A and B of the moving rod, agree with the displays of the clocks of the stationary system in the position they happen to be located. However, it is exactly this working hypothesis that leads him to the following stalemate:

By applying his two principles, i.e. the principle of relativity of linear translatory motion and the principle of the constancy of C (independence of C from the speed of the source of light), he concludes that, even though the clocks of the stationary system are synchronized and, **based on his working hypothesis**, the clocks on the A and B ends of the rod should also be synchronized, (as being in accordance with the displays of those in the stationary system at the position they are located), based on equations I and II, this is not the case. In other words, the fact (based on equations I and II) that $t_B - t_A \neq t'_A - t'_B$, in itself **invalidates the synchronization of the two clocks as said synchronization was defined.**

The above stalemate and the need for the clocks at ends A and B of the rod to be synchronized to one another, led Einstein to the well-known proposals of his Theory following the derivation of the Lorentz Transformation.

At this point, let me ask:

What is the physical meaning of the denominators on the right hand sides of equations (I) and (II), i.e. the expressions $C - v$ and $C + v$?

They represent the speed of light relative to the rod on its way towards the mirror, and the speed of light relative to the rod on its way back from the mirror, respectively, **measured from the stationary system** * .

But who, in God's Name, gives us the right to add and subtract speeds arithmetically as if they were...potatoes?

Three potatoes minus two potatoes give us one potato; three potatoes and two potatoes make five potatoes. The above sums, however, do not refer to potatoes, but speeds. Whence are they justified?

In Classical Newtonian Physics, the validity of Galileo's Transformation justifies of course the numerical addition and subtraction of speeds, as we previously mentioned (p. 44).

However, in Einstein's case, it would be **wholly contradictory** to have to appeal to Galileo's Transformation in order to construct two equations (I) and (II), after the processing of which he will conclude (following 3-4 pages of calculations) the Lorentz Transformation, which then, in an about-face **invalidates the Galileo Transformation on which it was based to start with.**

This is reasoning reminiscent of someone who builds a house and, having reached the second floor... does away with the foundations, hoping naively that the second floor will stay in place!

And this constitutes the very definition of a Fundamental Contradiction!

Despite this we could, if we very badly wanted to, overcome even this fundamental contradiction. The price to pay, however, would be too heavy:

We would need, henceforth, "to mobilize" those **"Bodiless Humans"**...
The RoT Observers!

* *Let us recall the example of Superfast Ferry and the yacht presented on p. 44*

On the Restricted on Trajectory (RoT) Observers

Suppose that **on** the X-axis, there is a **RoT** Observer at Position O (Fig. 1.1.11)



Figure 1.1.11

Let a particle approaching at speed v measured with the **LASC** (hence also synchronized) clock. The particle does not appear to the observer at position A, but at its conjugate position A' such that:

$$\frac{A'A}{v} = \frac{A'O}{c} \Rightarrow \frac{A'A}{A'O} = \frac{v}{c} \quad (1.1.36)$$

If X and X' are the abscissas of position A and its conjugate position A' respectively (O being the start), then from the above it follows:

$$X' \cdot \left(1 - \frac{v}{c}\right) = X \quad (1.1.37)$$

If v' is the **momentary speed** of the conjugate position A' , measured with the observer's local clock, then:

$$v' = \frac{v}{1 - \frac{v}{c}} \quad (1.1.38)$$

We observe that, even though the speed **of the conjugate position** is different (in this case higher) from the speed of the **position**, still speed v' remains consistently **independent from** the distance between the observed and the Observer.

It must be fully understood, that this phenomenon does **not apply** for the **Normal Human –Observers** who, in real life, are obliged to position themselves just off of axis X (see the mathematical formalism in Chapter 2).

If the particle moves away from O with speed ν and it is found at B, then again:

$$\frac{B'B}{\nu} = \frac{B'O}{c} \quad (1.1.39)$$

and $X' \cdot \left(1 + \frac{\nu}{c}\right) = X$ or

$$\nu' = \frac{\nu}{1 + \frac{\nu}{c}} \quad (1.1.40)$$

The previous observation applies here too.

Now speed ν' of the conjugate position is lower than ν . Thus the **RoT Observers** are privileged to measure **constant speeds of the "shadows" of the observed entities** (conjugate positions), something that doesn't apply to Normal Human-Observers. The trajectories of matter and light in the Physics of the RoT Observers are **collinear** a fact that, I must re-emphasize, **does not apply** in the Physics of Normal Humans.

Therefore, this constancy of speed ν' of the conjugate **for each position of the rod** deprives the rod of its "elasticity", that is present in the Physics of Normal humans beings. Hence, the length of the moving rod measured by the RoT Observer **remains constant and independent** of the distance of the rod from the Observer, depending **only** on whether the rod in question is approaching or is moving-away from him.

Taking into consideration the above, equations (I) and (II) presented in the disputed Einstein article are legitimized as follows:

Let rod AB moving at speed ν in relation to the stationary system X.

Let l be the length of the rod measured in its own reference frame.

Let r_{AB} be the rod's length measured **from the stationary system**. (The measurement is carried- out by the observer of the stationary system, as indicated by Einstein.)

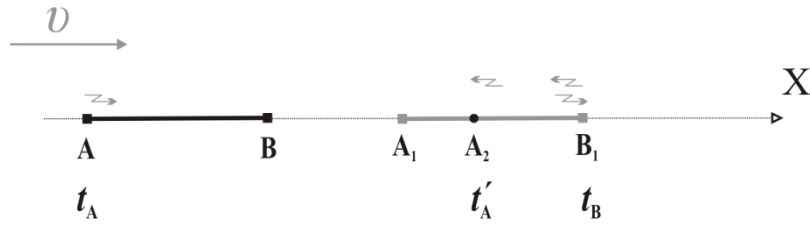


Figure 1.1.12

At time t_A , light is emitted from A towards B, where there is a mirror. The meaning of t_A as well as the meanings of all the symbols that follow, are those defined in Einstein's paper.

Light "chases" the mirror and let it intersect with it at B_1 , which means that A is at A_1 . Thus it would be legitimate for a **RoT Observer** to say and write (globally): In the time required for light to travel the interval AB_1 , the B end of the rod will travel the interval BB_1 , so:

$$\frac{AB_1}{c} = \frac{BB_1}{v} \Rightarrow \frac{v}{c} \cdot AB_1 = BB_1 \quad (1.1.41)$$

or

$$\frac{v}{c} \cdot AB_1 = AB_1 - r_{AB} ,$$

an entirely legitimate substitution, as the rod's length r_{AB} , measured by the RoT Observer, **is constant and independent of the position of the rod**. Therefore:

$$AB_1 = \frac{r_{AB}}{1 - \frac{v}{c}} \quad (1.1.42)$$

*[Caution! The fact that in the preceding equations I've chosen to present first the **speed ratios** followed by the sums and subtractions is **not without reason**. I suggest that the reader refers figure (1.1.4) on p. 24 to note that the ratios $1 + \frac{v}{c}$ and $1 - \frac{v}{c}$, define the harmonic points on the moving ray, that in turn define the Apollonian Circumference.*

Thus, in the Theory of Harmonicity, those speed ratios do not appear **on** line E, as here, but in a different direction and, (at the very moment of passing by the Foot of the Perpendicular), specifically **in a perpendicular direction**. (see Fig. 1.3.3 of Chapter 3). **This remark is essential for understanding the huge difference between the two theories**. In the Theory of Harmonicity r_{AB} is **variable** depending each time on the rod's **position**, whereas here r_{AB} is constant and changes only on either side of the RoT Observer's position O, because for him v' is **not a function of the distance from O**. It changes only on either side of O.]

and as $t_B - t_A = \frac{AB_1}{c}$ it follows that:

$$t_B - t_A = \frac{r_{AB}}{c - v} \quad (1.1.43)$$

Which is none other than equation (I) appearing in Einstein's disputed article.

Subsequently the ray, having been reflected on B₁ and while moving in **the opposite direction** on the X-axis, meets head-on with end A of the rod at point A₂, at time t'_A .

So, for the same RoT Observer it holds that:

$$\frac{A_1A_2}{v} = \frac{B_1A_2}{c} \Rightarrow A_1A_2 = \frac{v}{c} \cdot B_1A_2 \quad (1.1.44)$$

so:

$$r_{AB} - B_1A_2 = \frac{v}{c} \cdot B_1A_2 \quad \text{or} \quad B_1A_2 = \frac{r_{AB}}{1 + \frac{v}{c}} \quad (1.1.45)$$

And, as $t'_A - t_B = \frac{B_1A_2}{c}$, it follows that:

$$t'_A - t_B = \frac{r_{AB}}{c + v} \quad (1.1.46)$$

Which is none other than equation (II) presented in Einstein's disputed article.

2nd Conclusion :

Given that the invocation of the Galilean Transformation would lead, as shown previously, to a **fundamental contradiction**, the equations of part 2 of Einstein's paper,

$$t_B - t_A = \frac{r_{AB}}{C - U} \quad (\text{I})$$

and

$$t'_A - t_B = \frac{r_{AB}}{C + U} \quad (\text{II})$$

can be legitimately formulated **only by RoT Observers**, because it is **only them** that are legitimized to numerically **add and subtract** the speeds of light and matter... as if they were potatoes, **because only for them r_{AB} is constant at any position.**

Thus, it is clearly shown that deep within Einstein's error lurks the co-linearity of the velocities of motion of light and matter. The equivalent error in electromagnetism would be to consider the **total (apparent) power** (Voltage x Current) along a circuit, as being one and the same with the **active (true) power** (Voltage x Current x *cosine of the "phase difference angle"*) along the same circuit. **By leaving this little cosine out, Einstein inadvertently equated the total (apparent) energy of light with its active (true) one** *.

I hope that by now, an astute reader who has carefully followed our reasoning thus far would have probably already spotted Einstein's second big error, i.e. his thesis that the relation $U < C$ **is derived as a conclusion**:

**No! Of course it is not derived as a conclusion;
It is an absolutely essential prerequisite !**

Because, simply, if $U \geq C$, then **in the Euclidean Space** light, viewed from the stationary system, **could never reach the mirror** thus the thought (gedanken) experiment couldn't be realized and hence the article would not have been written!

On the other hand, in the **Projective Space**, light would reach the mirror from "behind"... where, however, the mirror might not even have a reflective surface.

* Had this error been made by the PPC (Public Power Corporation), i.e. had it attempted to charge domestic consumers for the total (apparent) energy instead of the active (true) one, they would be faced with a class-action legal suit of immense proportions....

However neither Einstein nor, as far as I know, any other physicist (prior to 1979), ever worked in the Projective Space. **The Theory of Harmonicity introduced Projective Space for the first time in Physics back in 1979** in the book “*On the Harmonicity of the Field*” as well as in a paper published in 1981.

Of course, someone could ask "so what" ?

Special Relativity is nothing but an "idealization", a bit more precise than the Newtonian Mechanics "idealization" which, anyway, belongs to the "Physics of the Angels". Einstein in fact, taking a step forward, described to us something closer to the human experience, restricting considerably the degree of idealization by replacing Newton's "Angels" (thus getting rid of the **instantaneous transmission of information**, a sole privilege of the... Angels), with the RoT Observers who, in his idealization, have the unique ability to be able to observe and measure the world, being themselves positioned **exactly on** the trajectories of moving entities.

So, where lies the Problem?

Unfortunately, the Problem results from an **impermissible Inconsistency!**

Let us pay closer attention:

With equations (1.1.38) and (1.1.40), we realized that when the material particle approaches the RoT Observer, the speed of its conjugate position is:

$$v' = \frac{v}{1 - \frac{v}{c}} \quad \text{and when moving-away, its speed is:} \quad v' = \frac{v}{1 + \frac{v}{c}}$$

Thus, from a position "*just before*" the Observer at O, to a position "*just after*" him, speed v' **makes a giant leap**. Moreover, exactly at position O, speed v' is **literally indeterminate**.

For example, for $\frac{v}{c} = \frac{1}{2}$, the particle (conjugate position) approaches the Observer at O with $v' = c$ and a tiny little bit after, just as it starts moving away, its speed decreases impressively to $v' = \frac{1}{3} \cdot c$

Those are **discontinuities** that the Theory of Relativity fails to describe. It is this discontinuity at O (position of the RoT Observer) that also causes the **Inconsistency**, because right there, **at the coincidence** of the Observer with the observed, the RoT Observer is arbitrarily transformed into an "Angel"* by suddenly acquiring **instantaneous** information concerning the event.

And this coincidence between the Observer and the observed is **inevitable**, as it occurs **during every single measuring of length**, as Einstein defined it.

This particular fundamental problem was first ingeniously "sensed" by Zeno of Elea, the Greek Dialectic philosopher of the 5th century BC. What follows I deem essential, as I believe we should not ignore the historical truth.

The purely Conceptual (gedanken) Experiment invented by Einstein in his historical paper, where he considered that light emitted from the A end of the moving rod "chases" the mirror placed at the B end, was indeed ingenious.

However, a similar concept was first posed in antiquity by Zeno, in his famous "Achilles" paradox, where the "Ἀχιλλεύς"*** Achilles can be considered as the light and the slow-moving turtle as the mirror*** :

"If we ask the swift-footed Achilles to race with a turtle and if the turtle starts the race with a certain, even minute head start over Achilles, then I claim that Achilles will never reach the turtle because: For the time it takes Achilles to reach the turtle's starting position, the turtle will have advanced a bit. By the time Achilles reaches the turtle's new position, again the turtle will have advanced a bit and so on and so forth. As nothing can stop me from splitting the distances of space and time ad-infinitum, it follows that Achilles will always find himself trailing at a certain distance, no matter how minute, behind the turtle, and hence he will never catch-up with it!!"

This was the "Thought Experiment" that the great philosopher puzzled his audiences with, some 2500 years ago [...]

* Exactly this "Pseudo-Angelic" philosophy prevented Einstein from accepting W. Heisenberg's **Uncertainty Principle** as a fundamental Principle of Nature. Later, we shall prove that the theoretical derivation of the Uncertainty Principle is possible **only** in the Physics of "Normal human beings".

* * Swift-footed

* * * To fulfill the quote by philosopher Friedrich Nietzsche: "There exists nothing that the Greeks have not said". I would simply add that there exists no fundamental Problem of the Cosmos that the Ancient Greeks did not ponder upon; and this because the Greek Spirit, apart from being un-easy, has also always been Syn-thetic.

Could it be that Zeno's paradox hides an even deeper physical meaning?

I firmly believe **yes** and that it has a lot more to reveal to us. So, I intend to return to Zeno later.

But for now, I consider it essential to cite the following excerpt about Zeno's contribution:

*"It is uncontested that Zeno marks an important landmark in the history of the European spirit. His queries, that point out the contradictions in the concepts of space and time generated by the concept of infinity –as far as this is concerned, it seems that Zeno influenced not only the mathematical thought of Eudoxus of Cnidus, but also the more recent infinitesimal calculus– reversed the entire edifice of mathematics and demonstrated that human knowledge should be placed on a completely new base, in a framework where the formulation of the problems can often be more important than their solution".*²⁵

In the case of Einstein's disputed paper, however, the antinomies (contradictions) generated in the concepts of space and time do not stem from the acceptance of the concept of infinity, but from the acceptance of the concept of **zero**, as Einstein considers **the distance from the Observer to the trajectory of the observed to be of zero-length**.

Of course, this zeroing of the distance inescapably renders the speed at which the information travels at the exact moment of measurement **i n f i n i t e**.

F i n a l C o n c l u s i o n :

Special Relativity, apart from its serious **fundamental** contradictions, also includes congenital, **impermissible inconsistencies**. The "Observer", in this Theory, may be no "Angel" but Human (albeit Bodiless); **however, he fails to consistently maintain this attribute**. There is at least one moment, the moment of measurement during which he coincides with the observed item, when he is practically "transformed" into an Angel (this is also when the speed of the transmission of information becomes **infinite** ...). Galileo and Newton may have taught us the "Physics of the Angels", i.e. of beings able to receive information concerning the events **instantaneously, remained however Consistent throughout** their description.

²⁵ Great Soviet Encyclopedia, Akademos Publ. S.A.; Athens, 1979; Lemma: Zeno, of Elea.

Einstein on the other hand, possibly without even noticing it, described to us a **hermaphrodite** world of "Angel-Humans", a serious slip-up that can almost certainly lead to unacceptable contradictions such as:

**"The speed of light is always finite,
but, from time to time, it becomes... infinite"**

generating, for over a century now, countless problems to Science, problems that "forced" many distinguished and serious scientists into a plethora of unacceptable "**mental acrobatics**", (theoretical calculation of the relativistic mass, interpretation of the twins paradox, etc.), in order to avoid the pitfalls of new contradictions. Despite of the fact that Albert Michelson, the leading American Experimentalist (first ever Nobel Prize for Science awarded to the United States, 1907) and deeply respected by Einstein, had already turned-on the "red light" for the particular theory.

In 1931, at a time when Einstein's Theory of Special Relativity already reigned supreme in the scientific arena, Michelson, who had never really accepted it, did not hesitate to let Einstein know of his feelings on their first and only face to face meeting:

"Michelson mentioned to Einstein that he still had a little regret that his experiments were responsible for the birth of such a "monster". - JEREMY BERNSTEIN, "Einstein", University of Crete Publ., Heraklion, 1993, p. 113.

We however, will **remain strictly and consistently** "Normal Human Beings" and only **as such** we shall attempt to describe the World.

So wherever, from now on, I shall refer to the "**Physics of Humans**", I shall mean precisely this: The description of this World by Observers, completely restricted by locality (in contrast to the description by Galileo-Newton) **and also** unable to position themselves **precisely on** the trajectories of the observed and measured entities (in contrast to Einstein's description).

CHAPTER 2

THE MATHEMATICAL FORMALIZATION OF THE KINEMATICS OF A MATERIAL POINT MOVING WITH SUBLUMINAL SPEED MEASURED WITH THE LASC

"Salviati: Is it possible for you [signore Simplicio] to doubt that if Aristotle should see the new discoveries in the sky he would change his opinions and correct his books and embrace the most sensible doctrines, casting away from himself those people so weak-minded as to be induced to go on abjectly maintaining everything he had ever said? Why, if Aristotle had been such a man as they imagine, he would have been a man of intractable mind, of obstinate spirit, and barbarous soul; a man of tyrannical will who, regarding all others as silly sheep, wished to have his decrees preferred over the senses, experience, and nature itself? It is the followers of Aristotle who have crowned him with authority, not he who has usurped or appropriated it to himself. And since it is handier to conceal oneself under the cloak of another than to show one's face in open court, they dare not in their timidity get a single step away from him. And rather than put any alterations into the heavens of Aristotle, they want to deny out of hand those that they see in nature's heaven".

Galileo ²⁶

²⁶ Galileo Galilei, "Dialogo Sopra I due massimi sistemi del mondo" (1632). (Dialog Concerning the Two Chief World Systems). Mentioned by Werner Heisenberg in his work: "Thoughts on the evolution of concepts in Physics", 1997. P. Travlos – E. Costaraki Publ. Athens, Greece; p. 102 (in Greek) Original: "Das Naturbild der heningen Physik; 1955. © Rowohlf Taschenbuck Verlag, GmbH. All underlining is mine.

Starting this chapter, I feel I should apologize in advance, as it is likely that the rather heavy use of geometric drawings and diagrams that follow might prove tiresome for some of the readers. I consider the use of such tools, however, absolutely essential for a **thorough** understanding of the **mathematical formalization** of material point kinematics, which will be the only subject under examination in this chapter.

Having said that, it should be stressed that the substance of the Theory of the Harmonicity of the Field of Light is not concealed in mathematics, but rather **in its logical concept**.

Symbolisms:

U = The speed of the material point's position as it moves along straight line E, measured with **the LASC** (the clock of the Angels).

U_{ob} = The material point's average speed between two conjugate positions, measured with the **local clock** (the clock of Humans).

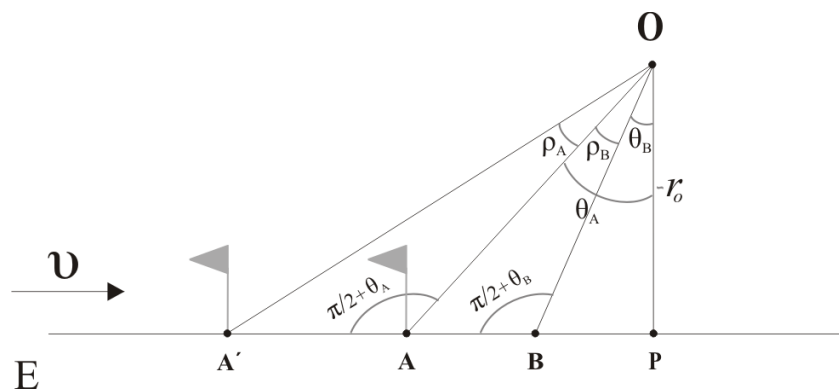


Figure 1.2.1

So, let us consider a material point moving with constant speed U on straight line E in the direction shown in figure 1.2.1, i.e. **approaching** the foot of the perpendicular P, which lies at a distance $OP = r_o$ from the Observer at point O.

Let A' be the conjugate of position A and let A be the conjugate of position B.

Let us assume that, having placed two flagged poles at points A' and A, we then ask the Observer at O to measure **with his clock** the average speed of the material point between the two poles, i.e. at the interval A'A.

As, when the material point is at A, the Observer sees it at A' and when the material point is at B, the Observer sees it at A, it follows that the time the Observer will measure for the interval A'A to be traveled is:

$$T_{ob} = \frac{AB}{v} \quad (1.2.1)$$

Consequently, the required speed that the Observer will measure is:

$$v_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot v \quad (1.2.2)$$

Obviously, v_{ob} is a function of position A. Thus, although the material point's speed v is constant, the speed v_{ob} **which is the one measured by the Observer** is variable and in particular, because $A'A > AB^*$, it follows that $v_{ob} > v$, when the material point **approaches P**.

In triangle OA'A using the sine theorem, we get:

$$\frac{A'A}{\sin \rho_A} = \frac{A'O}{\sin(\pi/2 + \theta_A)} = \frac{A'O}{\cos \theta_A} \Rightarrow \frac{\sin \rho_A}{\cos \theta_A} = \frac{A'A}{A'O} = \frac{v}{c}$$

Let $\frac{v}{c} = b < 1$. Hence, we get:

$$\sin \rho_A = b \cdot \cos \theta_A \quad (1.2.3)$$

Similarly, from triangle OAB we get:

$$\sin \rho_B = b \cdot \cos \theta_B \quad (1.2.4)$$

* It is easy to verify that $A'A > AB$. This results because $A'O > AO$ and also because $A'A = \frac{v}{c} \cdot A'O$

and $AB = \frac{v}{c} \cdot AO$

Also, because triangles OA'A and OAB share a common vertex and a common base carrier, it results:

$$\frac{A'A}{AB} = \frac{A'O \cdot AO \cdot \sin \rho_A}{AO \cdot BO \cdot \sin \rho_B} = \frac{A'O \cdot \cos \theta_A}{BO \cdot \cos \theta_B} = \frac{A'O \cdot \cos \theta_A}{r_o} \quad (1.2.5)$$

But $A'O = \frac{r_o}{\cos(\theta_A + \rho_A)}$ therefore, equation (1.2.5) becomes:

$$\frac{A'A}{AB} = \frac{\cos \theta_A}{\cos(\theta_A + \rho_A)} \quad (1.2.6)$$

Hence, the sought U_{ob} is (based on 1.2.2):

$$U_{ob} = \frac{\cos \theta_A}{\cos(\theta_A + \rho_A)} \cdot U = \frac{\cos \theta_A}{\cos \theta_A \cdot \cos \rho_A - \sin \theta_A \cdot \sin \rho_A} \cdot U$$

and for $\cos \theta_A \neq 0$ ($\theta_A \neq \pi/2$), I end up with:

$$U_{ob} = \frac{U}{\sqrt{1 - b^2 \cdot \cos^2 \theta_A} - b \cdot \sin \theta_A} \quad (1.2.7)$$

which can be also written as:

$$U_{ob} = \frac{U}{\cos \rho_A \cdot (1 - \tan \theta_A \cdot \tan \rho_A)} \quad (1.2.7a)$$

as $\cos \rho_A = \sqrt{1 - b^2 \cdot \cos^2 \theta_A}$.

Equations 1.2.7 and 1.2.7a represent the speed of a moving material point **measured by the local clock of the Observer**, as a function of U (measured with the LASC) and of the angle θ_A , i.e. the angle **between the moving ray** of the position A and OP, when the material point **approaches** P.

When the material point **reaches** the foot of the perpendicular P, then $\theta_A = 0$, $\cos \theta_A = 1$, $\sin \theta_A = 0$ and equation (1.2.7) becomes:

$$U_{ob} = \frac{U}{\sqrt{1 - \frac{U^2}{c^2}}}$$

which is no other than equation (1.1.9) that was derived in the first chapter.

Conclusions:

1. Speed U_{ob} , remaining throughout greater than U , tends to decrease as the material point approaches the foot of the perpendicular. In other words, the particle **both appears and it is measured** to be slowing down.
2. The interval between conjugate positions **tends to decrease** as the material point approaches the foot of the perpendicular.

Let us now examine what happens when the material point **draws away**^{*} from the foot of the perpendicular (and the Observer, Fig. 1.2.2).

Let A' be the conjugate position of A and A the conjugate position of B. Suppose that we placed the flagged poles at position A and at its conjugate A' and that we asked from the Observer at O **to measure with his clock** the average speed of the material point traveling the interval A'A.

^{*} The expression "the material point draws away from P" has an unequivocal meaning **only** in the Euclidean Space and not in the Projective Space, where "I draw away" is **equivalent** to "I approach" but **from the other side**. Much in the same way when I fly from N. York to London over the Atlantic, I travel eastbound away from New York, but at the same time, I'm approaching N.Y. from the West.

The aforementioned equivalence must be fully comprehended, as the introduction of Projective Space in Physics will shed light (as will become evident in the following chapters), to many of the so called Quantum Mechanics "mysteries"..

This introduction of Projective Space already took place back in 1979 with my work "On the Harmonicity of the Field" and its worth was proven in my article: "The nuclear interaction and the double nature of the world without -ons and without dice", published in 1981 in the Bulletin of the Hellenic Association of Mechanical and Electrical Engineers. (Issues 122, Dec. 1981 and 125, Mar. 1982). However, the Greek Academic Community of the era, faithful to its full of glaring contradictions and inconsistencies "Doctrines", unfortunately, chose to ignore it [...]

The ideas and mathematical formulation of the above article will be elaborated in the 5th chapter of this book.

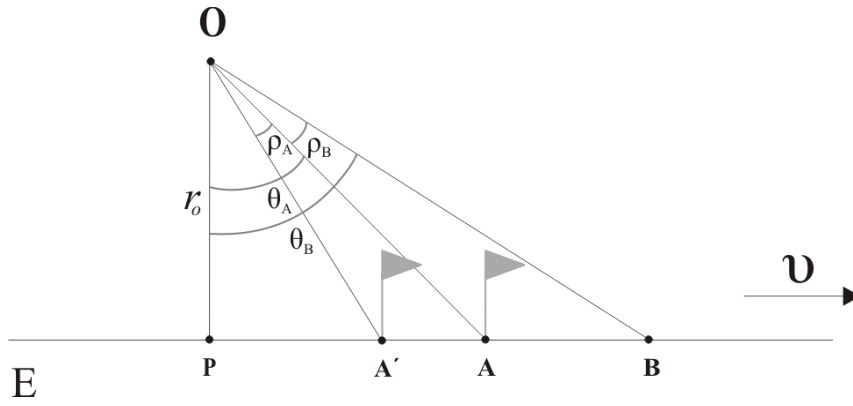


Figure 1.2.2

The time measured by the local clock for the path A'A is:

$$T_{ob} = \frac{AB}{v} \quad (1.2.8)$$

Therefore, the sought speed is:

$$v_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot v \quad (1.2.9)$$

Similarly as before, by applying the sine theorem to triangles OA'A and OAB, we get:

$$\sin \rho_A = b \cdot \cos \theta_A \quad (1.2.10) \quad \text{and} \quad \sin \rho_B = b \cdot \cos \theta_B \quad (1.2.11)$$

Also, from the above triangles, we have:

$$\frac{A'A}{AB} = \frac{A'O \cdot AO \cdot \sin \rho_A}{AO \cdot BO \cdot \sin \rho_B} = \frac{A'O \cdot \cos \theta_A}{BO \cdot \cos \theta_B} = \frac{A'O \cdot \cos \theta_A}{r_o} \quad (1.2.12)$$

$$\text{But, } A'O = \frac{r_o}{\cos(\theta_A - \rho_A)} \Rightarrow \frac{A'A}{AB} = \frac{\cos \theta_A}{\cos(\theta_A - \rho_A)} \quad (1.2.13)$$

In the same way and for $\cos \theta_A \neq 0$ ($\theta_A \neq \pi/2$), equation (1.2.9) becomes:

$$v_{ob} = \frac{v}{\sqrt{1 - b^2 \cdot \cos^2 \theta_A} + b \cdot \sin \theta_A} \quad (1.2.14)$$

which can also be written as:

$$v_{ob} = \frac{v}{\cos \rho_A \cdot (1 + \tan \theta_A \cdot \tan \rho_A)} \quad (1.2.14a)$$

This v_{ob} represents the speed of the moving material point **measured by the local clock of the Observer**, as a function of v (LASC) and the angle θ_A , i.e. the angle between the **moving ray at A** and OP, when the particle **draws away** from P.

It would be expected that we exhausted all possible cases. There is a third one though.

The one in which the material point draws away from P, but position A and its conjugate at A' are located respectively "on either side"* of P.

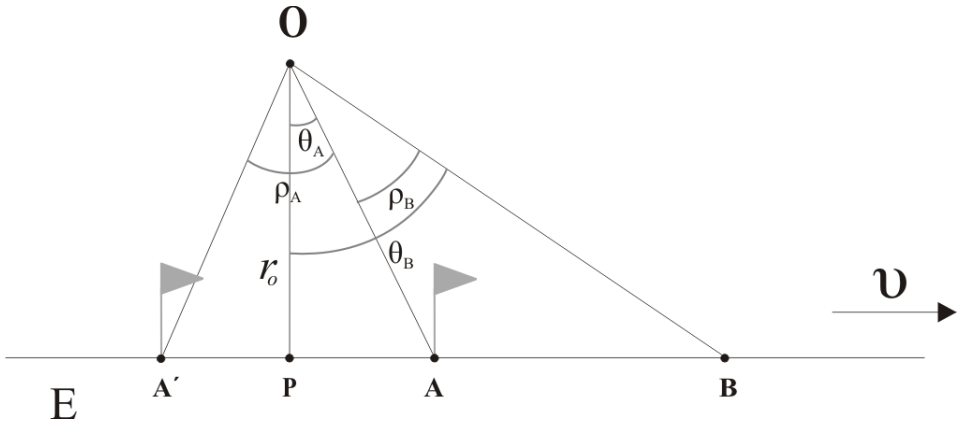


Figure 1.2.3

A' is the conjugate of A and A is the conjugate of B.

* Here, "either side" has the Euclidean meaning of the term. In Projective Space, there is no such thing as "either side".

The time measured by the local clock for the path A'A is:

$$T_{ob} = \frac{AB}{v} \quad (1.2.15)$$

The average speed v_{ob} in interval A'A is:

$$v_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot v \quad (1.2.16)$$

Similarly as before, we have:

$$\sin \rho_A = b \cdot \cos \theta_A \quad (1.2.17) \quad \text{and} \quad \sin \rho_B = b \cdot \cos \theta_B \quad (1.2.18)$$

$$\text{But, } \frac{A'A}{AB} = \frac{A'O \cdot \cos \theta_A}{r_o} \quad (1.2.19) \quad \text{and} \quad A'O = \frac{r_o}{\cos(\rho_A - \theta_A)} \quad \text{so}$$

$$\frac{A'A}{AB} = \frac{\cos \theta_A}{\cos(\rho_A - \theta_A)} \quad (1.2.20)$$

$$\text{And } v_{ob} \text{ of equation (1.2.16) becomes: } v_{ob} = \frac{v}{\sqrt{1 - b^2 \cdot \cos^2 \theta_A} + b \cdot \sin \theta_A} \quad (1.2.21)$$

GENERALIZING:

If we consider angle θ_A as having a sign,

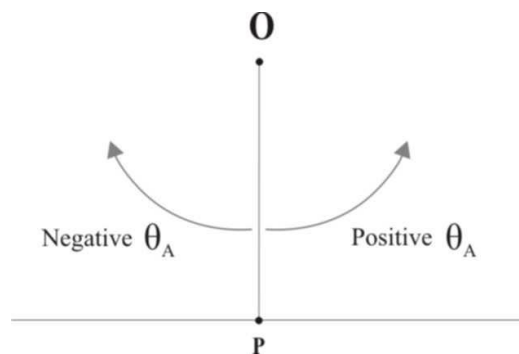


Figure 1.2.4

the three cases explored above can be combined into a single one:

$$v_{ob} = \frac{v}{\sqrt{1 - b^2 \cdot \cos^2 \theta_A} + b \cdot \sin \theta_A} \quad (1.2.22)$$

or

$$v_{ob} = \frac{v}{\cos \rho_A \cdot (1 + \tan \theta_A \cdot \tan \rho_A)} \quad (1.2.22a)$$

where $b = \frac{v}{c}$ and the angle θ_A is **positive** or **negative**, depending on whether the moving material point **draws away from** or **approaches** P, respectively.*

I am trying to determine the angle θ_A at which the speed of the material point, measured **by the local clock**, equals the speed of the material point measured **by the LASC**.

In other words, I'm trying to establish **under what conditions** the speed measurement by the Human clock, will agree with the speed measurement by the "Angelic clock".

Obviously, the denominator of equation (1.2.22) must be equal to one.

In other words, it must be:

$$\sqrt{1 - b^2 \cdot \cos^2 \theta_A} + b \cdot \sin \theta_A = 1 \quad (1.2.23)$$

and we get:

$$\sin \theta_A = \frac{1}{2} \cdot \frac{v}{c} \quad (1.2.24)$$

Then $A'A = AB$.

* Out of concern that I might not have made myself absolutely clear, I repeat once again that the verbs to "approach" and to "draw away" have meaning **only** in the Euclidean Space. Readers that have been educated in Projective Geometry will have certainly understood that **very strict propositions** are required with which to define the array A, P, Infinity. However, I refrain from presenting these now, as a service to the rest of the readers. Until, therefore, they are presented in one of the following chapters, those of the readers wishing to do so, can try to formulate them themselves as an exercise.

Summarizing:

As the material point **is approaching** the foot of the perpendicular, speed U_{ob} tends to decrease, remaining however continuously greater than U . Speed U_{ob} becomes equal to U when the particle **draws away** from the foot of the perpendicular and the moving ray OA forms a **positive** angle θ_A with the perpendicular, where $\theta_A = \arcsin\left(\frac{1}{2} \cdot \frac{U}{C}\right)$.

Then, the two successive intervals as they are defined by the respective successive pairs of conjugate positions A' & A, and A & B are equal. Consequently, while the drawing-away continues, U_{ob} becomes smaller than U and interval A'A smaller than AB.

It therefore becomes clear that there is no symmetry between "right" & "left", "approach" & "draw away".

Thus, when the material point **approaches**, U_{ob} is always **greater than** U .

When, however, the material point **draws away**, U_{ob} is:

1. **Greater than** U ($U_{ob} > U$) when $\sin\theta_A < \frac{1}{2} \cdot \frac{U}{C}$

2. **Equal to** U ($U_{ob} = U$) when $\sin\theta_A = \frac{1}{2} \cdot \frac{U}{C}$

3. **Smaller than** U ($U_{ob} < U$) when $\sin\theta_A > \frac{1}{2} \cdot \frac{U}{C}$

There is no symmetry between the right and the left sides of the foot of the perpendicular. "Right" might be equivalent to "left" in our brain, but in the **Humanly perceptible Space, the two are not equivalent.**

In the table the resulting graph that follows, we can observe the change in the ratio $\frac{U_{ob}}{C}$

for a given ratio $\frac{U}{C} = \frac{1}{2}$, as a function of angle θ_A^* .

* I chose the particular ratio $\frac{U}{C} = \frac{1}{2}$, as it has a deeper importance in the Harmony of the Natural World. **It is connected with the Octave Transformation in Music.**

Please note that if the material point moves with $U = \frac{1}{2} \cdot C$, then at -90° , $U_{ob} \rightarrow C$.

That is to say, the ratio $\frac{U}{U_{ob}} = \frac{(\text{speed measured by the "Angelic" clock})}{(\text{speed measured by the "Human" clock})}$ equals the frequency ratio of the same note in two successive octaves.

θ_A (degrees)	v_{ob}/c
(tends to) $\rightarrow -90^\circ$	(tends to) $\rightarrow 1$
-60°	0,934172358
-45°	0,859311825
-30°	0,767591879
$-14,45751188^\circ$ ($\sin\theta_A = -1/4$)	$2/3$
0°	$0,577350269$ ($\sqrt{3}/3$)
$14,45751188^\circ$ ($\sin\theta_A = 1/4$)	$1/2$
30°	0,434258450
45°	0,387907304
60°	0,356822089
(tends to) $\rightarrow 90^\circ$	(tends to) $\rightarrow 1/3$

The plot of the above change is as follows: *

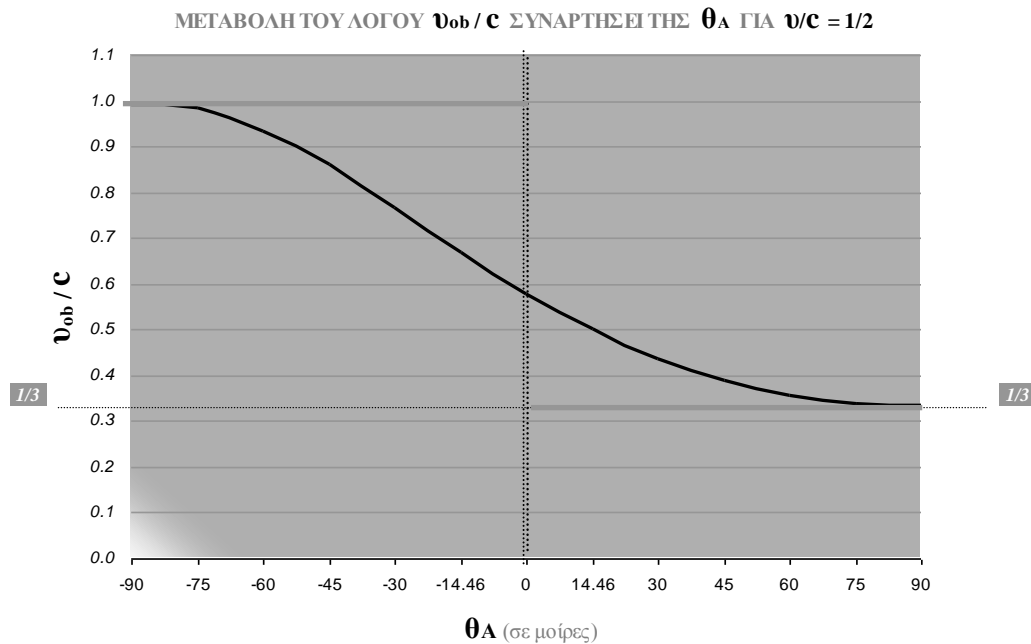


Figure 1.2.5

* Let us remember the corresponding case in the Physics of the RoT Observers: In the approach phase, we have: $v' = \frac{v}{1-v/c} = c$, whereas in the drawing-away phase, we have: $v' = \frac{v}{1+v/c} = \frac{1}{3} \cdot c$.

Thus, the above values of v' are valid, in **Human Physics**, only at the limits $(-\pi/2, \pi/2)$ for θ_A .

Furthermore, the curve representing v_{ob} as a function of θ_A is **continuous and does not contain any "leaps" in the finite Space** contrary to that of the Rot Observers (see heavier gray lines in 1.2.5).

The "leap" of v_{ob} , in Harmonicity Physics is realized only at infinity. It is therefore obvious that the Physics of the RoT Observers, upon which the Theory of Special Relativity is based, is not realizable in Practice. In SRT Physics, the moving particle literally "goes right through you" the exact moment of measurement. At that precise moment, v' makes the leap from c to $c/3$.

GENERALIZATION:

We are seeking the average speed, measured by the local clock, of a material point **approaching** P, between two **random** positions B' and A'.

Let us call it V_{ob}^* .

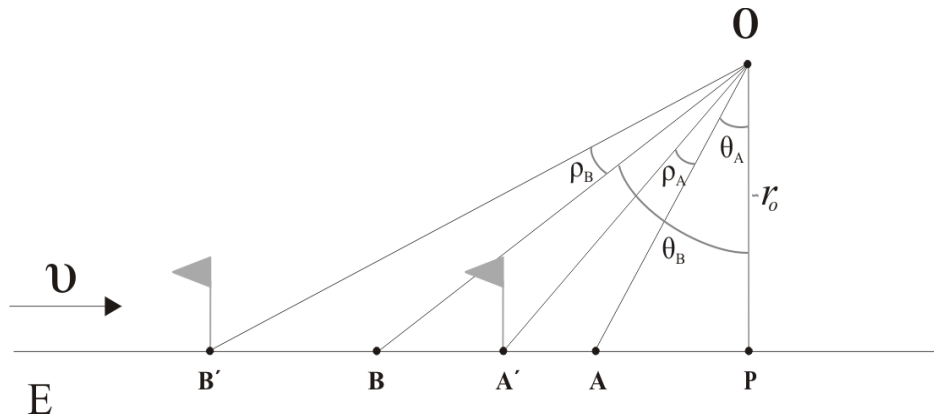


Figure 1.2.6

Let B' and A' the conjugates of B and A, respectively.

Then:
$$V_{ob} = \frac{B'A'}{T_{ob}} = \frac{B'A'}{BA} \cdot U$$

It also holds that: $\sin \rho_B = b \cdot \cos \theta_B$ and $\sin \rho_A = b \cdot \cos \theta_A$

And thus, finally we get:

$$V_{ob} = U \cdot \frac{\tan(\theta_B + \rho_B) - \tan(\theta_A + \rho_A)}{\tan \theta_B - \tan \theta_A}$$

And as $A'B' > AB$, it follows that $V_{ob} > U$ when the material point **approaches** the foot of the perpendicular.

Similarly, we can also calculate V_{ob} , when the material point **draws away** from P, between two random positions A' and B' (Fig. 1.2.7).

* In contrast to U_{ob} , which relates to measurements between **conjugate** positions.

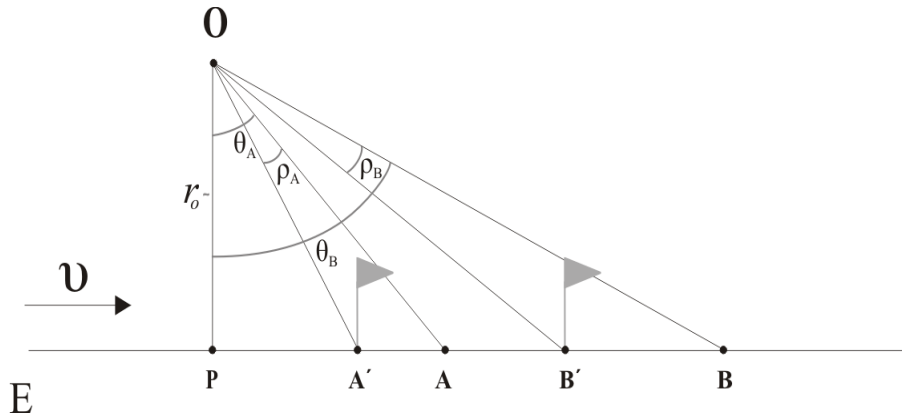


Figure 1.2.7

Let A' and B' the conjugates of A and B , respectively.

$$\text{Then: } V_{ob} = \frac{A'B'}{T_{ob}} = \frac{A'B'}{\frac{AB}{v}} = v \cdot \frac{A'B'}{AB}$$

And finally, we get:

$$V_{ob} = v \cdot \frac{\tan(\theta_B - \rho_B) - \tan(\theta_A - \rho_A)}{\tan \theta_B - \tan \theta_A}$$

And as $A'B' < AB \Rightarrow V_{ob} < v$, when the material point **draws away** from P .

At this point, the intriguing thought arises to examine what might happen when a thin, straight (mathematical) rod moves with uniform speed v , measured by the **LASC**, along straight-line E^* (Fig. 1.2.8).

Suppose that at time $t_0 = 0$, the rod is found at position A_0B_0 . Precisely at that moment, light signals are emitted from the start (head) B_0 and the end A_0 of the rod towards the Observer's position O .

* I have already made a mention to this at the end of the previous chapter, "elucidating" the source of the error of the Theory of Special Relativity. It is worth noting here the way Einstein's position is reversed, as in equations (I) and (II) of part 2 of his paper, he had considered r_{AB} to be a **constant magnitude, independent of the position of the moving rod** [...]

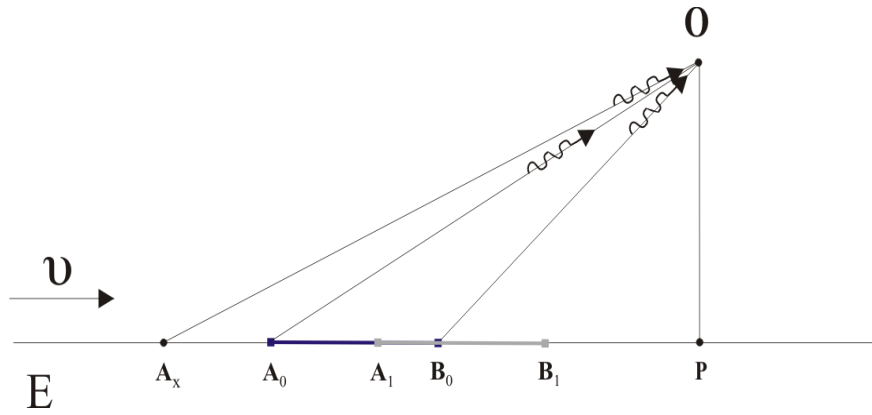


Figure 1.2.8

At the moment $t_1 = \frac{B_0O}{c} = \frac{B_0B_1}{v}$, the rod is found at position A_1B_1 and the signal from its head reaches O. In other words, the Observer at time t_1 , sees the start of the rod at B_0 (B_0 being the conjugate of B_1).

Where does the Observer see **n o w** (t_1) the end of the rod?

Obviously not in A_0 , because the "end" signal, emitted from A_0 at t_0 , **is still on its way** and has not yet reached O.

N o w (t_1), arrives at O the signal from a **previous end** position A_x , such that:

$$\frac{A_xO}{c} = \frac{B_0O}{c} + \frac{A_xA_0}{v} \quad (1.2.25)$$

Hence, **n o w** (t_1) the Observer sees the beginning (head) of the rod at B_0 and the end of rod at A_x . And as $A_xB_0 > A_0B_0$, we deduce:

A thin rod moving in a straight line with $v < c$, a p p r o a c h i n g the foot of the perpendicular, **appears to be and is measured e l o n g a t e d**.

In the same manner, we examine the case of the rod as it draws away (Fig. 1.2.9).

Suppose that at time $t_0 = 0$, the thin rod is found at position A_0B_0 and at that moment light signals are emitted from the end A_0 and the head B_0 of the rod towards O.

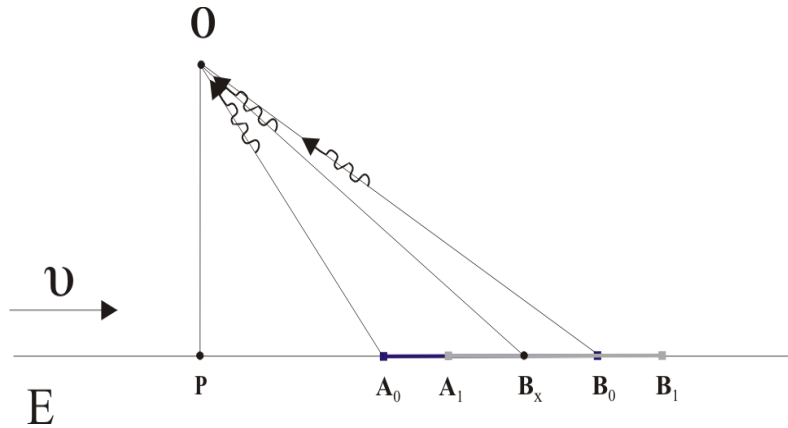


Figure 1.2.9

At time $t_1 = \frac{A_0O}{c} = \frac{A_0A_1}{v}$, the rod is found at position A_1B_1 and the signal from the end of the rod reaches O. In other words, the Observer, at time t_1 , sees the end of the rod at A_0 .

Where does the Observer see **n o w** (t_1) the beginning (head) of the rod?

Obviously not in B_0 , because the "start" (head) signal, emitted from B_0 at t_0 , **is still on its way**, and has not yet reached O.

N o w (t_1), the signal from a **previous "head"** position B_x arrives at O, such that:

$$\frac{B_xO}{c} = \frac{A_0O}{c} + \frac{B_xB_0}{v} \quad (1.2.26)$$

Hence, **now** (t_1) the Observer sees the beginning (head) of the rod at B_x and the end of rod at A_0 . And as $A_0B_x < A_0B_0$, we deduce:

A thin rod moving in a straight line with $v < c$, moving away from the foot of the perpendicular, appears to be and is measured contracted.

Of course, the above analysis presupposes **continuous** (and obstruction free) emission of light from the two distinct ends of the rod. In other words, it is not as yet **completely quantum** in nature.

Having thus proved that when the rod is approaching the foot of the perpendicular, it appears to be and is measured **expanded** and that when it is drawing away, it appears and to be and is measured **contracted**, how can the so called Lorentz Contraction, purporting that a moving rod **only contracts**, be valid?*

What we have shown happening **in reality**, is that "at either side" of the foot of the perpendicular, the "deformity" is reversed: **Expansion becomes contraction!**

Of course, I believe there's no need to refer at all to clocks. The apparent delay of the clocks' rhythm that manifests itself only during the drawing-away phase, is a direct consequence of the **delayed** arrival of information due to the finite speed of Light.** We are therefore before a Doppler-type effect. Here, I would like to emphasize that the equations of Harmonicity **differ** from the equations of the linear Doppler effect in as far as the distance OP is **in all cases** different from zero. Thus, when I speak about a linear Doppler effect, I refer to the equations that would be written by the RoT Observers.

Up until now, I have presented the Principles of the Uniform Translatory Motion **as it is measured by Humans**. As presented, those Principles never lead to contradictions nor do they make use of any kind of "magic". I will not tire you any longer. Those of you that have an interest can probe deeper into the subject, and carry-out the relatively simple calculations for the various sub cases such as, for example, for which position of the moving rod the "apparent" length of it will **equal to the true one**, etc.

I much rather deal with a different aspect of linear motion **with which, as far as I know, nobody has dealt with up until now** and which presents, in my opinion, enormous interest.

And I say enormous interest because, I believe, that this study will enable us to approach **and perhaps eventually comprehend** the deeper significance of the term "force" and particularly the term "gravitational force".

* I sincerely hope that, from all of the above, the proponents of the Theory of Special Relativity might have finally understood how **fundamentally** wrong this theory is.

** When a clock approaches the foot of the perpendicular, it shows a greater apparent frequency and when it draws away a smaller one. The above have nothing to do with the rate at which the clock ticks. It is a consequence of the delayed arrival of the information. Please note that the apparent frequency of the moving clock behaves in a **way similar** to the velocity V_{ob} ! When the clock approaches, ($V_{ob} > U$) and when it draws away, ($V_{ob} < U$).

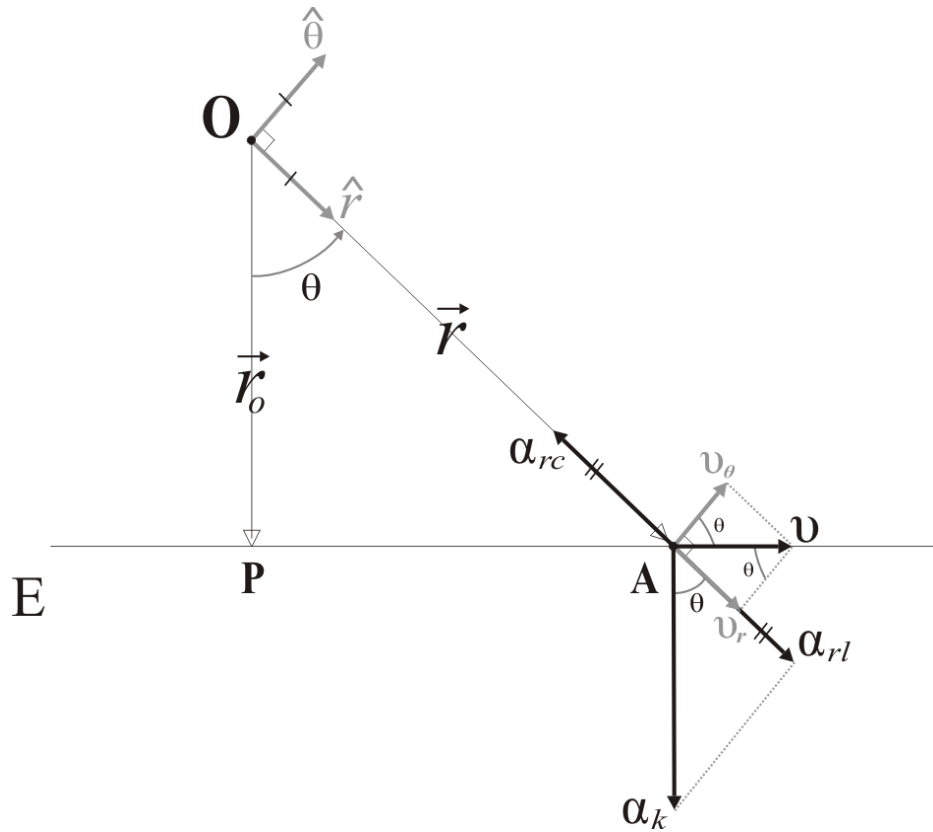


Figure 1.2.10

In the above figure, let us consider a material point moving on straight line E with constant speed v **measured with the LASC**. Let us suppose that v is so much smaller compared to the speed of light c ($v/c \rightarrow 0$), so that the position practically coincides with its conjugate.

I associate two unit vectors with the moving ray \bar{r} :

- I. \hat{r} , collinear with the moving ray.
- II. $\hat{\theta}$, perpendicular to the moving ray taking positive values as θ increases. Then:²⁷

$$\bar{v} = \frac{dr}{dt} \cdot \hat{r} + r \cdot \frac{d\theta}{dt} \cdot \hat{\theta} \quad (\text{a})$$

$$\frac{d\hat{r}}{dt} = \frac{d\theta}{dt} \cdot \hat{\theta} \quad (\text{b})$$

²⁷ Berkeley Physics Course, Vol. 1, "Mechanics", Kittel C., Knight W., Ruderman M., "Mechanics - Berkeley Physics Course", 2nd Edition, McGraw-Hill, Inc. USA, 1978.

$$\frac{d\hat{\theta}}{dt} = -\frac{d\theta}{dt} \cdot \hat{r} \quad (c)$$

Whereas the total acceleration (orbital) is:

$$\bar{a} = \frac{d\bar{v}}{dt} = \left[\frac{d^2 r}{dt^2} - r \cdot \left(\frac{d\theta}{dt} \right)^2 \right] \cdot \hat{r} + \frac{1}{r} \cdot \left[\frac{d}{dt} \cdot \left(r^2 \cdot \frac{d\theta}{dt} \right) \right] \cdot \hat{\theta} \quad (d)$$

Which we can write as:

$$\bar{a} = a_r \cdot \hat{r} + a_\theta \cdot \hat{\theta} \quad (e)$$

$$\text{where: } a_r = \frac{d^2 r}{dt^2} - r \cdot \left(\frac{d\theta}{dt} \right)^2 \quad (f)$$

and where the term $\frac{d^2 r}{dt^2}$ represents the linear radial acceleration (a_{rl}) i.e. the rate of change of the radial speed, while the term $-r \cdot \left(\frac{d\theta}{dt} \right)^2$ represents the centripetal acceleration (a_{rc}) due to U_θ . Currently, I will not deal with the term a_θ , which here is zero for every position A.

Of course, term a_r is also zero for every position A, so that the total acceleration in every position is zero. However, I am interested in resolving the term a_r into its two components, **which are equal and opposite in every position**, i.e. the linear radial $a_{rl} = \frac{d^2 r}{dt^2} = \frac{dv_r}{dt}$ is equal and opposite to the centripetal acceleration $a_{rc} = -r \cdot \left(\frac{d\theta}{dt} \right)^2$

The magnitude of U_r is: $U_r = U \cdot \sin \theta$

Whereas the rate of change of the magnitude U_r is: $\frac{dU_r}{dt} = U \cdot \cos \theta \cdot \frac{d\theta}{dt}$

If X is the abscissa of position A, then:

$$X = r_0 \cdot \tan \theta \quad \text{and} \quad \frac{dX}{dt} = \frac{r_0}{\cos^2 \theta} \cdot \frac{d\theta}{dt} \quad (1.2.27)$$

Therefore:

$$\frac{d\theta}{dt} = \frac{v \cdot \cos^2 \theta}{r_0} \quad (1.2.28)$$

Thus, by replacing $\frac{d\theta}{dt}$ in the equation of $\frac{dv_r}{dt}$, we have:

$$a_{rl} = \frac{dv_r}{dt} = \frac{v^2}{r_0} \cdot \cos^3 \theta \quad (1.2.29)$$

I now ask the hypothetical question:

As speed v_r represents the projection of velocity v on the moving ray, **which** is the "imaginary" acceleration, call it a_k , perpendicular on the path (so as to leave the magnitude of v unaffected), whose projection on the moving ray is a_{rl} ?

$$\text{Obviously, it would be: } a_k = \frac{a_{rl}}{\cos \theta} = \frac{v^2}{r_0} \cdot \cos^2 \theta \quad (1.2.30)$$

However, $\cos \theta = \frac{r_0}{OA}$, hence:

$$a_k = \frac{v^2 \cdot r_0}{(OA)^2} \quad (1.2.31)$$

Fundamental Conclusion:

The instantaneous "imaginary" acceleration, perpendicular on the path, whose projection on the moving ray gives the "real" linear radial acceleration of the material point, is inversely proportional to the square of the distance between the observed and the Observer at each position !!

Wait a minute! What is going on here?

Did we fall victims of a diabolical coincidence?

Have we discovered the theoretical base of Newton's law of inverse square?*

If loyal to our Projective ideas (i.e. considering straight lines as closed lines) we calculate a_k at the foot of the perpendicular, we get:

$$a_k = \frac{v^2}{r_0} \quad (1.2.32)$$

This happens to be the **real** acceleration in a (closed) circular orbit, with the Observer at its center, but with an opposite sign (centrifugal).**

Another diabolical coincidence!***

We have managed to calculate the acceleration in circular motion, working exclusively on a straight line. The **center** of this circular motion is the Observer!!

* Please be reminded that Newton's Law of inverse squares (Gravity) is entirely **empirical**. That is to say that J. Kepler discovered (by measuring) the elements of planetary orbits and then Newton explained the observed elements of orbits by **hypothesizing** the existence of an attraction "force" from the Sun, perpendicular to the orbit, whose magnitude **should** be inversely proportional to the squared distance of the planets from the Sun, with this "force", "implying" (!!) an acceleration which would both perpendicular on the orbit and inversely proportional to the squared distance of the planet from the Sun. To follow how Newton accomplished this feat, I refer you to the splendid book by David and Judith Goodstein, "Feynman's Lost Lecture, the motion of planets around the Sun". W.W. Norton and Co., 1996, California Institute of Technology.

** Of course, a_k results as centripetal if our previous analysis does not refer to a_{r1} , but its **equal and opposite** a_{rc} . Then, this a_k "points upwards" in Figure 1.2.10.

*** As I do not believe in coincidences, not even in diabolical ones, henceforth I shall call these cases "Bulk discoveries" and I define them either as "the unexpected discovery of a certain natural truth, which still remains incomprehensible", or as "the linking of natural magnitudes, at first glance irrelevant to each other, by a means that cannot be explained by any known theory". I believed that these cases are infrequent. I was proven wrong. We shall meet several in our course [...]

What is going on then?

I am not sure. I do, however, suspect the following possibilities:

- That the fundamental Problem of Physics is **purely Geometrical in nature** and that the concepts that we call "forces" could very well be simply **attributes of Space** (...pure Geometry in the most refined sense).

- That the essential reflection of modern Physics is very similar to the basic reflection of Ancient Greek Geometricians and more specifically **to the correlation between the straight line and the circumference** (mainly), a problem that preoccupied Archimedes and, a little later, in a more general sense, Apollonius of Perga.

- That the so called **law of inverse square** perhaps isn't a precise general law of Nature after all, but a rather **special, approximate sub case** of another, more general law, and valid only for small speeds ($v/c \rightarrow 0$).

- That the apparent primary "**gravitational acceleration**", at the foot of the perpendicular, is transformed to the more real "**inertial acceleration**" as is calculated at the circumference of circle with the Observer at its center.

- That the key for the solution to the problems of modern Physics is to be found in the **well hidden, unknown attributes of Light**, as a carrier of information (and interaction).

So far, we have studied the material point kinematics by calculating its **measurable** speed from an Observer's point of view, between two distinct **conjugate** positions A' and $A (v_{ob})$ as well as between two **random** (not conjugate) positions A' and $B' (v_{ob})$.

Thus, our study essentially concerned the calculation of an **average speed** between two distinct positions, where we placed our poles. If we now consider that the poles, found at two random positions, approach each other "*as near as we want*"*, then we can conceive the concept of the **instantaneous speed** U' of the conjugate position (Fig. 1.2.11).

* *This "as near as we want", utilized by Archimedes, Newton and Leibniz, seems feasible to the mind. In practice, however, it is impossible. The poles will always have a certain thickness. Therefore, we must be very cautious when we hear expressions such as this. The bottom line is that no matter how hard we try, "as near as we want" will never be achieved in reality. It is therefore obvious that the rebuttal to the aforementioned intellectual tricks is hidden in Zeno's "paradoxical" proposals. **And that's where the foundation of the Quantum Theory also lies.** The "diabolical coincidence" lies in the fact that both Archimedes, the founder of **infinitesimal calculus**, and Zeno of Elea, who first tackled the **Quantum Problem**, having lived at different times in Southern Italy, were influenced by the local Pythagoreans, whose considerations were not irrelevant to both the **Quantum Issue** and the **infinitesimal calculus** and who had "touched" **precisely** the source of the problem [...]*

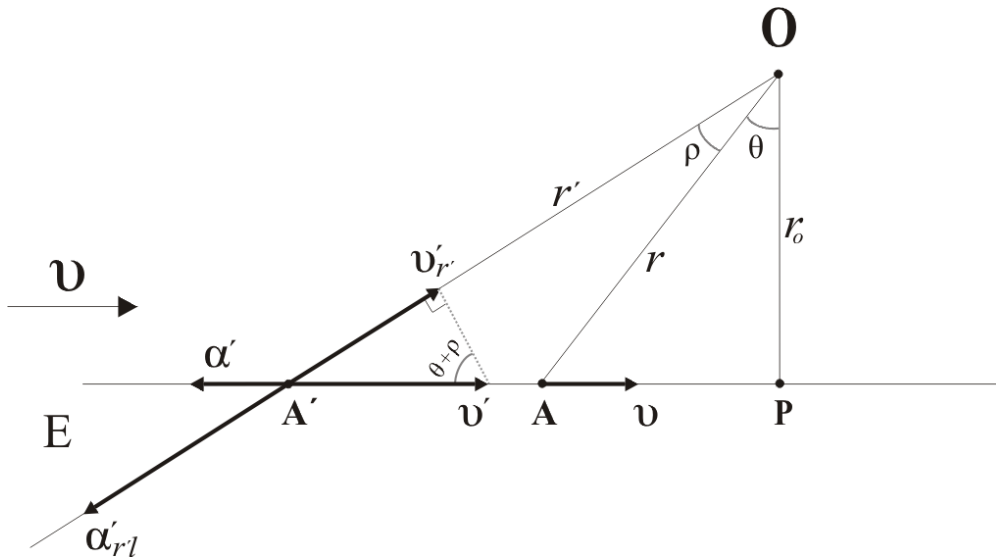


Figure 1.2.11

Symbols:

U = The speed of the particle, measured by **the LASC**.

U' = The **instantaneous** speed of the conjugate position A' .

a' = The instantaneous rate of change of the magnitude of speed U' , that is to say the **instantaneous acceleration** of the conjugate position A' at the direction of E.

$U'_{r'}$ = The perpendicular projection of U' **on the moving ray** of the conjugate position OA' (r').

$a'_{r'l}$ = The rate of change of the magnitude of speed $U'_{r'}$, that is to say the **linear radial acceleration** of the conjugate position A' .

It is obvious that the physical magnitudes that I presented above do not include all elements of the kinematics of conjugate position A' . There is still another component of U' , the speed $U'_{\theta'}$ perpendicular on the moving ray r' of the conjugate position, as well as other accelerations related with the two above components ($U'_{r'}$ and $U'_{\theta'}$) of speed U' .

These other accelerations (centripetal, Coriolis, and peripheral orbital), added-up as vectors with the radial acceleration $a'_{r'l}$, give the total acceleration a' . However, at this stage I do not use them and I focus on $a'_{r'l}$ alone, first to show, **at a preliminary stage**, the internal connection of the kinematics at the foot of the perpendicular with Maxwell's equations in vacuum and, secondly, to shed some light **also at a preliminary stage**, albeit somewhat obscurely, to the source of Heisenberg's Principle of Uncertainty.

Let X be the Cartesian abscissa of position A. Then, the corresponding abscissa of the conjugate position A' is:

$$X' = X - (A'A) \quad (1.2.33)$$

That is:

$$X' = X - b \cdot \frac{r_0}{\cos(\theta + \rho)} \quad \text{where } b = v/c \quad (1.2.34)$$

Therefore:

$$v' = \frac{dx'}{dt} = \frac{dx}{dt} - b \cdot r_0 \cdot \frac{\sin(\theta + \rho)}{\cos^2(\theta + \rho)} \cdot \frac{d(\theta + \rho)}{dt} \quad (1.2.35)$$

$$\text{But: } \sin \rho = b \cdot \cos \theta \Rightarrow \frac{d\rho}{dt} = -b \cdot \frac{\sin \theta}{\cos \rho} \cdot \frac{d\theta}{dt} \quad (1.2.36)$$

Thus equation (1.2.35) becomes:

$$v' = v - \frac{b \cdot r_0 \cdot \sin(\theta + \rho)}{\cos^2(\theta + \rho)} \cdot \left(1 - b \cdot \frac{\sin \theta}{\cos \rho} \right) \cdot \frac{d\theta}{dt} \quad (1.2.37)$$

and as $\frac{d\theta}{dt} = -\frac{v}{r_0} \cdot \cos^2 \theta$, it follows:

$$v' = v + b \cdot v \cdot \frac{\sin(\theta+\rho) \cdot \cos^2\theta}{\cos^2(\theta+\rho)} \cdot \left(1 - b \cdot \frac{\sin\theta}{\cos\rho}\right) \quad (1.2.38)$$

or

$$\frac{v'}{c} = b + b^2 \cdot \frac{\sin(\theta+\rho) \cdot \cos^2\theta}{\cos^2(\theta+\rho)} \cdot \left(1 - b \cdot \frac{\sin\theta}{\cos\rho}\right) \quad (1.2.39)$$

Which gives **the instantaneous speed of the conjugate position** as a function of v and the angle θ .

By placing: $y = \sin\theta = \sqrt{1 - \cos^2\theta}$ and $z = \cos\rho = \sqrt{1 - b^2 \cdot \cos^2\theta}$, (1.2.39) takes the elegant form:

$$\frac{v'}{c} = \frac{b}{z^2 - b \cdot y \cdot z} \quad (1.2.40)$$

or

$$\frac{v'}{c} = \frac{b}{1 - b^2 \cdot \cos^2\theta - b \cdot \sqrt{1 - \cos^2\theta} \cdot \sqrt{1 - b^2 \cdot \cos^2\theta}} \quad (1.2.41)$$

From (1.2.41), we have that: $\frac{v'}{c} > \frac{v}{c}$, and therefore we conclude:

Conclusion:

As the material point approaches the foot of the perpendicular, the shadow of the "being" is chasing the "being", approaching it also.

Calculating the acceleration of conjugate position A' (a')

From (1.2.40), we have:

$$\frac{1}{c} \cdot \frac{d\nu'}{dt} = -b \cdot (z^2 - b \cdot y \cdot z)^{-2} \cdot \left[2 \cdot z \cdot \frac{dz}{dt} - b \cdot y \cdot \frac{dz}{dt} - b \cdot z \cdot \frac{dy}{dt} \right] \quad (1.2.42)$$

But $\frac{dz}{dt} = -\frac{\nu}{r_0} \cdot \frac{y}{z} \cdot b^2 \cdot \cos^3 \theta$ (1.2.43) and $\frac{dy}{dt} = -\frac{\nu}{r_0} \cdot \cos^3 \theta$ (1.2.44)

therefore, by replacing in equation (1.2.42), we get:

$$a' = \frac{d\nu'}{dt} = -\frac{c^2}{r_0} \cdot \frac{b^3 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.2.45)$$

The projection of the speed ν' on the moving ray of the conjugate position (OA') is:

$$\nu'_{r'} = \nu' \cdot \sin(\theta + \rho) .$$

Therefore:

$$\frac{\nu'_{r'}}{c} = \frac{\nu'}{c} \cdot \sin(\theta + \rho) = b \cdot \sin(\theta + \rho) + b^2 \cdot \tan^2(\theta + \rho) \cdot \cos^2 \theta \cdot \left(1 - b \cdot \frac{\sin \theta}{\cos \rho} \right) \quad (1.2.46)$$

and after some algebra, we get:

$$\frac{\nu'_{r'}}{c} = \frac{1}{b} \cdot \frac{\nu'}{c} - 1 \quad (1.2.47)$$

Therefore: $\nu' - b \cdot \nu'_{r'} = \nu$ (1.2.48) or

$$\nu'_{r'} = \frac{\nu' - \nu}{b} \quad (1.2.48a)$$

And taking the derivative to the time, we have:

$$a'_{r'l} = \frac{d v'_{r'l}}{dt} = \frac{a'}{b} = -\frac{c^2}{r_0} \cdot \frac{b^2 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \frac{1}{b} \cdot \tan^3 \rho \quad (1.2.49)$$

This way, we have calculated some of the elements of **the conjugate position** motion, which, let us not forget, is also the subject of the **Physics of Humans**.

At first glance, what is impressive is that the above equations appear to be sufficiently elegant, which is an encouraging indication that we might be on the right track here as for many scientists, such as Paul Dirac, *beauty divulges truth*.

A first suspicion is that equations 1.2.45 and 1.2.49 have a "flavor" strongly reminiscent of the 3rd of Kepler's Laws and that compels us to continue probing a bit deeper.

Prior to proceeding, however, let us first examine what happens when the material point **draws away** from P.

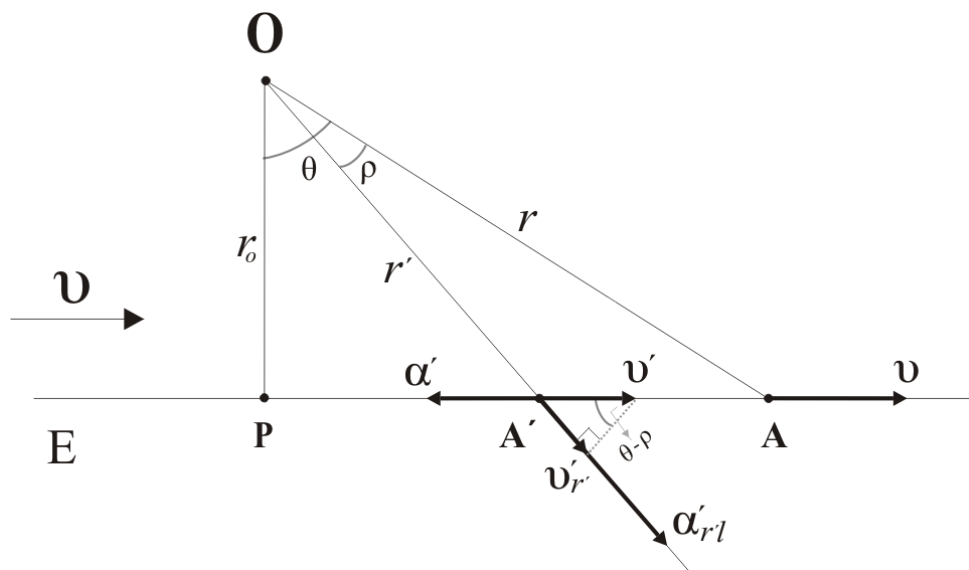


Figure 1.2.12

Suppose that A is the position, A' its conjugate and U the speed of the position measured with the LASC. According to what we've discussed so far, the application of the sine theorem on triangle OA'A leads to the equation:

$$\sin \rho = b \cdot \cos \theta \quad (1.2.50)$$

Furthermore, it is:

$$\frac{d\theta}{dt} = \frac{v}{r_0} \cdot \cos^2 \theta \quad (1.2.51) \quad \text{and} \quad \frac{d\rho}{dt} = -b \cdot \frac{\sin \theta}{\cos \rho} \cdot \frac{d\theta}{dt} \quad (1.2.52)$$

Working as above, we get:

$$v' = v - b \cdot v \cdot \frac{\sin(\theta - \rho) \cdot \cos^2 \theta}{\cos^2(\theta - \rho)} \cdot \left(1 + b \cdot \frac{\sin \theta}{\cos \rho} \right) \quad (1.2.53)$$

or

$$\frac{v'}{c} = b - b^2 \cdot \frac{\sin(\theta - \rho) \cdot \cos^2 \theta}{\cos^2(\theta - \rho)} \cdot \left(1 + b \cdot \frac{\sin \theta}{\cos \rho} \right) \quad (1.2.54)$$

and, by similarly substituting, $y = \sqrt{1 - \cos^2 \theta}$ and $z = \sqrt{1 - b^2 \cdot \cos^2 \theta}$, we are led to the elegant equation for v' :

$$\frac{v'}{c} = \frac{b}{z^2 + b \cdot y \cdot z} \quad (1.2.55)$$

or

$$\frac{v'}{c} = \frac{b}{1 - b^2 \cdot \cos^2 \theta + b \cdot \sqrt{1 - \cos^2 \theta} \cdot \sqrt{1 - b^2 \cdot \cos^2 \theta}} \quad (1.2.56)^*$$

* Please note that in the denominator of equation (1.2.56), the signs after the coefficient unit differ. Thus, in this case, we cannot, at first glance, decide whether v' is greater or less than v . We cannot, in other words, immediately decide whether the **shadow** of the "being" runs faster or slower than the "being". We will deal with the issue in detail below.

Calculating the acceleration of conjugate position A' (a')

From equation 1.2.55, we have:

$$\frac{1}{c} \cdot \frac{dV'}{dt} = -b \cdot (z^2 + b \cdot y \cdot z)^{-2} \cdot \left[2 \cdot z \cdot \frac{dz}{dt} + b \cdot y \cdot \frac{dz}{dt} + b \cdot z \cdot \frac{dy}{dt} \right] \quad (1.2.57)$$

$$\text{But } \frac{dz}{dt} = \frac{v}{r_0} \cdot \frac{y}{z} \cdot b^2 \cdot \cos^3 \theta \quad (1.2.58) \quad \text{and} \quad \frac{dy}{dt} = \frac{v}{r_0} \cdot \cos^3 \theta \quad (1.2.59)$$

therefore, by substituting in equation (1.2.57), we get:

$$a' = \frac{dV'}{dt} = -\frac{c^2}{r_0} \cdot \frac{b^3 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.2.60)$$

The above expression is identical to 1.2.45, i.e. the equation that applies in the case of **approaching** the foot of the perpendicular. The negative sign (–) indicates that the acceleration is negative (deceleration), in both cases examined.

The projection of V' on the moving ray (OA') is:

$$V'_r = V' \cdot \sin(\theta - \rho) . \text{ Therefore:}$$

$$\frac{V'_r}{c} = \frac{V'}{c} \cdot \sin(\theta - \rho) = b \cdot \sin(\theta - \rho) - b^2 \cdot \tan^2(\theta - \rho) \cdot \cos^2 \theta \cdot \left(1 + b \cdot \frac{\sin \theta}{\cos \rho} \right) \quad (1.2.61)$$

and, after some algebra, we get:

$$\frac{V'_r}{c} = 1 - \frac{1}{b} \cdot \frac{V'}{c} \quad (1.2.62)$$

$$\text{or} \quad V'_r = c - \frac{1}{b} \cdot V' \quad (1.2.63)$$

Therefore: $v' + b \cdot v'_{r'} = v$ (1.2.64)

or

$$v'_{r'} = \frac{v - v'}{b} \quad (1.2.64a)^*$$

By taking the time derivatives in equation 1.2.64, we have:

$$a'_{r'l} = \frac{dv'_{r'}}{dt} = -\frac{a'}{b} = +\frac{c^2}{r_0} \cdot \frac{b^2 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = +\frac{c^2}{r_0} \cdot \frac{1}{b} \cdot \tan^3 \rho \quad (1.2.65)$$

I will now examine the 3rd case in which the material point **draws away** from the foot of the perpendicular P, but the conjugate positions A and A' are found respectively **on either side**.

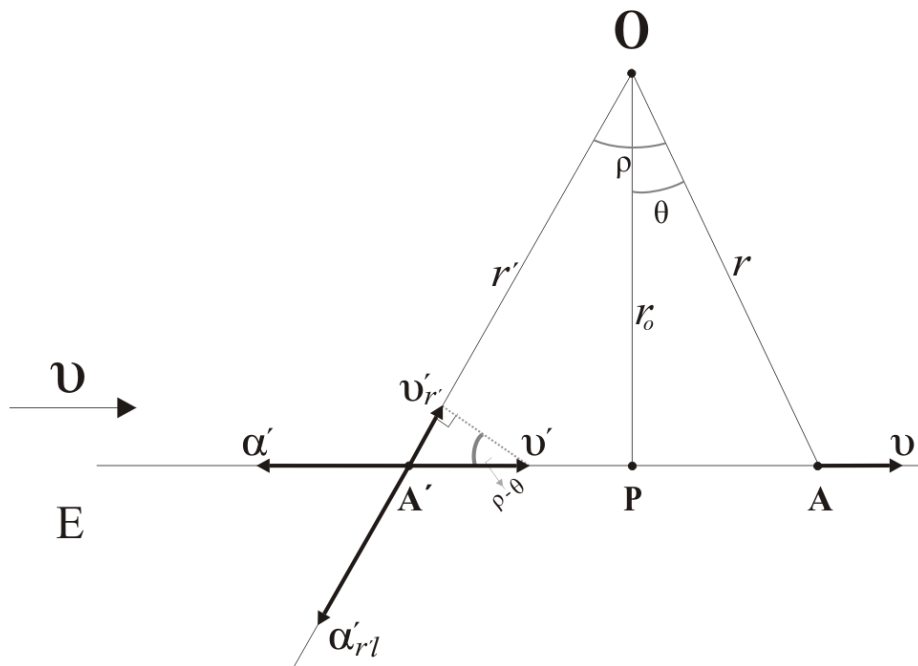


Figure 1.2.13

Following the same reasoning as above, we have: $\sin \rho = b \cdot \cos \theta$

* In equation 1.2.64 (or 1.2.64a) it appears at first sight that, during the **drawing-away phase** of the material point, always $v' < v$. Appearances however can deceive. We must **also** examine the case of the drawing-away phase, during which the two conjugate positions A and A' are found respectively **on either side** of the foot of the perpendicular.

It is also $X' = X - (A'A)$ That is: $X' = X - b \cdot \frac{r_0}{\cos(\rho - \theta)}$

Therefore, it follows:

$$v' = v - \frac{b \cdot r_0 \cdot \sin(\rho - \theta)}{\cos^2(\rho - \theta)} \cdot \left(\frac{d\rho}{dt} - \frac{d\theta}{dt} \right) \quad (1.2.66)$$

But $\frac{d\theta}{dt} = \frac{v}{r_0} \cdot \cos^2\theta$ and $\frac{d\rho}{dt} = -b \cdot \frac{\sin\theta}{\cos\rho} \cdot \frac{d\theta}{dt}$

Therefore:

$$v' = v + b \cdot v \cdot \frac{\sin(\rho - \theta) \cdot \cos^2\theta}{\cos^2(\rho - \theta)} \cdot \left(1 + b \cdot \frac{\sin\theta}{\cos\rho} \right) \quad (1.2.67)$$

or

$$\frac{v'}{c} = b + b^2 \cdot \frac{\sin(\rho - \theta) \cdot \cos^2\theta}{\cos^2(\rho - \theta)} \cdot \left(1 + b \cdot \frac{\sin\theta}{\cos\rho} \right) \quad (1.2.68)$$

By placing: $y = \sin\theta = \sqrt{1 - \cos^2\theta}$ και $z = \cos\rho = \sqrt{1 - b^2 \cdot \cos^2\theta}$ we have:

$$\frac{v'}{c} = \frac{b}{z^2 + b \cdot y \cdot z} \quad (1.2.69)$$

or

$$\frac{v'}{c} = \frac{b}{1 - b^2 \cdot \cos^2\theta + b \cdot \sqrt{1 - \cos^2\theta} \cdot \sqrt{1 - b^2 \cdot \cos^2\theta}} \quad (1.2.70)$$

Calculating the acceleration of conjugate position A' (a')

From (1.2.69), we get:

$$\frac{1}{c} \cdot \frac{d\nu'}{dt} = -b \cdot (z^2 + b \cdot y \cdot z)^{-2} \cdot \left[2 \cdot z \cdot \frac{dz}{dt} + b \cdot y \cdot \frac{dz}{dt} + b \cdot z \cdot \frac{dy}{dt} \right] \quad (1.2.71)$$

and working similarly as before, we get:

$$a' = \frac{d\nu'}{dt} = -\frac{c^2}{r_0} \cdot \frac{b^3 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.2.72)$$

The projection of ν' on r' is: $\nu'_{r'} = \nu' \cdot \sin(\rho - \theta)$, and therefore we get:

$$\nu'_{r'} = \frac{1}{b} \cdot \nu' - c \quad \Rightarrow \quad \nu' - b \cdot \nu'_{r'} = \nu \quad (1.2.73) \quad \text{or eventually:}$$

$$\nu'_{r'} = \frac{\nu' - \nu}{b} \quad (1.2.73a)$$

Finally, working as before, we have:

$$a'_{r'l} = \frac{d\nu'_{r'}}{dt} = \frac{a'}{b} = -\frac{c^2}{r_0} \cdot \frac{b^2 \cdot \cos^3 \theta}{(1 - b^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \frac{1}{b} \cdot \tan^3 \rho \quad (1.2.74)$$

This way, we have calculated the selected elements (ν' , a' , $\nu'_{r'}$, $a'_{r'l}$) of the motion of conjugate position A' **for all three cases.**

We observe that the mathematic expression of the last (3rd) case is similar to that of the 2nd case, the only difference being the signs of the relations yielding $U'_{r'}$ and $a'_{r'I}$.

Indeed, when the conjugate position crosses the PF*, $U'_{r'}$ **changes direction**.

What I must now seek is the when the speed of the conjugate position U' , **will equal** the speed of position U .

Obviously, the denominator of equations (1.2.56) and (1.2.70) must be equal to one, i.e.:

$$b \cdot \sqrt{1 - \cos^2 \theta} \cdot \sqrt{1 - b^2 \cdot \cos^2 \theta} = b^2 \cdot \cos^2 \theta \quad (1.2.75)$$

Thus, we get: $\cos \theta = \frac{1}{\sqrt{1 + b^2}}$ (1.2.76)

and therefore:

$$\tan \theta = b = \frac{U}{C} \quad (1.2.77) \quad \text{That is : } \rho = \theta \quad (1.2.78)$$

Fundamental Conclusion:

When the material point is already drawing away from the PF but appears to be located exactly at the PF, then the instantaneous speed of the conjugate position equals that of the position.

We observe and measure the material point as being at the PF and it is only then that the instantaneous speed U' is "correct", because right there it is equal to U . At that instant, however, the material point is not located at the PF.

* Henceforth, the perpendicular foot will be symbolized as PF for short.

SUMMARY

While the material point approaches the PF, the instantaneous speed U' of the conjugate position (while always remaining greater than U) decreases continuously. In other words, the **shadow** of the "being" approaches the "being" with a constantly decreasing speed as if it is applying the brakes. The moment the material point reaches position K, where the conjugate of K is the PF P (Fig. 1.1.5), the speed of the conjugate position U' equals the speed U of the position. As the drawing-away continues, speed U' becomes smaller than U , i.e. the distance between the "being" and its **shadow** increases, as its shadow continues to decelerate.

Thus, as in the case of U_{ob} , U' **does not present symmetry** at either side of the PF.

More specifically:

When the particle is **approaching** the PF, U' is always **greater than** U .

When, however, the particle is **drawing away**, U' is:

1. **Greater than** U ($U' > U$) when $\tan\theta < \frac{U}{C}$
2. **Equal to** U ($U' = U$) when $\tan\theta = \frac{U}{C}$
3. **Smaller than** U ($U' < U$) when $\tan\theta > \frac{U}{C}$

On the other hand, acceleration a' is **symmetrical at either side of the PF**, i.e. has the same value for symmetrical positions to P, while remaining continuously negative (deceleration), whereas the acceleration $a'_{r'l}$, for symmetrical positions at either side of P, has the **same magnitude but opposite sign**.

Important Remark:

1. During the **approach phase** to the PF, U' is given by (1.2.41). However, by taking (1.2.7) into consideration, it follows that:

$$U' = \frac{U_{ob}}{\sqrt{1 - b^2 \cdot \cos^2 \theta}} \quad (1.2.79)$$

2. During the **drawing-away phase** from the PF, U' is given by equations (1.2.56) and (1.2.70). However, considering (1.2.14) and (1.2.21), it also follows that:

$$U' = \frac{U_{ob}}{\sqrt{1 - b^2 \cdot \cos^2 \theta}} \quad (1.2.80)$$

Conclusion:

In **every** case and at **every** position, it holds that:

$$U' = \frac{U_{ob}}{\sqrt{1 - b^2 \cdot \cos^2 \theta}} \quad (1.2.81)$$

Where U' is the **calculated value** of the instantaneous speed of the conjugate position (shadow) and U_{ob} is **the measurable value** of the conjugate position (shadow) speed between **two distinct** marks at a finite distance from each other, one of which has been placed at the position and the other at its conjugate. Thus, the instantaneous speed U' of the conjugate position (shadow) is **ALWAYS** greater than U_{ob} , i.e. the measurable speed of the conjugate position.

Thus, once again, it appears that **noetic perception differs from sensory perception**. Speed U' is a purely “noetic” magnitude (as poles have thickness and "moments", in practice, **cannot have** zero duration), whereas U_{ob} is a magnitude which can be approached with the senses, i.e. **it can be measured in practice!**

The analysis presented above leads us to the conclusion that, if we practice the Physics of Humans, we ought to realize that there are limits in the abilities as well as in the reliability of the infinitesimal calculus. The statement "*as near as we want*" was and remains a wishful desire.

Of course, the main emerging question is **how** to define "limits" and **what** those "limits" ultimately depend upon. However, this fundamental question is not possible to be answered, at least for the time being. Let me simply note that, as a first practical restriction, you cannot further "slice the salami", when the remaining piece of salami is **thinner than the knife's blade**.

Thus, our question becomes one about "knives" and "blade thicknesses".

It is obvious that we have already "dipped both feet" well into the Quantum Problem, which of course the Theory of Special Relativity entirely ignored...

Let us now examine certain **special cases** which present particular interest.

1. At the PF ($\theta = 0$), the equation (1.2.81) becomes:

$$U' = \frac{U_{ob}}{\sqrt{1 - \frac{U^2}{c^2}}} \quad (1.2.82)$$

But, based on (1.1.9), at the PF U_{ob} is:

$$U_{ob} = \frac{U}{\sqrt{1 - \frac{U^2}{c^2}}}$$

By dividing equations (1.2.82) and (1.1.9) sidewise, we get:

$$\frac{U'}{U_{ob}} = \frac{U_{ob}}{U} \Rightarrow U_{ob}^2 = U \cdot U' \quad (1.2.83)$$

This sequence of relations (1.1.9) and (1.2.82) reminds us of a fractional structure (e.g. onion, fractals), or the traditional Russian nesting dolls (Babushkas): The relation of U' with U_{ob} is the same as the relation of U_{ob} with U .*

Conclusion :

At the PF, U_{ob} is the **geometric mean** (inner ratio) of U and U' .

Here, it seems, Nature is trying to reconcile things by telling us:

“What you measure with your real poles (if placed at conjugate positions) and with your real clock (U_{ob}), is the geometric mean of what you perceive (U) and what you calculate, or... believe you can measure (U')”.

2. Having realized that the magnitude of the orbital acceleration a' is **always less** than the measure of the linear radial acceleration $a'_{r'l}$, I now ask the question:

When does orbital acceleration a' constitute the **vertical (perpendicular) projection** of the linear radial acceleration $a'_{r'l}$ on straight line E?

At each position, we have: $a' = \pm b \cdot a'_{r'l} \quad \left(b = \frac{v}{c} < 1 \right)$

Thus, the above relations of the two accelerations are position independent.

Having posed the question, I now probe the existence of a **special position**, such that these two magnitudes are connected via a perpendicular projection.

For such a position, there should be:

$$\sin(\theta + \rho) = b \quad (1.2.84) \quad (\text{See Fig. 1.2.11}).$$

And for $b \neq 1$ ($v \neq c$), equation (1.2.84) has as solution: $\cos\theta = 1$, $\theta = 0$.

Fundamental Conclusion :

When the material point is located at the PF ($\theta = 0$), then the orbital acceleration of conjugate position (a') is the perpendicular projection of the linear radial acceleration ($a'_{r'l}$) on straight line E. (Fig. 1.2.14)

* By such semblances with "Babushkas", certain authors are led to speculate on the existence "Worlds within Worlds". I do not consider these speculations valid. There is, I believe, but a single World, and the fact that **the structures are fractionally repeated** (fractals) is not proof of the existence of many worlds.

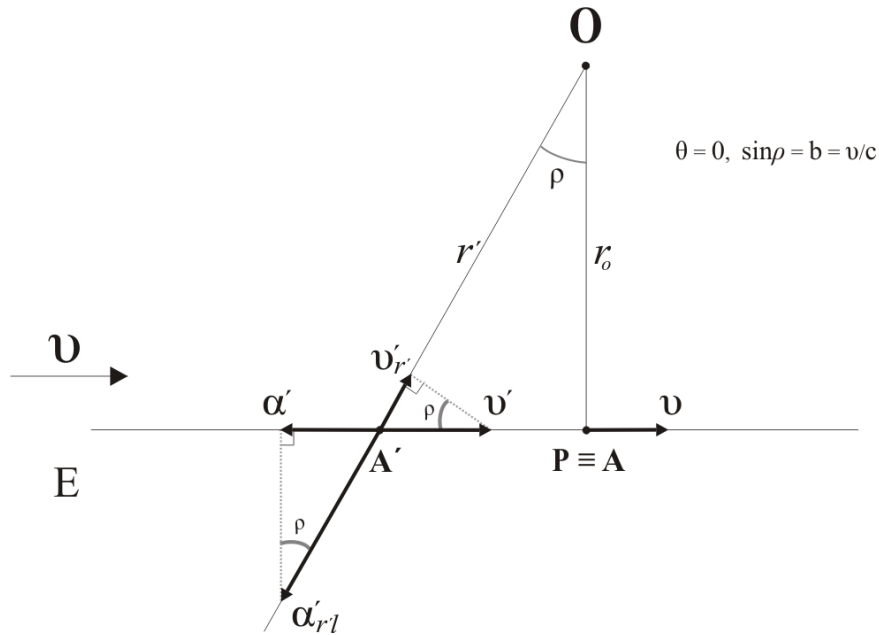


Figure 1.2.14

In other words, at **this special position**, accelerations a' and $a'_{r'l}$ "relate" to each other in a similar fashion to that of velocities $v'_{r'}$ and v' . We observe that spatial triangle $OA'A$ as well as the triangles of the velocities and the accelerations **are all similar**.

However, something truly **amazing** also happens:

In these last two triangles, functions do not correspond (are not homologous) to their derivatives, but one function corresponds (is homologous) to the derivative (with relation to time) of the other!

That is to say, v' with $a'_{r'l}$ (and not a') are the homologous sides of the similar triangles as are $v'_{r'}$ with a' (and not $a'_{r'l}$). This **reverse interweaving** of one function with the derivative (relative to time) of the other, which I consider fundamental, will keep us busy a lot later. That is why I point it out here.*

* Those claiming that they can "catch the scent" of Maxwell's equations here, are right. Indeed, two out of the four of Maxwell's equations in vacuum are: $\text{curl} \bar{B} = \epsilon_0 \cdot \mu_0 \cdot \frac{\partial \bar{E}}{\partial t}$, $\text{curl} \bar{E} = -\frac{\partial \bar{B}}{\partial t}$.

Where the partial derivative of the intensity of the electrical field (\bar{E}) to time, determines the spinning (rotation) of the magnetic field induction (\bar{B}), whereas the partial derivative of the magnetic field induction (\bar{B}) to time, determines the spinning (rotation) of the electrical field intensity \bar{E} .

Perhaps now it becomes clearer, for an astute reader, why it is that the mathematical formulation of the Theory of Special Relativity, is valid **only** at the PF.

The **topological correlation** of these two similar triangles is also very interesting:

We notice that, as long as these triangles remain on their plane, **it is impossible** to rotate them in such a way so that their homologous sides become parallel. It is **also impossible** to arrange them in a fashion where, if two equal angles coincide (e.g. the right ones), the opposite sides become parallel. To make this possible, one triangle should **"come out" of its plane and be spatially rotated at an angle of π ***.

Thus, these two similar triangles are connected:

a. By a **Spatial Rotation** at an angle of π (inversion).

b. By **Planar Rotation** at an angle of $\frac{\pi}{2} + \rho$.

c. By a **Homology** of ratio: $\lambda = \frac{a'_{r'l}}{v'} = \frac{a'}{v'_{r'}} = -\frac{v}{r_0} \cdot \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ (1.2.85)

We observe that the magnitude of the homology ratio $|\lambda|$ has units of frequency.

What is therefore its physical meaning?

Let us "freeze the picture" precisely at the moment the material point is located at the PF. Previously, we've shown that motion on a straight line and at that point (PF) **for the specific Observer** is identical, from a dynamic point of view, with motion on a circumference having the Observer located at its center. Therefore, for this circular movement, the angular velocity would be:

$$\omega = \frac{v}{r_0} \quad (1.2.86)$$

Thus the ratio of the homology equals an angular velocity of:

* Please pay particular attention to this observation! It will be much needed later for optimal comprehension of the **"spin"** concept.

$$\omega' = \frac{\omega}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.2.87)$$

and if ν is the frequency, we get a “transformed” frequency:

$$\nu' = \frac{\nu}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (1.2.88)$$

We can therefore understand where lies the root of the erroneous proposals of the Theory of Special Relativity concerning the clocks’ frequency:

Einstein, in his painstaking effort to achieve **a dynamic agreement between** Maxwell’s Electromagnetism and Newton’s Mechanics **arbitrarily considered “what is” (A) to be identical with what “appears to be” (A’)**. This is ENTIRELY wrong! The senses see and measure **only** A’ while the intellect comprehends **only** A.

The penalty for this arbitrary identification is the ensuing gross insult on Reason with claims about "the change in the rhythm (delay) of the clocks" and so on.... SOLELY on the account of uniform translatory motion!

[At this point, let me open a parenthesis as, already from the previous chapter, I feel I owe you an explanation on how Hermann Minkowski, misled by Einstein's erroneous conception, arrived at the rather monstrous concept of the "Space-Time".

Let us simply observe (in Fig. 1.2.14) that the triangle formed by the Observer, position A and its conjugate position A’, is a right one. Thus, specifically in the case where the moving material point is located at the PF, the information (or stimulation, or interaction, or light) travels along the hypotenuse A’O, while matter travels along the perpendicular A’A. According to Einstein’s erroneous conception however, (**arbitrarily** identifying “**what is**” with what “**appears to be**”), the information (or stimulation or interaction or light) travels on the other perpendicular AO.

These three ways are connected with the Pythagorean Theorem:

$$(A'O)^2 = (A'A)^2 + (AO)^2 \quad (1.2.89)$$

Thus what did Minkowski really do by creating the concept of the Space-Time?

He served us, reheated ...the Pythagorean Theorem!

We also observe that the ratio of the two "correlated" light paths $\frac{AO}{A'O}$, which according to the Theory of the Harmonicity of the Field of Light are not considered "simultaneous" **but successive**, is none other than the ratio of two successive paths of matter $\frac{PK}{P'P}$ of

Fig. 1.1.5, in other words, the Lorentz Contraction Coefficient $\sqrt{1 - \frac{v^2}{c^2}}$.

I believe I have said enough.

I am sure that henceforth, the thinking reader does not need any further clarifications. The issues, as presented so far, speak for themselves. From now on, it is up to the historian-physicist of the future to provide a plausible explanation as to **what really caused** the scientific "mass delusion" that overwhelmed Physics of the twentieth century, as a result of an unfortunate Theory...

For now, I shall restrict myself to reminding the reader that, so far, **no one has ever presented a persuasive argument to scientifically support that "Time" is an additional dimension, so that the "Space-Time" concept can make some sense.**

And to emphasize that Einstein is certainly not responsible for what followed.*

Einstein, in his time, influenced by the contemporary quest for a fundamental natural interpretation of the Lorentz Contraction Coefficient, simply provided a **mathematical interpretation** by tailoring a mathematical "Cinderella's slipper" to fit on the foot of Theoretical Physics. The fact that Theoretical Physics did not manage to remove the slipper **that kept it from walking straight for an entire century**, is certainly not Einstein's responsibility, but that of modern Theoretical Physics and its aficionados...]

* *Hermann Minkowski, Einstein's professor of Mathematics at the Technical University of Zurich, came up first with the concept of the "Space-Time", and Einstein, a young and unknown researcher at the time he originally published the Theory of Special Relativity, simply accepted it. Of course, the rumors have it that Minkowski, who did not think too highly of his student, was totally astonished with the fast glory Einstein acquired with his revolutionary Theory. It appears therefore that the professor, rather envious of his student's glory, "felt compelled" to create a ground breaking discovery for himself and thus created the monstrous concept of "Space-Time", by "misappropriating" purely a **Space** property, i.e. the Pythagorean Theorem [...]*

From special cases **1** and **2** mentioned above, we realized that:

When the material point (MP) **is located** at the PF, the orbital acceleration (a') “relates” to the linear radial acceleration ($a'_{r'l}$) the same way that the radial ($U'_{r'}$) speed “relates” to the orbital (U') speed. Moreover, we realized that when the material point **appears to be** at the PF, the conjugate position’s speed (U') is equal to the speed of the position (U).

Hence, without considering this as an exaggeration, we could claim that:

- When the MP **is located** at the PF, we have a **Dynamic Accord**.
- When the MP **appears to be** at the PF, we have a **Kinematic Accord**.

I believe it is fairly easy for one to realize that **there is no such position** where it is possible to simultaneously have **both** a dynamic and a kinematic accord.*

3. I now ask the question:

When the material point **is located at** the PF, what must be its speed U so that the instantaneous speed of its conjugate position (shadow) U' , **equals the speed of light?**

From equation (1.2.41), for $\theta = 0$, we have:
$$\frac{U'}{C} = \frac{b}{1-b^2} \tag{1.2.90}$$

Consequently, in order for U' to **equal** C , it must be:

$$b = \frac{U}{C} = \frac{\sqrt{5}-1}{2} = 0,618033988..... = \text{Golden Section (GS)}$$

Therefore, when U is equal to the **Golden Section** of the speed of light, then U' equals the speed of light (always at the PF). Here is still one more unequivocal manifestation of Harmony in Nature!...

* Those claiming that they can "catch the scent" of the Principle of Uncertainty are not too far off-base. However, we will deal with that issue later on. In short, what we are dealing with here is none other than what has been obvious to the Common Sense for centuries now: "You can't have the pie **and** eat it", and this big truth should never be forgotten when we deal with *Quantum Physics*.

The Golden Ratio has always been related to Beauty* .

Many famous artists have utilized this Divine (Golden) ratio in their works. The Parthenon in the Acropolis of Athens is full of golden sections, something that can also be found in the works of many great artists such as Leonardo da Vinci and Michelangelo.

Also from equation (1.2.48), for $b = GS$, results $U'_{r'} = U$.

$$\text{And because } U_{ob}^2 = U \cdot U' \Rightarrow U_{ob} = \sqrt{b} \cdot C = \sqrt{G.S.} \cdot C$$

Thus, in this case, the various speeds are arranged as follows:

$$U = U'_{r'} = (G.S.) \cdot C < U_{ob} = \sqrt{G.S.} \cdot C < U' = C$$

And while at this point, where the MP is located at the PF, I take this opportunity to return to Einstein's historical article (*“On the Electrodynamics of moving Bodies”*) and permanently eradicate all the conjuring tricks of the Theory of Special Relativity, such as **"tinkering" with the clocks' rhythm**, located at the tips A and B of the moving rod, in order to synchronize them...

We, on the contrary, shall succeed in synchronizing the moving clocks A and B to each other, **without interfering with their rhythm**, i.e. without having to resort to formulating contradictory proposals like this:

*“Clocks in rectilinear uniform translatory motion, delay due to their motion **and only because of that, although said motion is relative”**”.*

Our tool of course in this endeavor, will not be “Human Physics” in which, as we’ve previously shown, the validity of the above statement of the Theory of Special Relativity has already been rejected.

* *In the human body, when the height of the navel from the ground is the golden section of the total height of the body, then the body is considered as having ideal (harmonious) proportions. There are many more such golden ratios in the human face and body, proving that the Creator has "taste" and is an excellent artist.*

In the World of Mathematics, the Fibonacci sequence, which lately has become fashionable due to the

Stock Exchange technical analysis, approaches the ratio: $\frac{n_{οστος}}{(n+1)_{οστος}} = \text{Golden Section}$

Instead, we shall utilize the Physics of the RoT Observers, just as Einstein himself did subconsciously; we shall also employ the necessary idealizations, just as he did, so that we can show (within this idealized framework) that the Problem he presented with his historical article is **susceptible to yet another solution, not involving "intervention" to the moving clocks' rhythm and not leading to contradictions.**

This analysis is presented here and not in the Chapter 1, because the study of Chapter 2, so far, has already provided us with all the required mathematical and conceptual "gear".

Let us remember, therefore, from equation (1.2.90), that when the MP is at the PF, the conjugate position A' (shadow) has an **instantaneous** speed of:

$$v' = \frac{v}{1 - \frac{v^2}{c^2}} \quad (1.2.90a) \quad (\text{in "Human Physics"}).$$

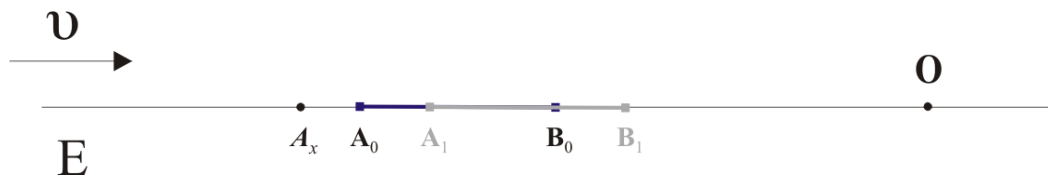


Figure 1.2.15

Consider (Fig. 1.2.15) a thin rod of length l , measured in its own system, which moves with speed v , ($v < c$), measured with the **LASC** and approaching the RoT Observer at O. Suppose that at time $t_0 = 0$, the rod is at position A_0B_0 and light signals are emitted from its two tips towards the Observer O.

At time $t_1 = \frac{B_0O}{c} = \frac{B_0B_1}{v}$ the rod is at position A_1B_1 , the light signal from tip B_0 **reaches** O, whereas the light signal from tip A_0 **has not yet reached** O, being still on its way.

Now (t_1), a **previous** light signal reaches O, emitted when tip A was located at position A_x , preceding A_0 , so that:

$$\frac{A_x A_0}{v} = \frac{A_x B_0}{c} \quad (1.2.91)$$

Therefore:

$$A_x B_0 = \frac{c}{v} \cdot A_x A_0 = \frac{c}{v} \cdot (A_x B_0 - l) = \frac{c}{v} \cdot A_x B_0 - \frac{c}{v} \cdot l$$

or

$$A_x B_0 = \frac{\frac{c}{v} \cdot l}{\frac{c}{v} - 1} = \frac{l}{1 - \frac{v}{c}}$$

In other words, the length of the rod as "**measured**" and "**seen**"* by the RoT Observer O when the rod **approaches** him is:

$$l_{approaching} = \frac{l}{1 - \frac{v}{c}} \quad (1.2.92)$$

Consequently, the **approaching rod appears to be and is measured expanded**.

In a similar fashion, we can calculate the **apparent** length of the rod when it **draws away** from the RoT Observer.

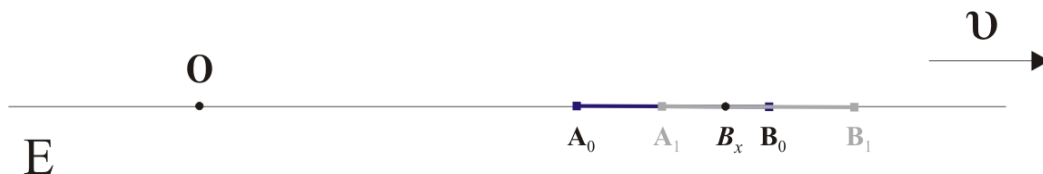


Figure 1.2.16

* Of course all that happens in our mind. The Observer O, located **precisely on** straight line E, does not see a rod but a point. However, these idealizations are made necessary by analogous idealizations in Einstein's paper, which also utilizes RoT Observers who, of course, **do not exist in Nature**.

At $t_0 = 0$, (Fig. 1.2.16), the rod of length l measured in its own system, is at position A_0B_0 and its two tips emit light signals towards the RoT Observer at O. The speed of the rod, measured by the **LASC**, is v ($v < c$).

At $t_1 = \frac{A_0O}{c} = \frac{A_0A_1}{v}$, the rod is at position A_1B_1 and the light signal from A_0 reaches O.

The signal from B_0 is still on its way.

Now (t_1), the signal emitted when tip B was at a previous position B_x , arrives at O so that:

$$\frac{B_x B_0}{v} = \frac{B_x A_0}{c} \quad (1.2.93)$$

Therefore:

$$B_x A_0 = \frac{c}{v} \cdot B_x B_0 = \frac{c}{v} \cdot (l - B_x A_0) = \frac{c}{v} \cdot l - \frac{c}{v} \cdot B_x A_0$$

or

$$B_x A_0 = \frac{\frac{c}{v} \cdot l}{1 + \frac{c}{v}} = \frac{l}{\frac{v}{c} + 1} = \frac{l}{1 + \frac{v}{c}}$$

In other words, the length of the rod as "**measured**" and "**seen**" by the RoT Observer O when the rod **draws-away** from him is:

$$l_{drawing - away} = \frac{l}{1 + \frac{v}{c}} \quad (1.2.94)$$

Thus, the **rod that draws-away appears to be and is measured contracted**.

We observe that the above two conclusions are also true in "Human Physics" (Theory of Harmonicity), with the **fundamental difference** that there, the apparent lengths of the rod are **variable** and dependent on the distance of the rod from the Observer*.

We are now ready to delve a bit deeper into the "thornier" issues of the controversial Einstein paper "*On the Electrodynamics of moving Bodies*"**

In that paper, Einstein **defined precisely the position of the moving Observers**, at the tips A and B of the moving rod, but he **did not define, with similar precision, the position of the Observer in the stationary system.**

He simply vaguely mentions that a certain Observer, located in the stationary system, "*ascertains at what points of this stationary system the two ends of the rod to be measured are located at a definite time*". Thus, in Einstein's paper, the Observer in the stationary system **does not have a clearly defined position during the experiment.**

As Einstein's experiment has two separate stages:

1. The stage where light and matter (the rod) move in the **same direction**, i.e. light travels towards the mirror (from A to B),
and
2. The stage where light and matter (the rod) move in **opposite directions**, i.e. light returns from the mirror (from B to A),

we must, following the directives of the Principle of Relativity of Linear Motion, position the Observer of the stationary system in the experiment, **so that he sees exactly what the moving Observers A and B** also see.

Thus, during stage 1 of the experiment, when the light traveling in the same direction as the rod "chases" the mirror, the moving Observers see the matter of the stationary system (matter on axis X) moving **opposite to the light carrying the information.** Consequently, in stage 1 of the experiment, the Observer of the stationary system ought to be seeing the moving rod (matter) **drawing-away** from him, so that the light (bringing him the information) to move **in opposite direction** to the rod (matter).

* See p. 108, 109, 110.

** See reference starting on p. 81 at the end of the 1st Chapter.

Also, during stage 2 of the experiment, where the light reflected on the mirror travels in opposite direction to the rod, the moving Observers see matter of the stationary system (“matter” of the X axis) moving **in the same direction with the light carrying the information**. Consequently, in stage 2 of the experiment, the Observer in the stationary system ought to see the moving rod (matter) **approaching** him, so that the light bringing the information to him moves **in the same direction** to the rod (matter)*

THEREFORE:

1st stage of the experiment: The rod draws-away from the RoT Observer.

Applying equation (I) of Einstein's paper, we get:

$$t_B - t_A = \frac{l_{drawing-away}}{c - v} = \frac{l}{\left(1 + \frac{v}{c}\right) \cdot (c - v)} = \frac{\frac{l}{c}}{\left(1 + \frac{v}{c}\right) \cdot \left(1 - \frac{v}{c}\right)} \Rightarrow$$

$$t_B - t_A = \frac{\frac{l}{c}}{1 - \frac{v^2}{c^2}} \quad (1.2.95)$$

2nd stage of the experiment: The rod approaches the RoT Observer.

Applying equation (II) of Einstein's paper, we have:

$$t'_A - t_B = \frac{l_{approaching}}{c + v} = \frac{l}{\left(1 - \frac{v}{c}\right) \cdot (c + v)} = \frac{\frac{l}{c}}{\left(1 - \frac{v}{c}\right) \cdot \left(1 + \frac{v}{c}\right)} \Rightarrow$$

$$t'_A - t_B = \frac{\frac{l}{c}}{1 - \frac{v^2}{c^2}} \quad (1.2.96)$$

* If there's an objection to the fact that I have introduced the system axis X as a **material axis** and not as a mathematical one, let me just say that the motion of matter has a meaning **only** as a motion relative to other matter, **and not** relative to some mathematical "system" that exists only in our mind.

Fundamental Conclusion:

**The moving clocks located at the tips A and B of the rod
ARE INDEED SYNCHRONIZED!**

Therefore:

- The cause that led to the birth of the Theory of Special Relativity exists no more!
- The cause that led Special Relativity to rape and abolish Logical Reasoning exists no more!
- The cause that led Special Relativity to its merciless assault against Common Sense exists no more!

Let us hope that from now on, the numerous proponents of this Theory will cease to "violate" the memory of Aristotle, the father of Scientific but also Logical Reasoning.

Verification:

The Total time of the experiment **measured by the RoT Observer** of the stationary system is:

$$t_{total} = t_B - t_A + t'_A - t'_B = \frac{2 \cdot \frac{l}{c}}{1 - \frac{v^2}{c^2}} \quad (1.2.97)$$

Within this time, tip A of the rod traveled from A to A₂ (Fig. 1.1.12).

Thus tip A of the rod (and consequently the entire rod) traveled the length:

$$S = v \cdot t_{total} = \frac{2 \cdot l \cdot \frac{v}{c}}{1 - \frac{v^2}{c^2}} \quad (1.2.98)$$

The Total time of the experiment measured by the moving observers A and B is:

$$T = \frac{2 \cdot l}{c} \quad (\text{consequence of Einstein's 2nd hypothesis}).$$

It is, however, clear that the difference in total experiment time as measured by the Observer of the stationary system and the ones moving with the rod, **is not due to differences in the rhythm of the clocks of the two systems**. Simply, the two kinds of observers **measure different events** (see Chapter 1).

Specifically, the moving Observers measure the phenomenon **directly**, whereas the Observer of the stationary system, located **at some (non-zero horizontal) distance from the rod** (although at a zero vertical distance from its path), measures the phenomenon **with some delay**. That is to say, he measures a phenomenon that corresponds to the conjugate positions of the moving rod, i.e. the conjugate positions relative to the RoT Observer. A direct result of this is the fact that the time of the phenomenon, as measured by the Observer of the stationary system, is **greater** than the time measured by the moving Observers.

However, I repeat, that the two kinds of Observers DO NOT MEASURE THE SAME PHENOMENON!

The **apparent** speed of the stationary system, relative to the moving one is:

$$v' = \frac{S}{T} = \frac{2 \cdot l \cdot \frac{v}{c}}{\left(1 - \frac{v^2}{c^2}\right) \frac{2 \cdot l}{c}} = \frac{v}{1 - \frac{v^2}{c^2}} \quad (1.2.99)$$

which is none other than the instantaneous speed of the conjugate position when the position is at the Foot of the Perpendicular! (Equation 1.2.90a of the Theory of Harmonicity).

Hence, we observe that the mathematical formulation of the Physics of the "RoT Observers" coincides with the mathematical formulation of Human Physics, **ONLY** at the Foot of the Perpendicular, **in exactly the same fashion** that the mathematical formulation of the Theory of Special Relativity, coincides with the mathematical formulation of the theory of Harmonicity **ONLY** at the Foot of the Perpendicular.

However, the **contents** of the proposals of the two theories **differ radically**.

Based on equation (1.2.99), the Observer of the moving system (rod) sees the clocks (their conjugate positions) of the stationary system (LASC) moving with speed:

$$v' = \frac{v}{1 - \frac{v^2}{c^2}}$$

each one of them being **as close as possible to the moving Observer**.

Similarly, Harmonicity's **real Observer**, i.e. the Normal Human of the stationary system, sees each tip of the rod (its conjugate position) moving with **instantaneous** speed:

$$v' = \frac{v}{1 - \frac{v^2}{c^2}} \quad [\text{See (1.2.90a)}]$$

when this tip of the rod is at the PF, i.e. **as close as possible to the stationary Observer**.

This way, not only Galileo's Principle of the Relativity of Motion is preserved, but mostly... Common Sense is restored.

CAUTION!

Speed v' in equation (1.2.90a), a result of Human Physics (Theory of Harmonicity), coincides with speed v' that we've calculated here (Physics of the "RoT Observers") **because it is not a quantum speed**. It resulted from the application of infinitesimal calculus.

The only true quantum speed is v_{ob} .

Therefore, to highlight the differences, I also note this:

As we have shown in the first chapter, while **approaching** the RoT Observer, the speed of the conjugate position is:

$$U'_{approaching} = \frac{U}{1 - \frac{U}{C}} \quad [\text{See (1.1.38)}]$$

While **drawing-away** from him, the speed of the conjugate position is:

$$U'_{drawing-away} = \frac{U}{1 + \frac{U}{C}} \quad [\text{See (1.1.40)}]$$

The **arithmetic mean** of these two speeds is:

$$U_{ar.mean} = \frac{U'_{approaching} + U'_{drawing-away}}{2} = \frac{U}{1 - \frac{U^2}{C^2}} = U' \quad (1.2.100)$$

On the contrary, U_{ob} , **which is a quantum speed**, is the **geometric mean** of U' and U (at the Foot of the perpendicular). U_{ob} is **the only speed that has a physical meaning**, as the result of **real measurements by a real local clock** in the Physics of Normal Humans.

I am sure that the reader has understood that to describe the **real** world by utilizing "Rot Observers", relative to who matter and light move **collinearly**, is equally arbitrary to the **linearity** of the equations of the Lorentz Transformation, which linearity Einstein introduced by simply pulling it out of a hat [...]

All contradictions and all paradoxes of the Theory of Special Relativity, which grossly violate Common Sense, **originate right here**. It might seem strange, just how this arbitrarily introduced linearity of the Lorentz Transformation, a simple "mathematical error", led to such a series of serious errors **in Physics**.

Linearity, however, is only the tip of the iceberg.

The crux of the matter is found in Einstein's arbitrary “coincidence” of the paths of light and matter (**co-linearity**) which, unavoidably, led **to arbitrarily considering different kinds of light energies (Active and Total), as one and the same.**

In other words, it is right here:

Einstein, by not taking into consideration the cosine of the phase-difference angle between cause and effect, considered the Total energy of light to be identical to the Active one.

That is to say, he considered KVAH identical to KWH or KVA identical to KW.

And, this is **a serious error in Physics** that could have been avoided...

CHAPTER 3

THE DYNAMICS OF A MATERIAL POINT MOVING WITH SUBLUMINAL SPEED MEASURED WITH THE LASC

"Salviati: So put forward the arguments and demonstrations, signore Simplicio -either yours or Aristotle's- but not just texts and bare authorities, because our discourses must relate to the world of the senses and not to one on paper".

Galileo²⁸

What is "Force"?

I admit I have no idea.

I suspect, however, that it is a purely noetic concept, invented by humans in order to explain the **motion** (Aristotle), **accelerated motion** (Newton), or distortion of matter.

Aristotle considered "force" to be **unbreakably linked with motion**.

His position was roughly as follows:

*"A body moves **only** when a force is exerted thereupon".*

The modern scientific community has rejected the above proposal...

Newton, on the other hand, saw it from a completely different perspective.

Thus, Newton's first law of inertia claims:

*"A body moves in a linear and uniform fashion
as long as **no force** is exerted thereupon".*

²⁸ Galileo Galilei, "Dialog Concerning the Two Chief World Systems". My underlining. Once again, I borrow this piece W. Heisenberg's work "*Thoughts on the Development of Concepts in Physics*" (Cf. reference 1 in the 2nd chapter).

Thus Newton associated force **only** with the accelerated motion of matter via his second "law"* of inertia:

$$F = m \cdot a \tag{1.3.1}$$

But, just a minute!

Who is Aristotle? Who is Newton? And who are we anyway?

Are we some kind of celestial beings, able to plot motion on ethereal mathematical axes positioned anywhere we choose in **Geometrical Space**?

Certainly not! We are Humans and therefore the reference system for motion is not located in our brain but, **in any case**, has to be "nailed" to matter which is an element of the **Perceptible Space**. Thus, apart from moving body A, there has to exist **material** body B, on which to "nail" our axes, on which in other words "to refer" motion (reference system), **otherwise said motion has no meaning**.

However, since **at least two** material bodies are required in order for motion to have any meaning at all, moving body A is, **in any case**, subjected to an interaction ("force") originating from B. We know that Gravity at least (whatever we mean by that word), exists. Thus motion, **any kind of motion**, is linked to "force" **BY DEFINITION**.

Why did we then reject Aristotle's proposal?

Newton's point of view was "celestial".

Aristotle's was down to earth.

Newton examined it through Plato's eyes**.

We shall examine it through Aristotle's eyes.

* I entered the term "law" in quotes because I maintain that equation (1.3.1) is not a law of Nature, but an incomplete (?) **definition** of the concept of "force". In order to be a law of Nature, each of the three symbols of the equation ought to be measurable **independently of the other two** and, once replaced by their values, to verify the equation. A much more "reliable" definition of the concept of "force", widely used today, which we will also use is:

"Force = The rate of change in momentum".

** Newton's Platonic approach (first inertial law), "tricked" Einstein into composing the Theory of Special Relativity, which examines the motion of matter and its consequences **outside of Gravitational Fields** and thus **void of "Earthquakes"**; As a result, Relativity ended up a Theory unable to be tested experimentally by Humans, i.e. a Theory fit only for "Angels" or "Angelic" Humans (RoT Observers).

This means that we cannot envision Motion **independently** of Force.

Newtonian mechanics taught us the effect of force on motion.

Here, we shall move in the opposite direction:

We shall examine the effect of motion on force*

In order, however, to avoid falling in the obvious vicious circle (force influencing motion, influencing force and so on)** we will need to make some idealizations in order to focus on our Problem, postponing for later the structuring of the relevant differential equations and the deeper analytical study.

Thus, we shall reduce all degrees of freedom of a moving material point into a single one: We will allow the particle to move on a straight line E *“in a linear and translatory fashion”*, with constant speed v , measured by the LASC.

We shall not currently define the force, as the rate of momentum change (based on (1.3.1)), but as the **Gravitational Force** (specifically in its classic definition) exerted by the environment on the moving material point.

This way, our study can be characterized **only** as the study of the **effect of motion on the Force of Gravity**.

Therefore, I mentally replace straight line E with a straight capillary tube, made out of glass, which limits the material point to one degree of freedom of movement only.

I also consider that between the material point and the Observer (or the material system in which the Observer "stands" e.g. the Earth), there is Gravitational interaction. I do not know what Gravity really is (and I do not believe anyone else knows either ...), but I consider it a “force” exerted on the material point **due to the existence of the Observer and his material system**, and I symbolize it with a vector \vec{F} . Our study, therefore, concerns the effect of motion on this vector.

Please note that the sole purpose of all the aforementioned idealizations is the study of the effect of the new concept of the “conjugate position” on the vector of Gravity.

* Let us remember the Principle of Duality in Space (see Introduction) where the true proposals continue to remain true when the concepts of Point - Plane swap roles. Here, I shall attempt something similar: I shall replace the "Cause" of Newtonian Mechanics with the "Effect" and vice versa.

** This sequence, in the Theory of Cybernetics, is called “Feedback loop”.

Suppose that **now**, the material point moving with speed U , measured with the LASC, where $U < C$, is found in position A. The Observer O, **now** sees it at the conjugate position A'.

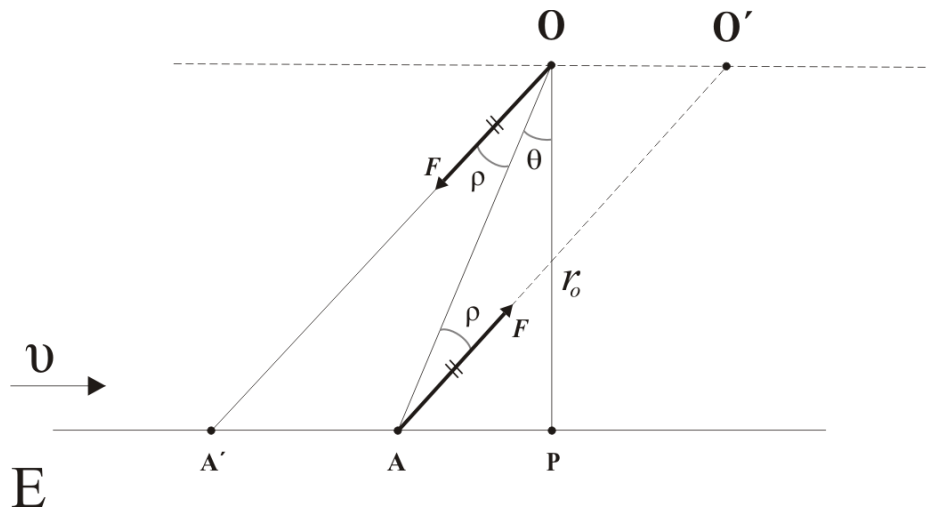


Figure 1.3.1

And thus the question arises: Which is the carrier of the force of Gravity exerted on the particle at A, **due to** the existence of the material system O?

Newtonian Mechanics considers that the carrier of the force of Gravity between two material particles is the straight line connecting them, i.e. the straight line AO.

I disagree!

This consideration belongs to the Physics of the "Angels".

In Human Physics, the following is true:

According to the first fundamental hypothesis of the Theory of the Harmonicity of the Field of Light, matter interactions move in Geometrical Space with the finite speed of light C that is measured by Observer O.

Hence, **now** the Observer O does not know that the material point is located at A, but **what he sees and knows** is that the material point is located at A'.

Similarly the material point located at A, does not "know" (does not "sense") that the Observer (and his material system) is located at O, but **at another position**, which we determine as follows:

If we immobilize the material point, then it is the Observer that moves relative to A.* Thus **now**, for the material point at A, the Observer is not located at O but rather at its conjugate O'. Under the condition that the metrics of Space and Time are identical in the two systems, O' is located at the intersection of following two straight lines:

1. The parallel to line E, drawn from point O and
2. The parallel to line OA', drawn from point A.

That is, **now** the particle "sees" the Observer at O' and from there interacts with him.

This is the fundamental difference between the Theory of the Harmonicity of the Field of Light and Newtonian Mechanics.

Thus, the force of Gravity exerted on the particle at A has AO' as its carrier and is of magnitude F. Similarly, the force of Gravity exerted at O has OA' as its carrier and has the same magnitude (under the condition of identical Space and Time metrics in the two systems). Therefore, we need to revise Newton's third Law:

So now, action is not equal and opposite in direction to reaction, but only equal in magnitude (always under the previous condition). Action and reaction are no longer **collinear**, but create a **pair of forces** that causes **rotational torque**.

F u n d a m e n t a l C o n c l u s i o n :

A system of two material bodies moving relative to each other tends, under the influence of Gravity, to rotate AS A WHOLE, and is subject, in addition to the attraction, to rotational torque as well.

The careful reader will have realized already that from the Kinematics of Harmonicity we have crossed to Dynamics in a very simple way: We have replaced the verb "see" with the verb "interact".

* *This position is a consequence of Galileo's Principle of Relativity of Linear Translatory Motion.*

This finding strengthens our suspicions that the Big Secret might perhaps **be found hidden in Light**, as all these are mere consequences of the way Light behaves*.

I resolve force F , exerted on the material point A and whose carrier is parallel to OA' , in two components:

1. One, which I call **Gravitational** (F_G), with moving ray OA as its carrier.
2. And another, which I call **Inertial** (F_I), with E as its carrier and collinear to the motion.

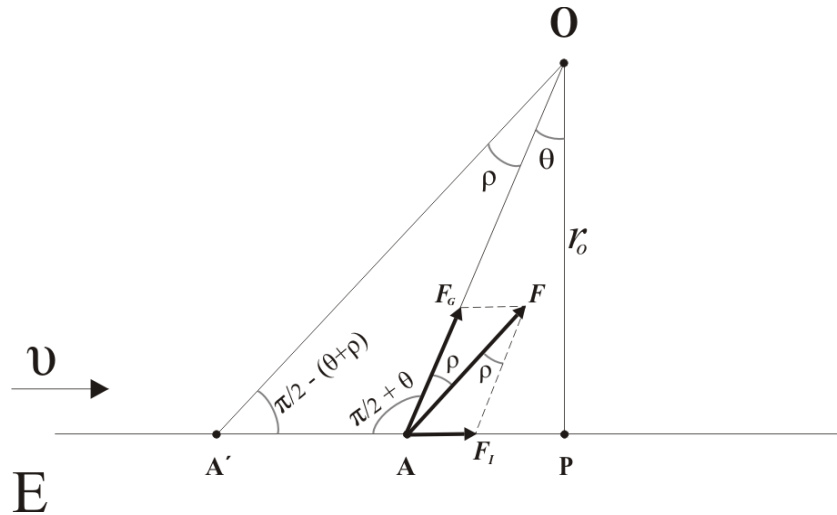


Figure 1.3.2

We observe that the force vectors triangle is **similar** to the spatial triangle $OA'A$. By applying the sine theorem in this triangle, we get:

$$\frac{F}{\sin\left(\frac{\pi}{2} + \theta\right)} = \frac{F_I}{\sin\rho} = \frac{F_G}{\sin\left[\frac{\pi}{2} - (\theta + \rho)\right]} \quad (1.3.2) \text{ and eventually:}$$

$$\frac{F}{\cos\theta} = \frac{F_I}{\sin\rho} = \frac{F_G}{\cos(\theta + \rho)} \quad (1.3.3) \Rightarrow \quad F_I = \frac{v}{c} \cdot F \quad (1.3.4)$$

as from (1.2.3): $\sin\rho = \frac{v}{c} \cdot \cos\theta$.

* At this point, I'm reminded of Greek poet Odysseus Elytis who writes:

*"It shines within me what I know not.
But, nevertheless, it shines."*

F_I , as expressed in (1.3.4), is strongly reminiscent of the Laplace (or Lorentz) Force in Electromagnetism! Differing only in direction with regards to the motion.

The **Gravitational** (F_G) results as:

$$F_G = \frac{\cos(\theta+\rho)}{\cos\theta} \cdot F \quad \text{and for } \cos\theta \neq 0 \text{ and where } \frac{v}{c} = b, \text{ we get:}$$

$$F_G = \left(\sqrt{1 - b^2 \cdot \cos^2\theta} - b \cdot \sin\theta \right) \cdot F \quad (1.3.5)$$

Moreover, we observe that the relation of the Inertial F_I to the total F , **is independent of the position**, whereas in the case of the Gravitational F_G **it is not**.

By taking (1.2.7) into consideration, we get:

$$F_G = \frac{v}{v_{ob}} \cdot F \quad (1.3.5a)$$

And by sidewise division of (1.3.4) and (1.3.5a), the ratio:

$$\frac{F_I}{F_G} = \frac{v_{ob}}{c} \quad (1.3.5b)$$

The elegance of the force ratio as a function of the speed ratio is obvious. However, much more important is the following conclusion:

It is the Speeds that determine the magnitudes of the Forces.

In Newtonian mechanics, force shapes and determines motion.

Our study herein, based on the first fundamental hypothesis of the Theory of the Harmonicity, leads to a symmetrical proposal:

It is the Motion that shapes and determines the Force!

The above proposal, while absent in Newtonian Gravity it is true in Electromagnetism (Laplace Force). Our research herein introduces it to Gravity. This constitutes a very important first step towards Unification. Thus Nature appears to be **dialectic**. Force and motion seem **unbreakably connected**, shaping one another.

Therefore, I am entitled to ask again:

Why did we then reject Aristotle's proposal?

When the material point is located at the FP P, ($\theta = 0$), the **Inertial** F_I continues to be given by (1.3.4), whereas the **Gravitational** F_G becomes:

$$F_G = F \cdot \sqrt{1 - \frac{v^2}{c^2}} \tag{1.3.6}$$

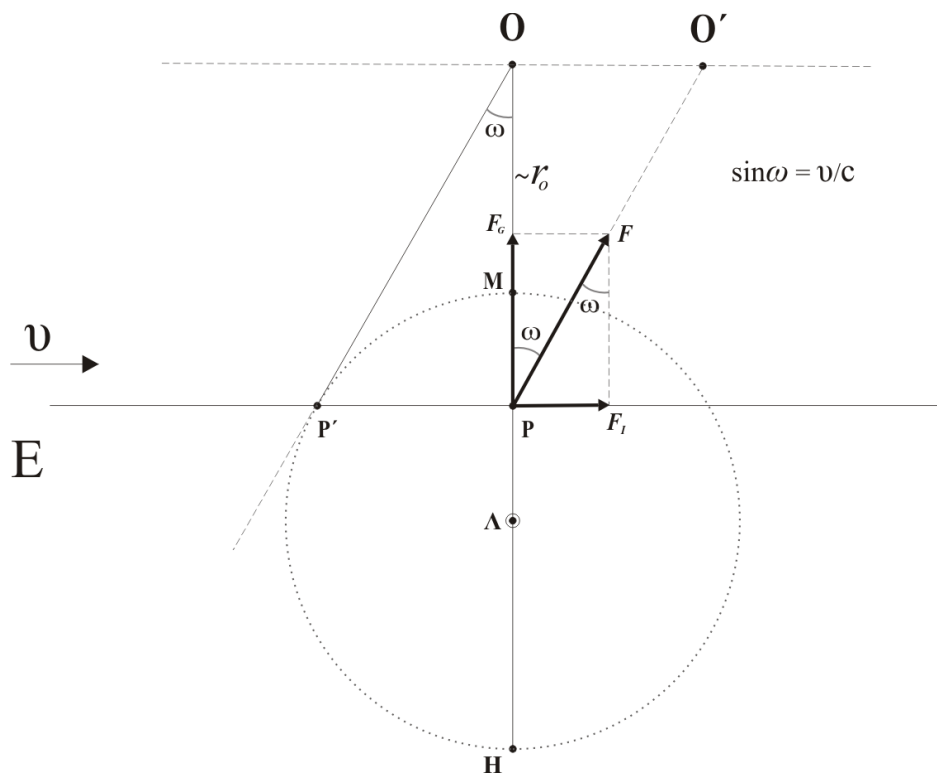


Figure 1.3.3

As was discussed in the first chapter, finding the location of the conjugate position, when the position is given, is achieved by using the Apollonian circumference.

Therefore, I have:

$$\frac{MP}{MO} = \frac{v}{c} \quad \text{καα} \quad \frac{HP}{HO} = \frac{v}{c}$$

With diameter MH, I draw the Apollonian circumference, yielding the conjugate P'.

But if $OP = r_0$ we have:

$$OM = \frac{r_0}{1 + \frac{v}{c}} \quad (1.3.7) \quad \text{and} \quad OH = \frac{r_0}{1 - \frac{v}{c}} \quad (1.3.8)$$

By sidewise multiplication, we get:

$$OM \cdot OH = \frac{r_0^2}{1 - \frac{v^2}{c^2}} \quad (1.3.9)$$

From triangle OP'P, however, we get:

$$OP' = \frac{r_0}{\cos \omega} = \frac{r_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \Rightarrow \quad (OP')^2 = \frac{r_0^2}{1 - \frac{v^2}{c^2}} \quad (1.3.10)$$

Therefore:

$$(OP')^2 = OM \cdot OH \quad (1.3.11)$$

Conclusion:

When the material point is at the PF, the conjugate position's moving ray **is tangent, at the conjugate position**, to the Apollonian circumference that yields the conjugate position. Or, more simply:

Straight line E is the Polar of O with regards to the Apollonian circumference.

And while talking in geometrical terms, I would like to draw the reader's attention to a rather diabolical (?) coincidence.

From Geometry, we know that the product $OM.OH$ is called "**Force**" of the **point O to the circle of diameter MH**. I therefore wonder, what is the purpose of using the term "**Force**" in a purely geometric context?

The term "**Force**" is purely physical; what does it have to do with Geometry?

The coincidence becomes even more diabolical if we take into consideration equation (1.3.11), on the basis of which the "**Force**" of O to the circle is $(OP')^2$.

And if we consider:

1. The validity of the law of inverse square of Newtonian Gravity and
2. Its transformation by the Theory of the Harmonicity,

it follows that the Force of Gravity F is **inversely proportional** to $(OP')^2$

Conclusion:

The Force of Gravity is inversely proportional to the Geometrical "Force"!

What is going on here?

I have no idea.

The coincidences, however, are shockingly diabolical.

Perhaps the Science of Ancient Greeks was much more advanced than we thought.

In any case, we have before us a "Bulk Discovery". Our study so far, appears to present a contradiction to Newtonian Mechanics. That is so, because although we consider speed U constant we have, **at the same time**, "loaded" material point A with a force F , which in general **has a non-zero projection** on straight line E.

How can this be possible?

Doesn't this constitute a violation of Newtonian Mechanics?

The answer is no. There only appears to be a contradiction, because:

Nothing realistically changes in our study, if we consider speed U of our equations to be the **average speed** of the material point between conjugate positions.

In Figure (1.3.3) for example, we can very well define speed as: $U = \frac{P'P}{\Delta t_\epsilon}$

where Δt_ϵ is the "distance in time" between "ticks" of our LASC at positions P' and P.

What, however, is important is the following: We must not forget Plato's "shadows".

The object of our Physics **is not** A, but rather A', as it is **only** A' that belongs to the Human Perceptible Space. Hence, A' is what **we only see** and what **we only measure!**

And A' DOES NOT MOVE WITH A CONSTANT SPEED!

Therefore, there exists no contradiction with Newtonian Mechanics*.

Our study herein does not infract Newtonian Mechanics. It does, however, **supplement it** by eliciting a **rotation** to the Newtonian Force and a readjustment of its magnitude, (as the force now originates from a conjugate position), that appears at high speeds.

In other words, the Theory of the Harmonicity of the Field of Light, based on its first fundamental hypothesis, differentiates itself** from Newtonian Mechanics **only** insofar the **direction** and the **origin of the Force of Gravity** is concerned.

* I fully understand any difficulties that the reader might have, in considering U constant while **at the same time** a force F is exerted on the moving material point. Had I wanted to tackle this problem superficially, I could consider that the projection of F on line E is cancelled-out by a variable friction between the material point and the walls of the glass capillary tube, or even "configure" the material point with certain "provisions" that would stabilize U .

However, I do not wish to superficially skip over the Problem. Therefore, I draw the attention of the reader to the fact that in this chapter, my endeavor is to find the deeper connection between the "realistic" i.e. **measurable** kinematics magnitudes of the previous chapter (such as speed, acceleration, etc), and the "noetic" magnitudes of this chapter (forces).

Force vectors are not measurable elements of the Perceptible Space. **They exist only in our mind.**

Thus, any "difficulties" in comprehension are simply due to deeply rooted, centuries-old biases. I guess, Newton himself must have faced similar "difficulties" when he first replaced the Angels (that "pushed" the planets in their orbits around the Sun...) with the Force of Gravity.

And I wonder: What is **more real**? The Forces or the Angels?

** This differentiation of course is rather revolutionary and its deeper consequences will appear later on. Nevertheless, Newtonian Mechanics is **logically coherent** and the creator and proponents of STR were not entitled, in their haste, to denounce it by formulating contradictory proposals. We, here, only **supplement** Newtonian Mechanics without denouncing it.

In any case, when $v/c \rightarrow 0$, Harmonicity coincides with the Newtonian Theory, i.e. the Force of Gravity is made practically central.

The Theory of Harmonicity **opposes** Special Relativity, denouncing its proposals as contradictory and as having no connection with physical reality, where by physical reality I mean **what I can see and what I can measure and not what... I imagine**.

The all-important “**element**” that the founder of SRT failed to conceptualize, was simply the **unavoidable delay** in the transmission of interaction or information, a delay however that determines the crucial difference between "BEING" and "APPEARING TO BE". Nothing else! All the rest are simply logical consequences.

I just wanted to make this absolutely clear.

When the material point reaches K, of which P is the conjugate, then F total reaches **maximum** value, as the distance from the pole of “attraction” that the material point “feels” is at its minimum. Thus, position K is the one in which the vertical projection of F on trajectory E , reverses.

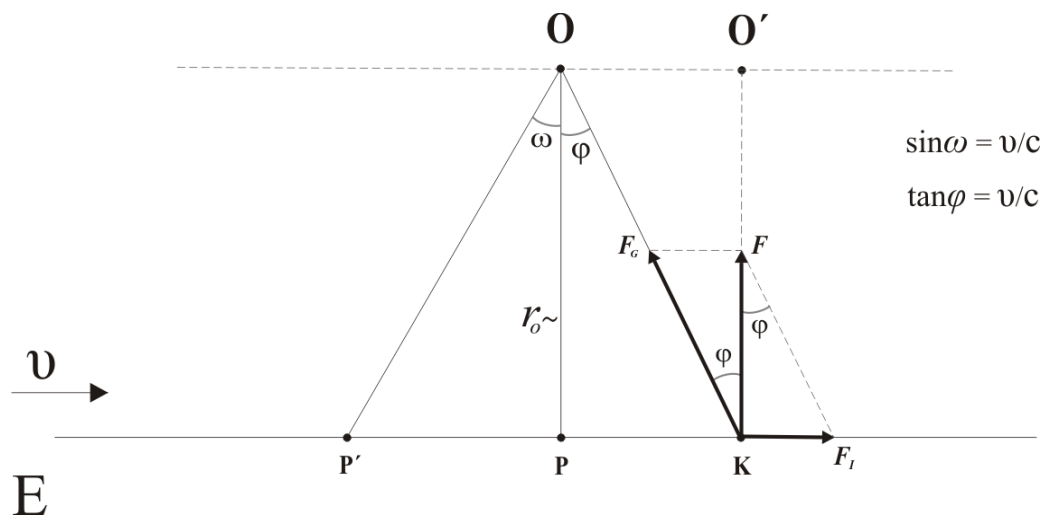


Figure 1.3.3a

We observe that there exists a certain delay in the reversal of the projection of F . This delay equals the time, measured with the LASC, needed for the material point to travel the interval PK.

Thus, during this time, and despite the fact that the material point is actually **moving away** from the Source of the Gravitational Field O, said Gravitational Field continues adding (instead of subtracting) kinetic energy to it. In other words, during this time, the force of Gravity continues having a projection on the travel path in the same direction to motion, whereas said projection ought to have the opposite direction. Thus, in this section of the material point's path, **Gravity is repulsive**.

This "window" in Space (segment PK), (where the moving material point actually "deceives", in a way, the source of the gravitational Field, by **appearing** in the interval P'P, i.e. approaching, while in reality **it is located** in the interval PK, i.e. moving away), I call "**Antigravity Window**" and is exclusively due to the delay in the transmission of the interaction. I strongly suspect that the comprehension and exploitation of this "window", will provide us in the future with some very important practical applications, the implications of which can not even be conceived by current Science*.

At K, we have:

$$F_t = F \cdot \tan \varphi = \frac{v}{c} \cdot F, \text{ as it was also expected:}$$

$$F_G = \frac{F}{\cos \varphi} = F \cdot \sqrt{1 + \tan^2 \varphi} = F \cdot \sqrt{1 + \frac{v^2}{c^2}} \quad (1.3.12)$$

Suppose that the material point at position A is now distancing from the PF (Fig. 1.3.4). The conjugate is A'. The diagram of forces is the following:

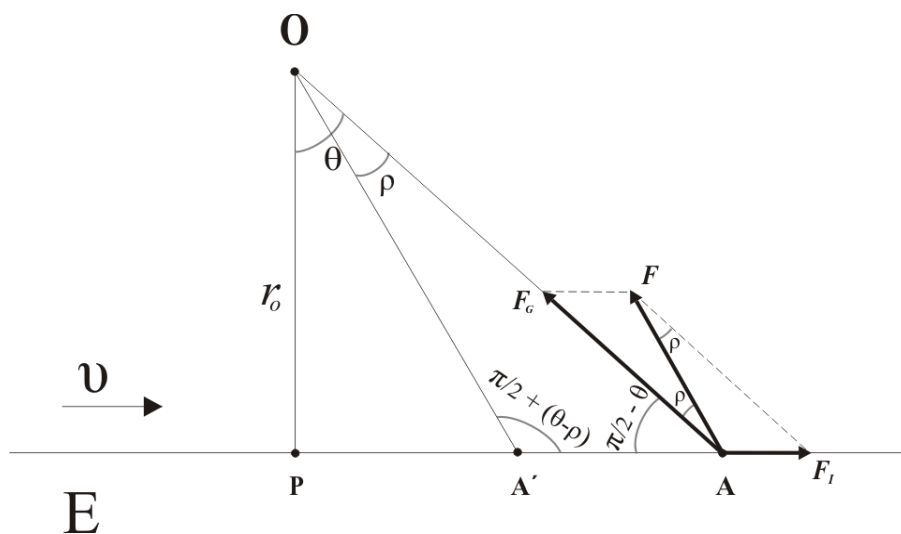


Figure 1.3.4

* Who knows? Sometime in the future, this "window" might help us... return to the Stars.

The triangle of the forces is similar to the triangle OA'A. Hence:

$$\frac{F}{\sin\left(\frac{\pi}{2} - \theta\right)} = \frac{F_I}{\sin\rho} = \frac{F_G}{\sin\left[\frac{\pi}{2} + (\theta - \rho)\right]} \quad (1.3.13)$$

or

$$\frac{F}{\cos\theta} = \frac{F_I}{\sin\rho} = \frac{F_G}{\cos(\theta - \rho)} \quad (1.3.14) \quad \text{and we have:}$$

$$F_I = \frac{U}{C} \cdot F \quad (1.3.15) \quad \text{and}$$

$$F_G = \left(\sqrt{1 - b^2 \cdot \cos^2\theta} + b \cdot \sin\theta\right) \cdot F \quad (1.3.16)$$

The above equation for $\theta = \varphi$, where $\tan\varphi = \frac{U}{C}$ yields (1.3.12) being true at position K.

Taking into consideration (1.2.14) for U_{ob} we have:

$$F_G = \frac{U}{U_{ob}} \cdot F \quad (1.3.16a) \quad \text{and} \quad \frac{F_I}{F_G} = \frac{U_{ob}}{C} \quad (1.3.16b)$$

which are the **very same** equations as the ones applying during the approach to the PF.

Conclusion:

**The ratios of forces, as functions of the speed ratios remain unchanged,
during both the approach and the moving away phases
with regards to the foot of the perpendicular.**

Having reached the above conclusion, a reasonable question arises: Since the behavior of the forces is practically **identical** to the behavior of the speeds, what do we need forces for? Why don't we do away with them all together?

Do they have an ontological substance? Probably not.

Do they have gnoseological usefulness? I really do not know. Maybe they do.

And I say so, as from our study of forces, we have come to realize the following:

1. Speed U_{ob} , which we have defined as the speed of the material point as measured by the **local clock** of the Observer, with our poles located **in conjugate positions**, plays an active part in the structure of the force equations.

In other words, speed U_{ob} is not a conventional concept*, but a **Fundamental Physical Concept**. Indeed, it is a **quantum** concept, in contrast to the **instantaneous speed** U' which **is not****.

The fact that speed U_{ob} is a quantum concept, lends in turn a "**quantum undertone**" to the gravity component of force F , *i.e.* F_G , to which it appears inversely proportional (Equations 1.3.5a and 1.3.16a). It is precisely this "**quantum undertone**" of force F_G that brings us back to our initial question:

What is "Force"?

Is it a purely **noetic causal agent**, Aristotle's and Newton's invention, or does it have a more **objective substance**, over and beyond any human speculations on "causes"?

2. Furthermore, perhaps the concept of Force has gnoseological usefulness for the following reason: From equations (1.2.49), (1.2.65) and (1.2.74), we get that at **every position on the path**: $a' = \left(\pm \frac{U}{c} \right) \cdot a'_{r'l}$. Also from the dynamics equations in this

chapter, it follows that for **every position on the path** it holds that: $F_I = \frac{U}{c} \cdot F$

Thus, **regarding magnitude only**, for **every position** on the path it holds that:

$$\frac{F_I}{a'} = \frac{F}{a'_{r'l}} \quad (1.3.17)$$

* By the term *conventional concept*, I mean a concept that we defined the way we did because we liked it that way, or out of convenience.

** Let me remind the reader that we have **calculated** U' by applying rules of infinitesimal calculus, whereas U_{ob} we have **measured**.

Conclusion :

For every position of the material point's path, the ratio of the inertial force to the orbital acceleration equals, IN MAGNITUDE ONLY, the ratio of the total force (Gravity) to the linear radial acceleration.

Caution!

The above equation (1.3.17) and the conclusion that we've just formulated **does not, under any circumstances, constitute a law of Nature**. It is simply a consequence of the way we chose to analyze the force. It has only gnoseological usefulness, in the sense that it helps to better "accommodate" in our thought process the cause and effect relationship ($|F| = m \cdot |a|$).

3. Finally, the concept of Force might have gnoseological value for one more reason:

The force of Gravity, as a consequence of our first fundamental hypothesis, ceases to be central. It **always** originates from the conjugate position.

**Consequently, in a pair of particles that move relatively to each other,
a pair of "forces" is created that tends to rotate it as a whole.
THIS IS A LAW OF NATURE!***

Thus, as a consequence of the above law, we can better comprehend phenomena such as the perpetual **self-spinning** of accumulations of matter on both the macro (galaxies, stars, planets etc.), as well the micro level (atoms, molecules etc.).

It is this "comprehension" that "needs" the concept of "Force" in order to "accommodate" the cause and effect relationship.

Therefore, the net dividend from our study "On Forces", is purely gnoseological. However, for this "dividend", we had to pay a hefty price:

In Newtonian Mechanics, force is **the cause of motion**, or at least violent motion. Here, we have come to also realize that **motion determines the force**.

* *In fact, proper Law of Nature is only the first fundamental hypothesis of the Theory of Harmonicity of the Field of Light. All the other "laws" are mere consequences.*

Thus, we've reached the vital eternal question:

What gave birth to what?

Which was there at the very beginning?

Was it the Force or was it the motion?

I must admit that I am not satisfied at all!

And that is because, a researcher must not feel content with just the so-called gnoseological gain which, after all, most of the time, is simply utilitarian.

A researcher **must answer** the Ontological Question:

What is "Force" after all?

The advice of my long gone high school physics professor springs to mind:

"To answer any question, or to solve any problem, you should first try to understand it really well".

So, let us follow his wise advice and let us try to "...understand really well":

What did we essentially attempt to do in this study on Forces?

We considered a material point A, moving on straight line E and on it we nailed an arrow \vec{F} , to which we gave the name "Force of Gravity".

Where does the arrow \vec{F} point to?

It points to where particle A actually "sees" particle (body) O, i.e. **not** at position O itself but rather at position O'.

In other words, what does the arrow \vec{F} really show?

It shows **the path light travels** on its way from O' to A.

Thus, the arrow \vec{F} **represents the "light path"**.

Then, what did we do with the arrow \overline{F} ?

We resolved it to two "components", or even better to two "component arrows" \overline{F}_I & \overline{F}_G .

What does the arrow \overline{F}_I show?

It shows straight-line E.

In other words?

It shows the "**path of the matter**".

What does the arrow \overline{F}_G show?

It shows the position where O actually **IS** as well as the "**route**" to reach it.

In other words?

It shows the position that **WE NOETICALLY CONCEIVE** O to be, as well as the "path" that **WE NOETICALLY CONCEIVE** as connecting A with O.

In other words?

It shows the "path" connecting A with O in **Geometrical Space**, which space, however, exists **only** in our mind.

What, therefore, do these forces correspond to?

Total \overline{F} (force of Gravity), corresponds to the "**Path of Light**".

The **Inertial** component of this, \overline{F}_I , corresponds to the "**Path of Matter**".

Its **Gravitational** component, \overline{F}_G , corresponds to the "path" of Geometrical space, in other words to the "**Path of Intellect**".

We observe that in Newtonian Theory, \overline{F} and \overline{F}_G coincide.

Thus in Newtonian Theory **Sensory Perception coincides with Noetic Perception**.

In the Theory of the Harmonicity, however, Sensory Perception **differs** from Noetic Perception. This differentiation (a consequence of our first fundamental hypothesis), causes the differentiation of position A from its conjugate A', which in turn causes the creation of angle ρ , which **separates** the strictly sensory "path of light" from the strictly noetic "path of Intellect".

This angle ρ , I shall name:

«**Angle of Light Deflection**» or simply **ALD**.

This angle constitutes the "**phase difference**" between cause and effect, to which I have previously repeatedly referred to.

At the Foot of the perpendicular, the angle ρ equals angle ω (Fig. 1.1.5) and it holds that:

$$\cos\rho = \cos\omega = \sqrt{1 - \frac{v^2}{c^2}}$$

That is all!

Newton taught us that **Force determines Motion**.

We however, here, have come to realize that **Motion determines Force**, as a result of the behavior of light.

Following this realization, a big Question **vehemently** arises:

Could it be that the so-called "Force of Gravity" is nothing more but the consequence of some "motion" occurring **along the "Path of Light"**?

This Question "*Ουκ εά με καθύδειν*"
(keeps me sleepless at nights) [...]

CHAPTER 4

KINEMATICS AND DYNAMICS OF THE MATERIAL POINT MOVING WITH THE SPEED OF LIGHT MEASURED BY THE LASC. THE ELECTROMAGNETIC FIELD OF LIGHT

*Lord,
You waste so much blue
not to be seen..."*

Odysseas Elytis, ("Maria Nefeli")

In this chapter, I shall unify Kinematics with Dynamics for the simple reason that, as we have already realized, the latter results effortlessly from the former if we simply replace the verb "**to see**" with the verb "**to interact**".

We will examine, therefore, the kinematics and dynamics behavior a material point, moving with speed C , **measured with the LASC**. Of course, in doing so, we enter "no-man's land" as far as the Theory of Special Relativity is concerned which claims **that it is impossible** for a material body to move with the speed of light. However, in the first chapter, we have already proved that the aforementioned claim is erroneous in its theoretical base. To be more precise, we have already shown that **it was never proved theoretically**. Moreover, while processing the Mt. Washington experiment data, we have also shown that this particular allegation lacks experimental support* too.

Therefore, no one's to say that we cannot move at the speed of light or even at a greater speed than that. Taking into consideration however that the issues under scrutiny here are extremely "delicate", we ought to proceed very cautiously indeed.

Let us, therefore, start by investigating first the phase where the material point **moves away** from the Foot of the Perpendicular as, in this case, the concepts involved are much simpler.

* As Einstein himself used to claim: "A thousand experiments in accord with a specific Theory, are not enough to prove its truth; a single incongruous one however, is more than enough to prove its error".

To start with, we discern the following distinct cases:

1. The material point **moves away** from the PF which **doesn't** "separate"* the conjugates.
2. The material point **moves away** from the PF which **does** "separate" the conjugates.
3. The material point **approaches** the PF which **does** "separate" the conjugates.
4. The material point **approaches** the PF which **doesn't** "separate" the conjugates.

1st CASE

The material point, as it moves with speed c measured with the LASC, **moves away** from the Foot of the Perpendicular and the PF does **not** "separate" the conjugates.

1A. ELEMENTS OF KINEMATICS

Let us assume (Fig. 1.4.1) that the material point is found at position A, moving away from P with speed c , measured with the LASC.

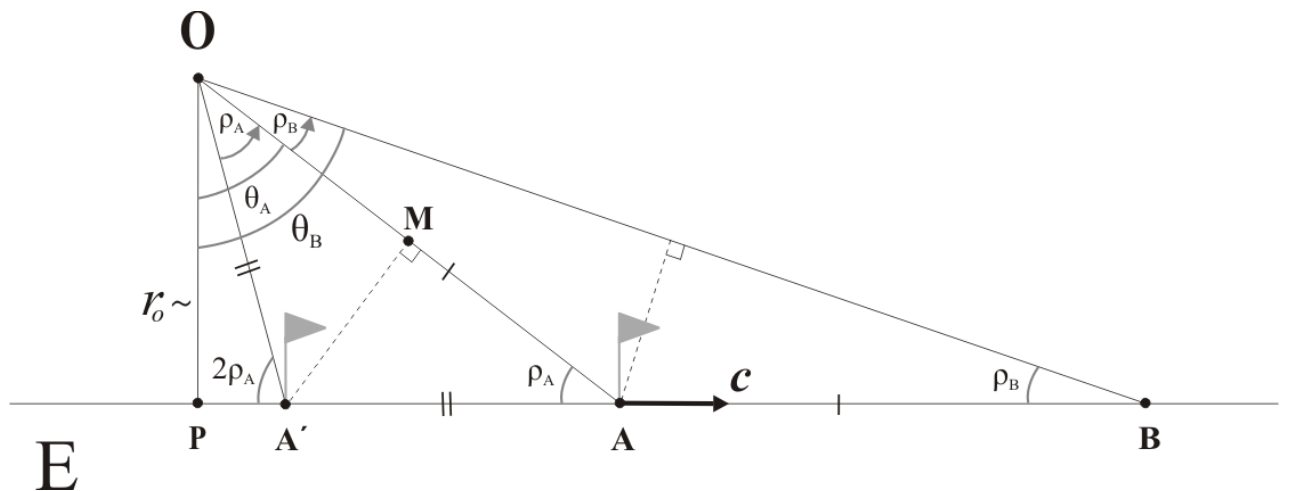


Figure 1.4.1

Where is its conjugate?

* Here, the verb "separate" is used in the Euclidean sense.

If we try to discover the conjugate by means of the Apollonian circumference, we will not succeed because we must divide OA, internally with point M, in the middle and externally with point H also in the middle. However, as point H is located at infinity^{*}, no Apollonian circumference exists.

And what condition must conjugate position A' satisfy? It must be: $A'O = A'A$.

Therefore, A' must be located at the intersection of the perpendicular bisector^{**} of OA, with straight line E.

Do notice that for $v < c$, the Apollonian circumference gives two conjugate positions A' and A'' for a given position A and, **in Euclidean Space**, we have associated A' with one direction of movement and A'' with the opposite direction of movement of the material point, along straight line E (Fig. 1.1.4).

The fact that on straight line E there exist **two distinct and opposing directions of movement**, is a consequence of the VIII axiom of the founding of Projective Space.^{***}

However, in this particular case, solution A' is **the one and only**.

For any given position A, there exists **only one** conjugate position A'!

This discovery is extremely important in further developing the Theory of Harmonicity of the Field of Light and it could be "noetically perceived" in two ways:

a. Either to consider that, in this case, the Apollonian circumference "**degenerates**" to straight line MA' and that A' is a **double solution**.

b. Or to consider that the Apollonian circumference **does not degenerate to a straight line**, i.e. it remains a "circumference" and thus, second solution A'' is located at the point at infinity of straight line E, as the second intersection of the Apollonian circumference, defined this way, with straight line E.

We observe that, as triangle OA'A is isosceles, the angles adjacent to base OA are equal.

* *The harmonic conjugate of the middle of a straight-line segment in relation to its endings is at infinity.*

** *In other words, the Apollonian circumference providing the solutions "has degenerated" to straight line MA', where the diametrically opposing points defining it are point M and the point at infinity of moving ray OA.*

*** *See Introduction.*

Therefore:

The angle between the "**path of Light**" (OA') and the "**noetic path**" (OA) is equal to the angle between the "**noetic path**" (OA) and the "**path of matter**" (A'A).

Also, the angle between the "path of Light" (OA') and the "path of matter" (A'A) is **twice the size** of the angle between the "path of Light" (OA') and the "noetic path" (OA).

Calculation of the elements of motion :

1. U_{ob} = Speed between conjugate positions measured by the local clock

Let us suppose that we have placed flagged poles at conjugate positions A' and A and we have asked the Observer to measure with his local clock the speed of the material point moving along straight line E, at the speed of light.

Let position A be the conjugate of position B, i.e. located at the perpendicular bisector of OB. On account of the fact that, when the material point is at A, the Observer **actually** sees it at A' and when it is at B, he **actually** sees it at A, the speed measured by him is:

$$U_{ob} = \frac{A'A}{T_{ob}} \quad \text{where} \quad T_{ob} = \frac{AB}{c} \quad \text{Therefore:}$$

$$U_{ob} = c \cdot \frac{A'A}{AB} \tag{1.4.1}$$

But from triangles OA'A and OAB, both having the same altitude, we get:

$$\frac{A'A}{AB} = \frac{OA' \cdot OA \cdot \sin \rho_A}{OA \cdot OB \cdot \sin \rho_B} = \frac{OA' \cdot \sin \rho_A}{OB \cdot \sin \rho_B} = \frac{OA' \cdot \sin \rho_A}{r_0} \tag{1.4.2}$$

Also, at triangle OPA', it holds that: $OA' = \frac{r_0}{\cos(\theta_A - \rho_A)}$

Additionally, from triangle OPA, we have: $\theta_A + \rho_A = \pi/2$, hence

$\sin \rho_A = \cos \theta_A$ and $\cos \rho_A = \sin \theta_A$. Therefore, equation (1.4.2) becomes:

$$\frac{A'A}{AB} = \frac{\cos \theta_A}{\cos \theta_A \cdot (\sin \theta_A + \sin \theta_A)} = \frac{1}{2 \cdot \sin \theta_A} \quad (1.4.3)$$

(for $\cos \theta_A \neq 0$, in other words for $\theta_A \neq \pi/2$)

Hence, the **measurable** speed U_{ob} is:

$$U_{ob} = \frac{c}{2} \cdot \frac{1}{\sin \theta_A} \quad (1.4.4)$$

It is worth noticing that we can end up with the **exact same equation**, if in (1.2.14), which is valid for $v < c$, we place $v = c$ and $b = \frac{v}{c} = 1$.

2. U' = **Instantaneous speed of the conjugate position defined as $\frac{dx'}{dt}$**

Here we seek the instantaneous speed of conjugate position U' , as we defined it in Chapter Two (Fig. 1.4.2).

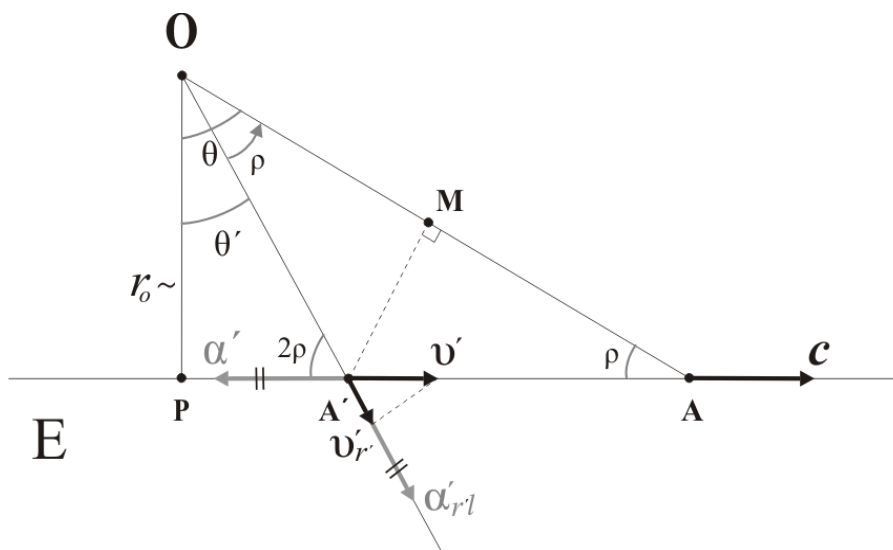


Figure 1.4.2

It holds that: $x' = r_0 \cdot \tan \theta' \Rightarrow v' = \frac{dx'}{dt} = r_0 \cdot \frac{1}{\cos^2 \theta'} \cdot \frac{d\theta'}{dt}$

But also: $\theta + \rho = \pi/2 \Rightarrow \sin \rho = \cos \theta$ and $\cos \rho = \sin \theta$

Furthermore: $\theta' + 2\rho = \pi/2 \Rightarrow \theta' = \frac{\pi}{2} - 2\rho = 2\theta - \frac{\pi}{2}$ (1.4.5)

Therefore: $\cos \theta' = \sin 2\rho = 2 \cdot \sin \rho \cdot \cos \rho = 2 \cdot \cos \theta \cdot \sin \theta$

Additionally from (1.4.5): $\frac{d\theta'}{dt} = 2 \cdot \frac{d\theta}{dt}$ (1.4.6)

In other words, the angular velocity of the moving ray of the conjugate position is **twice** the angular velocity of the moving ray of the position.

In which case, speed v' becomes:

$$v' = r_0 \cdot \frac{1}{4 \cdot \cos^2 \theta \cdot \sin^2 \theta} \cdot 2 \cdot \frac{d\theta}{dt} \quad (1.4.7)$$

But $x = r_0 \cdot \tan \theta \Rightarrow \frac{dx}{dt} = c = r_0 \cdot \frac{1}{\cos^2 \theta} \cdot \frac{d\theta}{dt}$

Therefore: $\frac{d\theta}{dt} = \frac{c}{r_0} \cdot \cos^2 \theta$ (1.4.8)

And by replacing in (1.4.7), we get:

$$v' = \frac{c}{2} \cdot \frac{1}{\sin^2 \theta} \quad (1.4.9)$$

We observe that we can end up with exactly the same equation, if in (1.2.56), that gives v' for $v < c$, we place $b = 1$.

Similarly, if in the relation (1.2.81) $v' = \frac{v_{ob}}{\sqrt{1-b^2 \cdot \cos^2 \theta}}$

We place $b = 1$ and $v_{ob} = \frac{c}{2} \cdot \frac{1}{\sin \theta}$

Indeed, it holds that:

$$v' = \frac{v_{ob}}{\sin \theta} \quad (1.4.10)$$

3. $v'_{r'}$ = **Instantaneous radial velocity defined as the projection of the velocity of the conjugate position v' on the moving ray of the conjugate position OA'**

It holds that (Fig. 1.4.2) :

$$v'_{r'} = v' \cdot \cos 2\rho = v' \cdot (2 \cdot \cos^2 \rho - 1) = v' \cdot (2 \cdot \sin^2 \theta - 1) = 2 \cdot v' \cdot \sin^2 \theta - v' = c - v'$$

Therefore:

$$v'_{r'} = c - v' \quad (1.4.11)$$

We observe the peculiar fact that the numerical subtraction of the magnitudes of the two collinear velocities yields the magnitude of the radial (non collinear) $v'_{r'}$.

We observe that we are also led to equation (1.4.11) from (1.2.64) $v' + b \cdot v'_{r'} = v$, which is valid for $v < c$, if we place $v = c$ and $b = 1$.

Equation (1.4.11), purely as a function of c and angle θ , is written as:

$$v'_{r'} = -\frac{c}{2} \cdot \frac{\cos 2\theta}{\sin^2 \theta} \quad (1.4.12)$$

4. a' = Instantaneous **orbital acceleration of the conjugate position** defined as $\frac{dv'}{dt}$

It holds that:
$$a' = \frac{dv'}{dt} = \frac{d}{dt} \left(\frac{c}{2} \cdot \sin^2 \theta \right) = -c \cdot \frac{\cos \theta}{\sin^3 \theta} \cdot \frac{d\theta}{dt} \quad (1.4.13)$$

And by replacing $\frac{d\theta}{dt}$ from (1.4.8), we get:

$$a' = -\frac{c^2}{r_0} \cdot \frac{\cos^3 \theta}{\sin^3 \theta} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.4.14)$$

where ρ is the «**Angle of Light Deflection**» (ALD). By placing $b = 1$ in (1.2.60) which is true for $v < c$, we are led to the very same equation.

5. $a'_{r'l}$ = Instantaneous **radial acceleration of the conjugate position** defined as $\frac{dv'_{r'}}{dt}$

From equation (1.4.11), we get: $\frac{dv'_{r'}}{dt} = -\frac{dv'}{dt}$. Therefore:

$$a'_{r'l} = +\frac{c^2}{r_0} \cdot \frac{\cos^3 \theta}{\sin^3 \theta} = +\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.4.15)$$

Hence, we realize that a' and $a'_{r'l}$ are **equal** in magnitude at **every** position.

Thus, we have calculated all five elements of the conjugate position's motion as those were defined in Chapter 2.

Perhaps the question as to when does U' equal C could arise.

From equation (1.4.9), and by substituting $U' = C$, we get:

$$\sin^2 \theta = \frac{1}{2} \Rightarrow \sin \theta = \frac{\sqrt{2}}{2} \quad \text{i.e.} \quad \theta = \frac{\pi}{4} = 45^\circ.$$

In this case, however, angle ρ equals similarly $\frac{\pi}{4}$, thus A' is located at the PF.

Conclusion:

When the material point, moving away with speed C , appears to be at the PF, then the instantaneous speed of the conjugate position equals the speed of the position.

It is important that the above **also** holds true for subluminal speeds.

Position A, such that A' is found at the PF ($\theta = \pi/4$), is the **boundary** position of the case we have just examined, as the prerequisite was that the PF **does not split** the (Euclidean) interval $A'A$.

Hereby, while the material point moves away from P, the following events take place:

a. U_{ob} decreases gradually leading, for $\theta \rightarrow \pi/2$, to $C/2$.

(Initial value, for $\theta = \pi/4$, $C \cdot \frac{\sqrt{2}}{2}$)

b. U' decreases gradually leading, for $\theta \rightarrow \pi/2$, to $C/2$.

(Initial value, for $\theta = \pi/4$, C)

c. U'_r increases gradually leading, for $\theta \rightarrow \pi/2$, to $C/2$.

(Initial value, for $\theta = \pi/4$, 0)

We observe that, for $\theta \rightarrow \pi/2$, all three aforementioned speeds (U_{ob} , U' , U'_r) are **equal to each other** and also equal to **one half the speed of light**.

d. The orbital acceleration a' is **negative** (deceleration) with its absolute magnitude decreasing gradually, and for $\theta \rightarrow \pi/2$, becoming zero.

(Initial value, for $\theta = \pi/4$, $a' = -\frac{c^2}{r_0}$).

e. Radial acceleration $a'_{r'l}$ is **positive**, with its magnitude decreasing gradually becoming zero, for $\theta \rightarrow \pi/2$.

(Initial value, for $\theta = \pi/4$, $a'_{r'l} = \frac{c^2}{r_0}$).

Thus, at the moment a material point moving on a straight line with the speed of light appears to the Observer as being at the PF, the orbital and radial accelerations are equal in magnitude and perpendicular to each other.

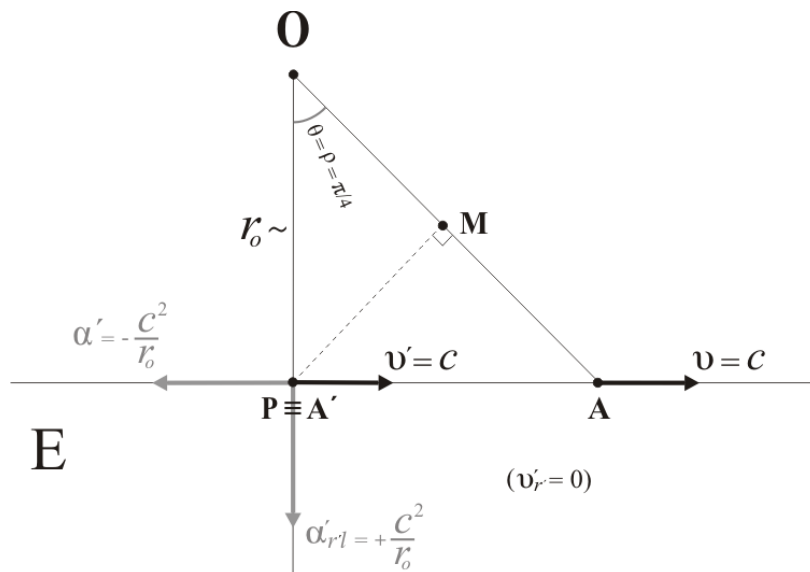


Figure 1.4.3

The fact that although the radial speed $v'_{r'}$ is zero, the radial acceleration $a'_{r'l}$ is not, must not come as a surprise, as $a'_{r'l}$ is the derivative value of a function which here is zero.

It is not necessary for the derivative itself to become zero.

We have thus examined the elements of Kinematics of a material point moving away from the Foot of the Perpendicular with speed $v = C$, with its moving ray sweeping the angle from $\theta_1 = \pi/4$ to $\theta_2 = \pi/2$.

Important Remark:

When the moving ray of position (A) sweeps the above angle ($\pi/4$ to $\pi/2$), the moving ray of conjugate position (A') sweeps an angle interval **twice as much** (0 to $\pi/2$). This is a consequence of the fact that the moving ray of the conjugate position **has always twice the angular speed** of the moving ray of the position, i.e. $\frac{d\theta'}{dt} = 2 \cdot \frac{d\theta}{dt}$.*

1B. ELEMENTS OF DYNAMICS

The force of Gravity is exerted on the moving material point due to its "coexistence" with material "element" O. According to the fundamental hypothesis of the Theory of Harmonicity, this force originates from O', the conjugate of O, which is located at the intersection point where the parallel line to E, drawn from O, and the parallel to OA', drawn from A, meet. (Fig.1.4.4).

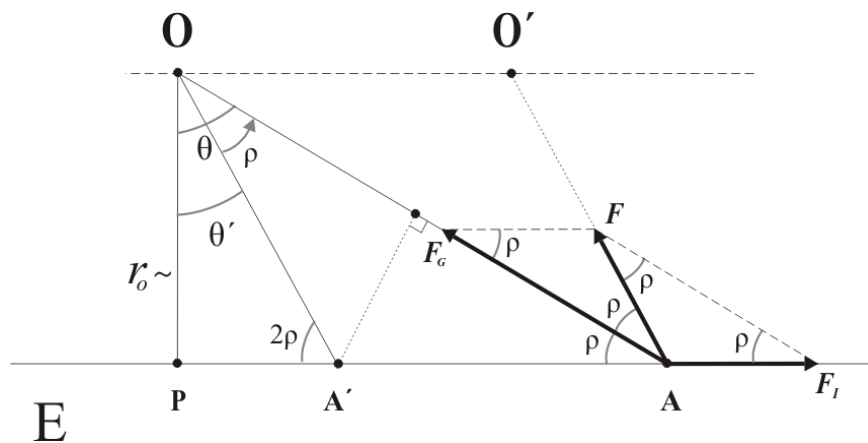


Figure 1.4.4

I resolve the total force of Gravity F into the following two components: a) the force of inertia F_I along the direction of movement (*path of matter*), and b) the force of gravity F_G along AO (*noetic path*).

* Those of you who, at this point, already begin "to catch the scent" of the Quantum Mechanics spin concept, are absolutely right. We shall examine this concept in more detail later in this chapter.

Because the triangle of the forces is similar to the isosceles triangle $OA'A$, we have:

$$F_I = F \quad (1.4.16)$$

A relation also resulting from (1.3.4), for $\frac{v}{c} = 1$.

$$\text{Also: } \frac{F_G}{2} = F \cdot \cos \rho = F \cdot \sin \theta \quad \Rightarrow \quad \frac{F_G}{F} = 2 \cdot \sin \theta = \frac{c}{v_{ob}}$$

Therefore:

$$F_G = \frac{c}{v_{ob}} \cdot F \quad (1.4.17)$$

A relation also resulting from (1.3.5a), for $v = c$.

Thus the proposals that we formulated for the Dynamics at subliminal speeds, **are also true** for the Dynamics at speeds equal to that of light. The structure remains the same.

Important Special Case

It is interesting to examine what happens when the material point **appears at** the PF (Fig. 1.4.5).

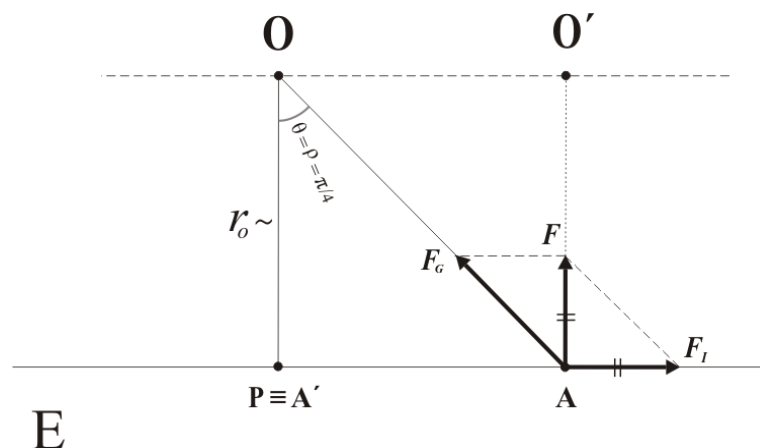


Figure 1.4.5

At this position, it holds that: $F_I = F$ and $F_G = \sqrt{2} \cdot F$.

Let us compare figures (1.4.5) and (1.4.3). We observe that the equality of accelerations a' and $a'_{r'l}$, is mirrored in the equality of forces F_l and F .

The force of gravity F exerted on the material point originates from O' and is **inversely proportional** to $(O'A)^2 = (OA')^2 = r_0^2$.*

In such a field, where the force is inversely proportional to the square of the distance from the point of attraction, the dynamic energy of mass m at a distance h from this point is:

$$E_{dyn} = m \cdot g \cdot h \quad (1.4.18)$$

where g is the acceleration of gravity **at the location of matter**.

Here, matter **appears to be located** (measured) at position A' , which is at a distance r_0 from the point of attraction and subject to a radial acceleration $a'_{r'l}$ (corresponding to gravity F), which is equal to:

$$a'_{r'l} = \frac{c^2}{r_0} \quad (\text{See Fig. 1.4.3})$$

Thus, by replacing the above values in equation 1.4.18, it results that the dynamic energy of the material point within the field of Gravity under consideration is:

$$E_{dyn} = m \cdot g \cdot h = m \cdot \frac{c^2}{r_0} \cdot r_0$$

In other words:

$$E_{dyn} = m \cdot c^2 \quad (1.4.19)$$

* In Chapter Two, I made a first attempt at "proving" the Law of inverse square based **solely** on the elements of motion. I do not believe that I convinced the reader that this is an important conquest. In any case, I am not satisfied either, as I still have not understood what Gravity **really** is. Thus let us, for the time being, "borrow" from Newtonian Mechanics the fact that F is inversely proportional to the square of $(O'A)$.

The important change that Harmonicity brings here is the **shift** of O to O' . In other words, a follower of Newtonian Mechanics would consider that F is inversely proportional to $(OA)^2$ because this **IS** the distance between the two material "elements". This, however, is wrong. The force of Gravity is inversely proportional to the square of the path that A "sees", i.e. the "path of light" ($O'A$) and not of the "noetic path" (OA). Later on, when we understand Gravity better, **we shall be a lot stricter in proving the law of the inverse square** and in investigating its restrictions.

Caution!

We ended up with above equation because **we corresponded** the force of gravity F with the acceleration $a'_{r'l} = \frac{C^2}{r_0}$, which **we calculated at the specific position**, based on the elements of motion and on the 1st Fundamental hypothesis of Harmonicity.

Perhaps many readers will consider the above "correspondence" arbitrary. However, it is not, because the acceleration which is perpendicular to the orbit was already proved, in Chapter Two, as being **inversely proportional to the square** of the distance from O, and $a'_{r'l}$ is precisely this kind of acceleration.

The **physical meaning** of equation (1.4.19) appears to be different to the physical meaning of Einstein's $E = mc^2$ equation. The latter is translated as showing the equivalence of matter (mass) and energy. This "translation" might perhaps be good for accountants. It is not good, however, for physicists and for all "physically" thinking people.

The **physical meaning** of Einstein's $E = mc^2$ can be best explained as follows:

You cannot go sailing, in dead calm, by placing a fan, no matter how powerful, at the stern of the boat blowing wind onto the sail.

(Even if said fan, instead of air, happens to "blow" photons onto the sail...).

This is the physical meaning of Einstein's $E = mc^2$ equation, which was derived on the basis of the **Principle of the Conservation of Momentum** and of the **Principle of the Constancy of the Speed of Light**.

On the other hand, our equation (1.4.19) was derived on the basis of the independence of the speed of light, (1st fundamental hypothesis of Harmonicity) and of Newton's law of Gravity (as amended by Harmonicity). However, Newton's law of Gravity and the principle of the Conservation of Momentum have the same source*.

* To explain why, let us follow these steps:

*1st Step: The Momentum Conservation Principle is **equivalent** to the Angular Momentum Conservation Principle (See Richard Feynman, 1967 "The Character of Physical Law", 2nd Edition, MIT Press, USA).*

*2nd Step: The Angular Momentum Conservation Principle **leads** to Kepler's second law (The moving ray sweeps equal areas in equal times).*

*3rd Step: Kepler's second law **is to be found at the foundations** of Newton's law of Gravity.*

Both laws represent attributes of Geometrical Space, which **we have agreed** * to consider uniform.

If the uniformity of Geometrical Space is not considered a prerequisite, then all of the above "laws" and equations **are not valid**. Thus both, Einstein's and the Theory of Harmonicity's equations above, **essentially "spring" from the same source**.

- The Constancy of the Speed of Light.**
- The Uniformity of Geometrical Space.

2nd CASE

The material point moving with speed c , measured with the LASC, **moves away** from the Foot of the Perpendicular, which "splits" the conjugates.

2A. ELEMENTS OF KINEMATICS

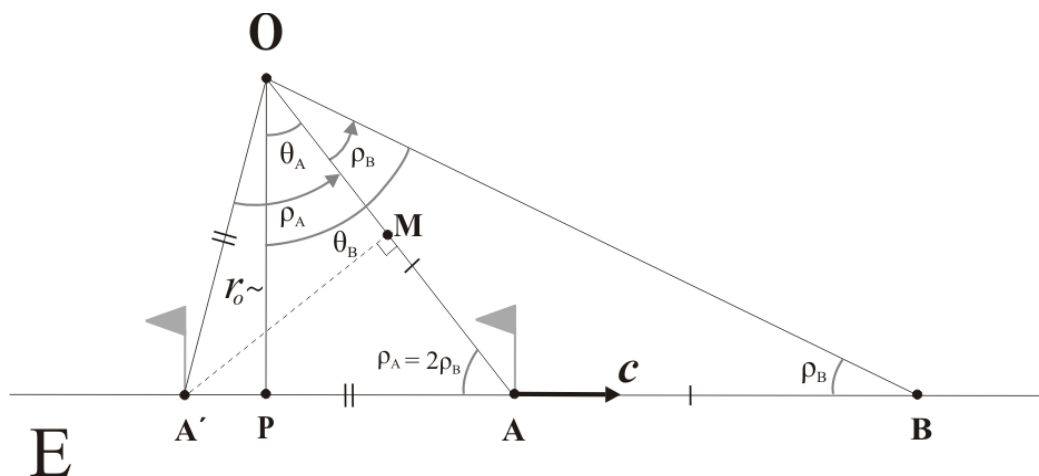


Figure 1.4.6

* I emphasize "**we have agreed**" because Geometrical Space exists **only** in our minds. Only Perceptible Space is objective.

** Perhaps, someone trying to investigate **the cause of the constancy of the speed of light**, could attribute it to the "uniformity of time flow". However, as I have already stated that I do not understand what Time really "is", I confine myself to simply "work" with this constancy. It is possible that I have already tired the reader by constantly repeating that I do not understand what Time is really all about... Unfortunately, however, this is the truth. On this, on my opinion, **fundamental problem of human knowledge**, we should perhaps remember St. Augustine's words:

"When they ask me what Time is, I do not know; when they don't ask me, I do".

Let us assume (Fig. 1.4.6) that the material point is located at position A, and moves away from P with speed c measured with the LASC. Its conjugate A' is located at the point where the perpendicular bisector on OA meets straight line E.

Calculation of the elements of movement:

1. U_{ob} = Speed measurable with the local clock between conjugate positions

Suppose that we placed our poles on the conjugate positions A and A' and asked from the Observer **to measure U_{ob} with his clock**. Suppose now that A is the conjugate of B. Thinking as before, we get:

$$U_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot c \quad (1.4.20)$$

$$\text{But: } \frac{A'A}{AB} = \frac{\cos \theta_A}{\cos(\rho_A - \theta_A)} = \frac{1}{2 \cdot \sin \theta_A} \quad (1.4.21)$$

Therefore:

$$U_{ob} = \frac{c}{2} \cdot \frac{1}{\sin \theta_A} \quad (1.4.22)$$

A relation that is identical with (1.4.4) of the previous 1st case.

However, here we observe that when angle $\theta_A=0$, i.e. when the material point **is located** at the Foot of the Perpendicular, U_{ob} becomes, based on 1.4.22, **infinite!**

Caution, however!

All of the above have a purely mathematical meaning **only**, as U_{ob} becomes infinite as a direct result of A' "being transferred" to infinity. In Physics, however, someone must actually "travel" to infinity, to position the flagged pole there, so that we are able **to perform the measurement!**

In **Physics**, therefore, for $\theta_A = 0$, U_{ob} **is not infinite, it simply has no meaning**.

In any case, as angle θ_A **approaches** zero, U_{ob} **approaches** an infinite value. Thus, a material point moving with the speed of light measured with the LASC and located near the PF, **appears** to move with **infinite speed**, but simultaneously **it appears** to be located much-much farther*.

2. U' = **Instantaneous speed of the conjugate position defined as** $\frac{dx'}{dt}$

I consider P as the origin of the lengths measurement.

Absolute values of angles are taken only.

From Fig. 1.4.7 we have: $\theta + \rho = \pi/2$ and $\theta' + \pi - 2\rho = \pi/2$

Therefore:
$$\theta' = \frac{\pi}{2} - 2\theta \tag{1.4.23}$$

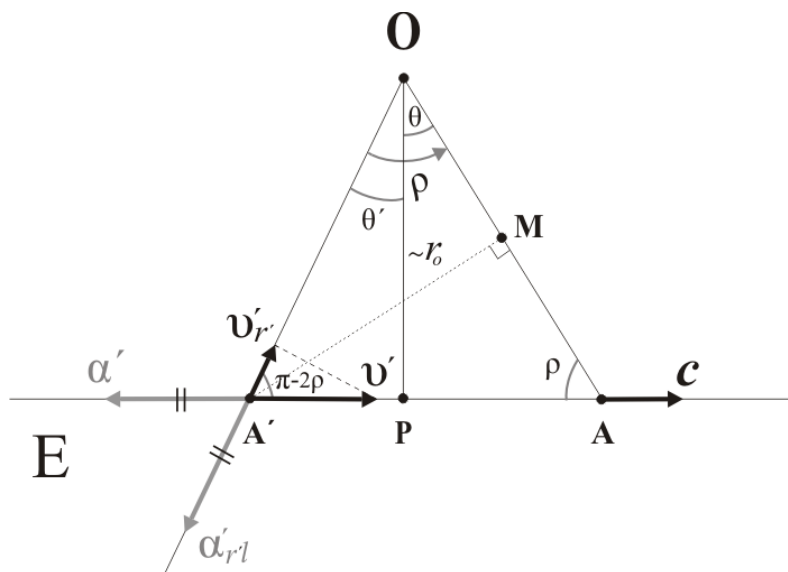


Figure 1.4.7

Because: $x' = -r_0 \cdot \tan \theta' \Rightarrow U' = \frac{dx'}{dt} = -\frac{r_0}{\cos^2 \theta'} \cdot \frac{d\theta'}{dt}$

* Here, again, I have to remember Zeno: In order to "move" A' to infinity, A must be located **precisely** at P. In other words, distance PA must become **exactly zero**. This, however, can be only achieved in the mind. The term "**e x a c t l y**" has no meaning in the real world [...]

But: $\frac{d\theta}{dt} = \frac{c}{r_0} \cdot \cos^2\theta$ and $\frac{d\theta'}{dt} = -2 \cdot \frac{d\theta}{dt}$

Also: $\cos\theta' = \sin 2\theta = 2 \cdot \sin\theta \cdot \cos\theta$, therefore, v' is calculated as:

$$v' = \frac{c}{2} \cdot \frac{1}{\sin^2\theta} \quad (1.4.24)$$

In other words, here too v' is given by the same relation, as in the 1st case.

3. $v'_{r'}$ = **Instantaneous radial velocity defined as the projection of the velocity of the conjugate position v' on the moving ray of the conjugate position OA'**

It holds that:

$$v'_{r'} = v' \cdot \cos(\pi - 2\rho) = -v' \cdot \cos 2\rho = -v' \cdot (2 \cdot \cos^2\rho - 1) = -v' \cdot (2 \cdot \sin^2\theta - 1) = v' - c$$

Therefore:

$$v'_{r'} = v' - c \quad (1.4.25)$$

This relation results also from (1.2.73), for $b = 1$ and $v = c$.

We observe that the strange fact, that the **numerical subtraction of the magnitudes** of the two collinear velocities **yields the magnitude of the radial** (not collinear) $v'_{r'}$, occurs in this case also.

Also $v'_{r'}$, as a function of c and angle θ **only**, is written as:

$$v'_{r'} = \frac{c}{2} \cdot \frac{\cos 2\theta}{\sin^2\theta} \quad (1.4.26)$$

4. a' = **Instantaneous orbital acceleration of the conjugate position defined as** $\frac{dv'}{dt}$

As previously, we have:

$$a' = -\frac{c^2}{r_0} \cdot \frac{\cos^3 \theta}{\sin^3 \theta} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.4.27)$$

where ρ is the « **Angle of Light Deflection** » (ALD).

5. $a'_{r'l}$ = **Instantaneous radial acceleration of the conjugate position defined as** $\frac{dv'_{r'}}{dt}$

From equation (1.4.25), we have: $\frac{dv'_{r'}}{dt} = \frac{dv'}{dt}$. Therefore:

$$a'_{r'l} = -\frac{c^2}{r_0} \cdot \frac{\cos^3 \theta}{\sin^3 \theta} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.4.28)$$

We have calculated, therefore, the defined elements of the motion of the conjugate position, when angle θ sweeps the angular interval (0 to $\pi/4$). We observe that angle θ' sweeps an interval **twice as wide** ($-\pi/2$ to 0). This is due to the fact that the angular velocity of the moving ray of the conjugate position is **twice** the angular velocity of the moving ray of the position.

The 1st and 2nd case **combined**, that we have just examined, concern the case that position A travels along **half-line*** E, i.e. moving ray OA sweeps the angular interval (0 until $\pi/2$). However, we observe at the same time that conjugate position A' travels along the "**entire length**" of straight line E, i.e. moving ray OA' sweeps an angle interval **twice** as wide ($-\pi/2$ to $\pi/2$).

* The term "half-line" is used in its Euclidean meaning. In Projective Space, "half-lines" **do not exist**.

2B. ELEMENTS OF DYNAMICS

The force of Gravity is exerted on the moving material point due to its "coexistence" with material element O. As previously explained in 1B, this force originates from O', the conjugate of O, which (Fig. 1.4.8) lies at the point where the parallel to E drawn from O, meets the parallel to OA' drawn from A.

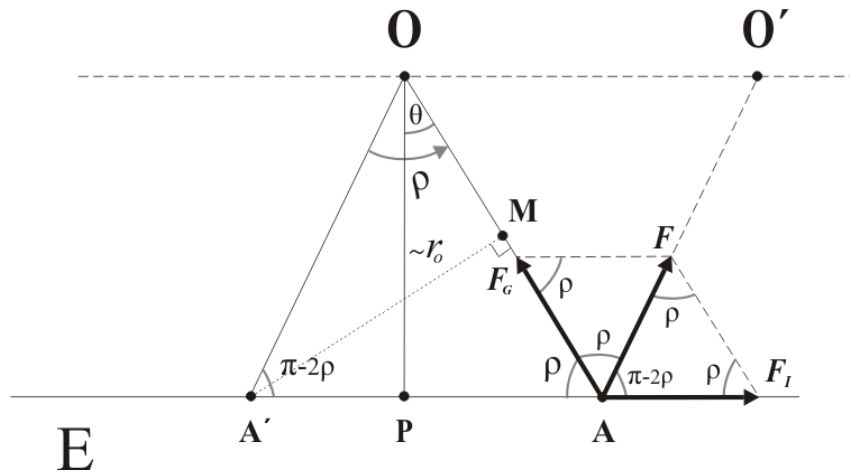


Figure 1.4.8

I resolve the total force of Gravity F into its two components: a) the inertial force F_I along the direction of movement (*path of matter*), and b) the gravitational force F_G along AO (*noetic path*).

As the triangle of the forces is similar to the isosceles triangle OA'A, it follows that:

$$F_I = F \tag{1.4.29}$$

Also: $F_G = 2 \cdot F \cdot \cos \rho = 2 \cdot F \cdot \sin \theta$ and therefore:

$$F_G = \frac{C}{U_{ob}} \cdot F \tag{1.4.30}$$

We observe, therefore, that our findings are the same to those of the previous case. Here, however, and specifically for $\theta = \pi/6$ (30°), we have $U_{ob} = C$ and hence:

$$F = F_I = F_G .$$

The important point, however, is the following:

As the material point A, while moving away from P, changes position and until angle θ equals $\pi/4$ (45°), i.e. A' reaches P, **the force of Gravity F exerted at A is repulsive**. In general, **the repulsive gravitational force (antigravity)** appears when position A travels the interval PK, K being the position that has the PF as its conjugate (See Chapters One and Three).

As far as I know, there is no Physics Theory providing for the existence of repulsive Gravity. This conquest of ours, **which reconciles Gravity with Electromagnetism**, (at least with regards the direction of the force), where **attraction** and **repulsion** exist, is due to the revision of Newtonian Gravity "imposed" by the Theory of the Harmonicity of the Field of Light with its 1st fundamental hypothesis, i.e. the "transposition" of the attraction producing position, from O to O'.

3rd CASE

The material point moving with speed c , measured with the LASC, **approaches** to the Foot of the Perpendicular, which "**separates**" the conjugates.

Consider (Fig. 1.4.9) that the material point at position A is approaching the PF.

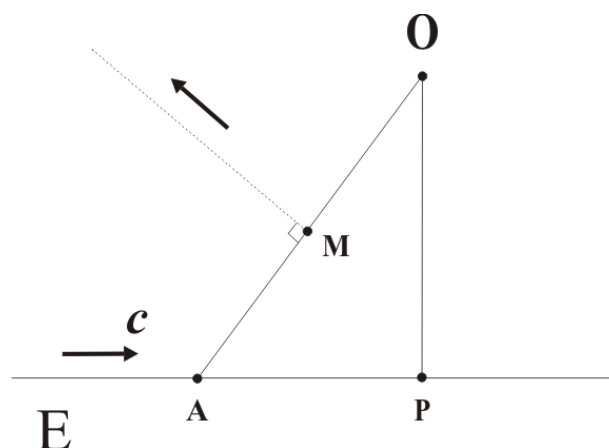


Figure 1.4.9

The question arises: Where is the conjugate position of A located?

By reference to the methodology of the two previous cases, we draw the perpendicular bisector at OA and we expect to find the sought conjugate position at the point where we will meet straight line E, as we move on the perpendicular bisector in the direction indicated by the arrow. However, if we were to do that, we would never meet straight line E **in the Euclidean Space**.

Conclusion :

A material point moving with the speed of Light and approaching the Foot of the Perpendicular, does not have a conjugate i.e. is not perceived in Euclidean Space.

The aforementioned conclusion is not only reasonable but also entirely compatible with our every day sensory experience, at least in the case of sound. Indeed, an airplane moving with the speed of sound and approaching the Observer **is not heard**.

However, from the point of view of dynamics there is a problem as, on account of A not having a conjugate, which according to our Theory is the source of the force of Gravity, it follows that A is not subject to any gravitational force!

In other words, we have stumbled upon a space void of any Field whatsoever!!

If, however, we were to accept Aristotle's²⁹ and later Descartes' and Leibniz's position, namely that there is no space **void of matter** as well as Einstein's³⁰ advanced position that not only there is no such thing as a space void of matter but also no space **void of Field**, then we do have indeed,* a problem.

Fortunately, however, the problem exists **only** in the Euclidean Space.

In the **Projective Space** of the Theory of the Harmonicity of the Field of Light no Problem exists (in principle).

²⁹ Aristotle's "De Naturae" (D 217b, 21): "Because someone can neither accept by logical reasoning that there is nor that void does exist, nor can it be created directly and immediately, nor by using simple weak reasoning, nor can it be realized dynamically by physical evolution. All this is valid except when somebody willingly decides after deep thinking, in any case, to call "κενόν" (i.e. void) that which is the cause and has the property to transport, i.e. to let pass or carried through or be brought or to be adduced".

³⁰ Albert Einstein, "The Princeton Lectures", Korontzis Publ., Athens (in Greek):. On the nonexistence of a space void of matter, see p. 12.

* I gladly "perceptively" accept this "perceptive" position of Einstein, namely that "there is no space void of any field". Unfortunately however, "pressing" facts will force me to revise it in the next Chapter.

The conjugate of A **does exist!**

Moving in the Projective Space that we have previously described, we will meet straight line E at A' (Fig. 1.4.10), the difference being that A' is now located on the "other side" of the perpendicular bisector. In other words, a development analogous to that of Christopher Columbus, who sailed from Spain westbound in order to reach the subcontinent of India from the "other side".*

The thus found conjugate position A', which is located on the perpendicular bisector of OA, satisfies the relation $A'A = A'O$.

What, however, is its **physical meaning?**

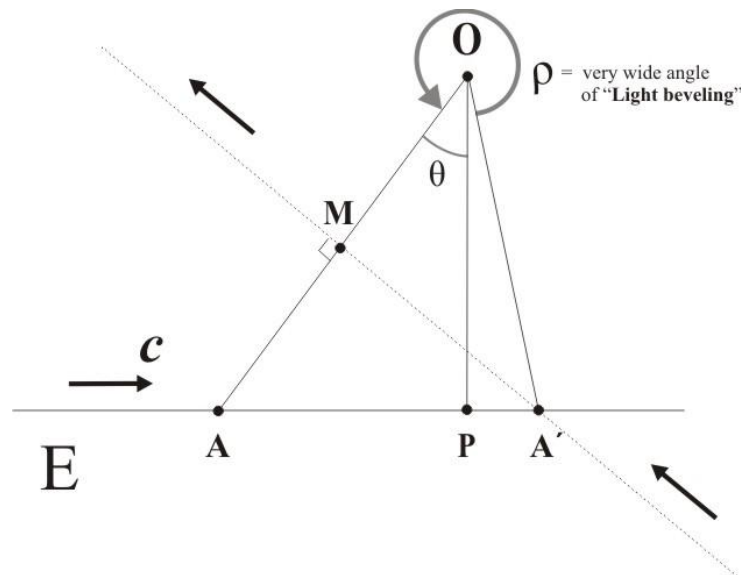


Figure 1.4.10

What does it **actually** mean that A' is the conjugate of A?

* Here someone who has not understood me well enough, could think that he could "rebut" me with my own arguments claiming that in order to reach A' from M, moving in the direction of the arrow, we would have to pass from infinity.

Caution, however; here we are referring to motion in the **Noetic Geometrical Space** and consequently this is feasible. In contrast, when, in previous pages, I claimed that position A' (flagged pole) is unfeasible at infinity, I did so because then A' was moving in the **Perceptible Space** and, as we know, in the Perceptible Space there is no infinity (... at least "we can't see it").

The point at infinity in the Noetic Geometrical Space was introduced by the great French mathematician and mechanical engineer Gerard Desargues (1593 - 1661), in his work : "Brouillon project d' une atteinte aux evenemens des rencontres d' un cone avec un plan". Paris, 1639.

I consider this to be a truly revolutionary concept and I bow before it. It solved many problems in Geometry. And, as it will become evident in later chapters, it solves even more Problems in Physics!

- Could it be that the effect (A') **precedes the cause** (A)?
- Could it be that the material point (A) "appears" at or interacts from a position (A') **that has not been reached yet?**
- Could it be that the material point "**appears**" or interacts from its "**future**" instead, as it would be reasonable, of "**appearing**" and interacting from its "**past**"? And, what if, while on its way to A', the material point (body) were to suddenly disappear (e.g. explode); how could it "**be perceived**" from somewhere where it had never arrived?
- Could it be that with this "geometrical dribbling" we abolished something much more important, i.e. the Causality Principle?
- Or that instead of solving a problem (field vacuum), we complicated it even more?

I must admit that this particular question tortured me immensely and for a very long time. Before, however, I present the reader with my final answer, I consider it necessary to list extensively all intermediary answers that I gave, while **always** trying to maintain my loyalty to the Causality Principle*.

1st Answer

The Causality Principle is not really abolished but, instead, Space "curves" and acts as a "gravitational lens" triggering A (cause) to "relocate" to A' (effect).**

This answer is indeed consistent with Einstein's General Relativity Theory, which respects the Causality Principle.

* There exist also "answers" that abolish the Causality Principle. However, philosophically, I cannot even think about them because on one hand I have unlimited respect for Aristotle and, on the other, I cannot allow myself to imagine a Universe where the effect... preceded the cause in time!

I consider the current proposals by some Physics theorists, namely that in some "special occasions" elementary particles presumably move from the future to the past, fairy tales or, at best, mathematical tautologies **bearing no relation whatsoever to the Perceptible World**. If we could really understand the concept of a capacitor's "negative energy" (reactive load), then perhaps we could avoid these foolish mathematical tautologies.

** Let us remember again Apostle Paul, (To Corinthians Letter A'; 13, 12): "...For now we see in a mirror dimly, but then face to face; now I know in part; then I shall understand fully, even as I have been fully understood." In this case, this mirror is not level and thus the Space "curves". Try to visualize the "magic mirrors" in an Amusement Park.

In this, the "curvature" of Space takes place by selecting a non-Euclidean Geometry: The Riemannian Geometry.

2nd Answer

We remain in the Projective Geometry and give the following physical explanation:

- a. If the material point travels **for the first time** straight line E, the first answer is valid*
- b. If, however, the material point **already has traveled** straight line E, then its conjugate is A', **which belongs to its previous travel.**

In other words, while the material point was traveling straight line E for the (n-1)th time then, **the moment when it was located** at A', it emitted light, which reaches O, when the material point is located at A, having traveled straight line E for the *n*th time.

That means that the material point has traveled the interval $A' \infty A$, in the time it took light to travel the interval A'O. But the distance between positions A' and A is the finite distance (A'A) because, in practice, this is the **only** one we measure.

Thus, the material point appears and is measured traveling the finite distance A'A, in the Time it takes light to travel the distance A'O.

Thus, this explanation does not abolish the Causality Principle because the "ticking" of the LASC at A' **precedes** the "ticking" of the LASC at A.

Although this explanation has some quantum connotations (lacking in the first answer) stemming from the introduction of **integer numbers** measuring the "runs", in other words it constitutes perhaps a **fundamental explanation** of the integer numbers in Quantum Theory, (which were axiomatically "imposed" on Theoretical Physics by experiment), however it appears "punctured" as it weakens and "blurs" the definition of speed, measured with the LASC, that we have given in Chapter 1.

* Space "curvature" is not forbidden in Projective Geometry. In particular, Riemann's and Gauss's Geometrical Space (where General Relativity works), are merely a special case of the Projective Space (see below).

And this because it requires, that the material point runs the enormous (infinite) interval $A' \infty A$ **in the same amount of time** required to run the finite interval $A'A$, a fact equally "absurd"* to the abolishment of the Causality Principle, which, however, we have tried to rescue.

This explanation could be very well acceptable **only** in the case where straight line E is converted to a circumference having $A'A$ as its diameter**. It is of course understood that, in this case, point O **exits** the plane of the circle altogether, thus giving rise to a **cone of vertex O** , whose generator equals the semi-circumference.

Despite all of these, the main concept of the 2nd answer is not immediately objectionable, because "absurdity" is present only if we consider intervals in the form of " $A' \infty A$ ", i.e. only if we perceive that we measure orbit segments that pass through infinity. However, in Physics, **we do not actually perform** such measurements. In Physics, the distance between two points is the finite one, i.e. the one corresponding to the unique Euclidean interval $A'A$.

The main supporting concept for this answer comes from Electromagnetism. At the end of Chapter One (p. 76), I touched upon the subject to shed some light on a deeper aspect of the error in the Special Theory of Relativity. Here, we shall return to investigate the Problem deeper.

In a **non-ideal inductive AC circuit**, i.e. in a circuit consisting of an inductor and a non-zero resistor, the rotating Voltage-Intensity graph of Figure 119 (p. 76) appears. The diagram rotates in the sense of the arrow of the circular frequency ω of the energy source. The angle φ is the "phase difference" between Voltage (cause) and Intensity (effect) and is a measure of the circuit "inertia".

By circuit "inertia", I mean the inverse of the speed with which the circuit responds to excitations.

* This "absurdity" remains as long as the concepts of Metric Euclidean Geometry are used, because no such absurdity exists in Projective Space. Panagiotis Ladopoulos writes on the relation of these two segments precisely: "This distinction to finite and infinite is made on the basis of Euclidean Geometry because on the basis of Projective Geometry no such distinction exists between the two segments, which are equivalent in the projective space". (Panagiotis Ladopoulos, "Elements of Projective Geometry", Volume I; A. Karavias Publications, Athens, 1966, p. 119).

** It is possible to convert the (Projective) straight line E to a circumference. Imagine a circumference with a very large radius. Locally, it appears as a straight line.

So far, there is no conflict with Causality. The cause (electric voltage) precedes and the effect i.e. the electrical current, represented by its intensity, follows with a delay of (φ). Thus this picture of the non-ideal **inductive** circuit (RL) "is reminiscent" of the examined 1st and 2nd cases, where the material point **was moving away** from the Foot of the Perpendicular with the speed of light. We did not have any Causality problem there either. Position A (cause) preceded and the conjugate position A' (effect) followed.

The Problem of Causality first appeared when, in the 3rd case, we considered the material point **approaching** the Foot of the Perpendicular. Let us remember therefore what happens in a non-ideal **capacity** (RC) circuit, i.e. a circuit with a capacitor and a non-zero resistor. In this circuit, the rotating Voltage-Intensity diagram is displayed in Fig. 1.1.10 (p. 77), where the cause (voltage) seems to follow the effect (intensity) by an angle (φ).

Thus here too it seems that the Causality Principle is abolished. However, this is not the case. Here, the phase difference is **not** φ , but the "enormous" angle $360^\circ - \varphi$, where the cause precedes and the effect follows by an "enormous" delay, and where the following equations are valid:

$$\cos(360^\circ - \varphi) = \cos \varphi \quad (1.4.31) \quad \text{and} \quad \sin(360^\circ - \varphi) = -\sin \varphi \quad (1.4.32)$$

By keeping precisely this philosophy in our second answer, we considered that the "Angle of Light Deflection" is the "enormous" angle ρ presented in Fig. 1.4.10, i.e., in this case, light has a very large "deflection angle".

Thus, when the material point **moves away** from the Foot of the Perpendicular with speed C we have A' "behaving" in a similar fashion to an RL circuit, whereas when it **approaches** the PF with speed C , it "behaves" in a fashion similar to an RC circuit.

Against this 2nd answer, there can be the following objections:

A. The exemplification of the motion of a material point on a straight line with speed C with the above circuits and the use of such "electromagnetic concepts" is arbitrary, because the Voltage-Intensity graphs are **rotated**, whereas the motion on a straight line with speed C is in no way related to rotation.

To this, I initially answer that **the straight line is Projective** and hence a **closed line**. Thus, in the Projective line, motion becomes rotational too.

The Projective Space, in which I have chosen to compose the Theory of the Harmonicity of the Field of Light, is much more general and abstract than the currently used Spaces of Physics.

The General Relativity Theory has chosen the Riemannian Geometrical Space which, however, is a **special sub-case of** the Projective Space.

If we, arbitrarily, designate the Riemannian Geometrical Space as **positive curvature space**, then the Theory of General Relativity is unable to describe phenomena (such as the repulsive Gravity) that occur in spaces of (conventionally) negative curvature (e.g. N. Lobachevsky's Hyperbolic Space).

Or, speaking in "electromagnetic" terms: The selection of the Riemannian Space can describe an "inductive circuit", but it is unable to describe an (opposite) "capacitor circuit"*. Thus, our problem, in its root, is not one about **Time**, i.e. a problem of Causality, but rather one about **Space**, i.e. a problem of Geometry.

The leading German mathematician Felix Klein, a major contributor** in the creation of the "mathematical foundation" of the General Relativity Theory, **proved the absolute generality of** Projective Geometry.

My late professor Panagiotis Ladopoulos writes:

* This opposite "capacitor circuit" was introduced essentially by Paul Dirac, who developed the Relativistic Quantum Mechanics **by inventing** antimatter.

In this treatise, we will not need to invoke any new "demons" (i.e. antimatter particles), but simply to comprehend that modern Physics is still incomplete because of the limitations of the chosen Geometric Space. By selecting the Projective Space, which also provides for negative curvatures and negative (reactive) energies, we can rid Physics from such "demons" and add to its prestige by cutting-down the number of its Axioms and by limiting its many arbitrariness.

I emphasize "**by inventing**" because antimatter does not exist. We had to invent it to "save" the phenomena.

** Many believe that the General Relativity Theory was created exclusively by Einstein. This, however, is wrong. Einstein created its "Physical" part. The "Mathematical" part was mostly developed by great mathematicians, first and foremost amongst them Einstein's friend, Marcel Grossmann. Some of them came from the brilliant mathematical nursery of the University of Göttingen. Felix Klein was one of them, as was his successor (1913) in the famous seat of Mathematics at Göttingen, the leading Greek mathematician and civil engineer, Konstantinos Karatheodori' (1873 - 1950). Einstein himself had a deep appreciation for Konstantinos Karatheodori (who was scoffed and doggedly fought by the academic establishment of Athens when Prime Minister Eleftherios Venizelos tried to repatriate him by offering him a teaching position at the University of Athens). In one of his letters asking Karatheodori's assistance to a mathematical problem in Physics, Einstein writes: "If you could define the problem I ask you, I will be your faithful listener. If, however, you could solve it for me, I will fall on my knees before you" [...]

*“Projective Geometry, founded eventually on purely graphic concepts, incorporates the metric attributes of both the Euclidean, as mentioned above, as well as the non-Euclidean Geometries, as Felix Klein proved. It has thus been proved, that both Euclidean and non-Euclidean Geometries come under Projective Geometry, as included in it, from which they can also result”*³¹

Thus F. Klein, on the aftermath of his grand achievement, declares:

*“Die Projektive Geometrie ist die ganze Geometrie”*³²

The brilliant structure of the Projective Space will become more apparent below, but even more so in the next Chapter, where we shall attempt to **unify** Gravity with the electromagnetic (attractive & repulsive), as well as with the nuclear (strong & weak) force.

B. The second objection is even more severe:

The claim that in the same time required by light to travel the interval $A'O$, the material point traveled interval $A' \infty A$, which means that in the same time it travels interval $A'A$, weakens the generality of the description, because **it revokes the severity** with which we defined the speed measured with the LASC.

The description is specific to a circumference, even of an enormous radius, where points A and A' are diametrically opposite. In other words, even if straight line E is Projective, the description suffers in general. Of course, if we do not pay attention to **metric concepts**, but only to projective (graphic) ones, the description does not suffer at all. In that case, however, we would have to work **only with the ratio v/c** and, in essence, would have to revise the "concepts" of the speeds of matter and light.

Therefore, I admit that if I do not want to limit myself to the special case of the circle, i.e. if I wish to maintain the **generality of** the description and not to have to forego the metric concepts (essential in Technology), **I do not have any persuasive arguments** against the above serious objection.

Hence, it is necessary to start searching for the optimal, final answer.

³¹ Panagiotis Ladopoulos, "Elements of Projective Geometry", Volume I; A. Karavias Publications, Athens, 1966, p. 15a and 15b.

³² op. cit. p. 16

3rd Answer

I will, once again, use electromagnetic "concepts", which I borrow from the technology of electricity.

In a RC circuit of alternating current, whose rotating Voltage / Current vector diagram is illustrated in Fig. 1.1.10 (p. 77), electricians have agreed to the following "**convention**":

They've agreed to symbolize angle φ , **by an angle equal in magnitude and opposite direction** (negative). Thus, the vector diagram becomes:

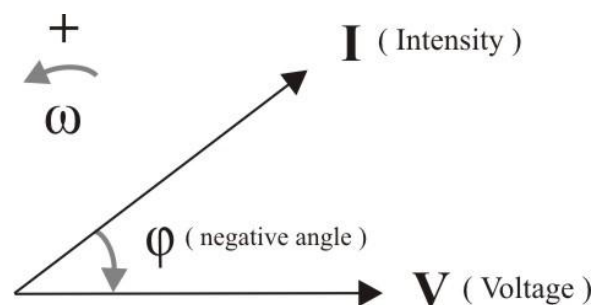


Figure 1.4.11

And equations (1.4.31) and (1.4.32) become:

$$\cos(360^\circ - |\varphi|) = \cos(-|\varphi|) = \cos|\varphi| \quad (1.4.31a)$$

$$\sin(360^\circ - |\varphi|) = \sin(-|\varphi|) = -\sin|\varphi| \quad (1.4.32a)$$

Of course, **the physical meaning** of negative angle φ is that it has rotation in the **opposite** direction to that of the diagram (direction of ω). The "convention" is not arbitrary, but is consistent with the rules of electromagnetism as it ensures the most essential:

In capacitors, reactive power* becomes **negative**.

* **Reactive power** is the product $Q = V \cdot I \cdot \sin\varphi$, whereas **active power** is the product $P = V \cdot I \cdot \cos\varphi$ and **apparent (or total) power** is the product $S = V \cdot I$, which is also given by the Pythagorean Theorem: $S^2 = P^2 + Q^2$. The domestic consumer is only charged for the active energy, which is the product of the active power (P) times the time of consumption. For anyone wishing to become more familiar with the subject and to better understand the concepts of electrical technology that I've used here, I recommend the following concise and with a minimum of math book: Heinz Rieger, "Leistung und Arbeit des Wechselstroms (PU 37)", 1974 (Siemens Aktiengesellschaft), Berlin und Munchen.

It is **important** that the reactive capacity power be negative because **we've selected** to name the reactive inductive power positive and, **moreover**, because the phase difference between the purely capacitor current and the purely induction one is π (180°)

Precisely this electricians' convention, which respects the Causality Principle, leads us also to our own 3rd Answer.

Just as the electricians reversed the direction of angle φ , we also reverse **the direction of Light motion**. Now light is perceived as moving along the path $A'_{\infty}O$, i.e. **opposite** to the path $A'O$. Thus, in the time required for the material point to travel interval $A'_{\infty}A$, light (the interaction) have traveled interval $A'_{\infty}O$.

Thus:

1. The Causality Principle is secured.
2. We do not need to revise the concepts of "speed of matter measured with the LASC" and "speed of light ".

Here, I emphasize that the intervals that we really measure **in Practice** are **only** the Euclidean ones, i.e. $A'A$ and the $A'O$. The explanation that this 3rd Answer gives **in no case** implies Time reversal, even if the intervals that we can measure ($A'A$ and $A'O$) are **opposite (or complementary)** of intervals $A'_{\infty}A$ and $A'_{\infty}O$ in the Projective Space.

Of course, conjugate position A' **does not precede** position A . Conjugate position A' **follows** position A , because straight line E is Projective. To better understand this, let us examine Fig. 1.4.12.

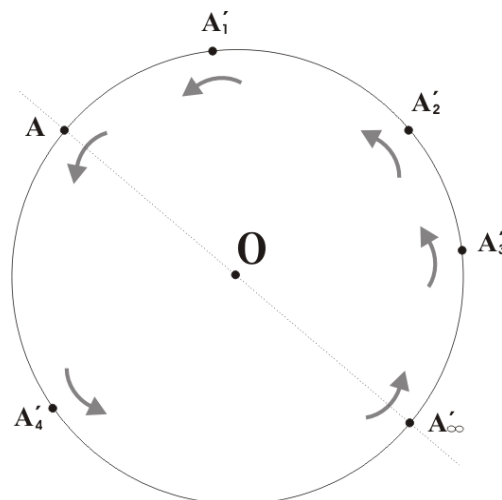


Figure 1.4.12

Consider on the circumference, two points A and A'_i moving in the same direction as the direction of the arrows. Let us assign A at the position and A'_i in the conjugate position. It is obvious, from the drawing, that A **precedes** A'_i . Let us reposition A'_i **backwards** and let us display it at positions $A'_2, A'_3, A'_\infty, A'_4$, etc, where A'_∞ is the diametrically opposite of A. Because we have accepted that A precedes A'_i , it is reasonable to accept that the same happens also in the relation of A with A'_2, A'_3 .

The crucial point here is A'_∞ . Thus it is possible for someone to consider that A'_4 , which has passed from A'_∞ , precedes A.

No! That would be wrong because A'_4 **has resulted via the continuous "backwards" repositioning of A'_i** . Point A continues to precede A'_4 ; simply the phase difference angle is greater than π (180°).

This picture and the explanation that I give, in combination with Fig. 1.4.10, is not valid in the Euclidean Space. **It is valid, however, in the Projective one.**

Thus, the introduction of the Projective Space in Physics **is absolutely necessary** in order to rid it, once and for all, from all its "metaphysical demons" and to pave the way for a "New Physics", which will be governed by the **reasoning austerity of Mathematics** and in which nobody, in his effort to interpret the natural phenomena, will be allowed to "capriciously" create, a-la-carte, the corresponding "god" or "demon" of choice.

In the 3rd Answer, **the measured** intervals appear **opposite** (negative) compared to the intervals traveled by matter and light. Thus, our answer is fully compatible with the electricians' convention (negative angle)*.

At this point, I have to clarify this:

I am not sure that conjugate position A' , during the approach phase to the PF, is visible, even if we consider that the phenomena occur in Projective Space. Perhaps, position A' is located outside the Human Field of View**.

* A phenomenon, analogous to the apparent reversal of the direction of motion of bicycle wheel spokes or propeller blades that we observe in the movies.

** Even in the case where conjugate position A' could become visible, our Observer at O will definitely need a rear view mirror. Let us again remember, St. Paul's mirror [...]

I am, however, sure that the gravitational interaction between material system of reference of Observer (O) and the moving material point, comes from A'.

Only Experimental Physicists or Astronomers will provide a definite answer on whether the conjugate position is "visible" or "invisible".

If the conjugate position A', during the approach phase towards the PF, turns out to be **invisible***, then the Theory of Harmonicity explains the modern big mystery of the so-called "Dark Matter". The why becomes obvious: "Dark Matter", while not apparent, does create gravitational interaction, **a phenomenon that so far has not been explained** by the existing theories of modern Science.

Finally, from a graphic (Projective) point of view, the 3rd Answer is identical to the 2nd one. We observe that the **negative angle** φ has the same trigonometric functions as angle $360^\circ - |\varphi|$ (Equations 1.4.31a and 1.4.32a).

So far, we have examined in-depth the Kinematics and Dynamics of a **material point moving with the speed of light**, as measured with the LASC and we have come to realize that **in Projective Space** the "approach" phase to the Foot of the Perpendicular and the Observer (3rd and 4th case), is **essentially** a "moving away" phase (2nd and 1st case). Indeed the equations are precisely the same, if we keep in mind that angle ρ should be considered negative.

Hence, cases 3 and 4 are true mirror images of cases 2 and 1, respectively.

We have also realized that the World, the subject matter of Physical Science, **depends in a crucial and unique way on the behavior, properties and action of Light.**

* *"And the LORD said unto Moses, I will do this thing also that thou hast spoken: for thou hast found grace in my sight, and I know thee by name. And he said, I beseech thee, shew me thy glory. And he said, I will make all my goodness pass before thee, and I will proclaim the name of the LORD before thee; and will be gracious to whom I will be gracious, and will shew mercy on whom I will shew mercy. And he said, **Thou canst not see my face: for there shall no man see me, and live.** And the LORD said, Behold, there is a place by me, and thou shalt stand upon a rock: And it shall come to pass, while my glory passeth by, that I will put thee in a clift of the rock, **and will cover thee with my hand while I pass by; And I will take away mine hand, and thou shalt see my back parts: but my face shall not be seen.**"*

(Exodus, 33: 17-23) *My underlining.*

Light, the information & interaction carrier, shapes the object of knowledge* .

Thus the Matter - Antimatter distinction is nothing more than a **reversal** of the Light path (direction of travel). This **directional change of the motion of Light** has some additional and rather shocking consequences, which, however, we shall not examine in this Chapter.

The greatness of the Greek **Synthetic** and **Geometrical** Spirit is revealed mainly by the fact that (firstly with Thales of Miletus) it managed to conceive and formulate general proposals as **Principles** (hypotheses), from which it derived **deductively** other true proposals **testable by experience** which, by itself alone, **was impossible** to lead to the Principles.

By contrast, today's modern Physics gathers mostly empirical data and, occasionally, it attempts to conceive and formulate the Principles through Big Scientific Revolutions. However, such "Revolutions" certainly do not happen every day and thus, inevitably, various empirical data tends to accumulate without ever obtaining any **integral and fundamental understanding** of the structure and/or the relations of the elements of the Perceptible Space.**

I feel therefore compelled to open right here, now that we've become somewhat familiar with the Projective concepts, a Mathematical (Projective and Topological) parenthesis, in order to reveal some of the Fundamental Principles of mathematical nature, which are **essential**, in my opinion, to connect and to optimally comprehend the data of our Physical experience that is under examination in this chapter.

* *"That was the true Light, which lighteth every man that cometh into the world".
(John 1:9)*

"For the law was given by Moses, but grace and truth came by Jesus Christ. No man hath seen God at any time, the only begotten Son, which is in the bosom of the Father, he hath declared him". (John 1: 17 – 18).

** *Of course, I do not consider as "**fundamental understanding**" the hallucinations of modern Physics, which in order to explain the experiments (empirical data) frequently invents another new "god" or "demon", thereby sentencing itself to eternally stagger in the domain of **self-fulfilling prophecies** (e.g. elementary particles, antimatter, tunnels, strings, "worm-holes" and various other exotic nonsense).*

*Similarly, I reject most proposals of Cosmology as not providing fundamental understanding for the additional reason that **they are not falsifiable**, i.e. cannot be considered scientific proposals. Thus the famous "conflict" between theoretical Physicist Peter Higgs and his followers and cosmologist Stephen Hawking on the existence or not of the controversial **boson** (Higgs boson), the so-called "divine particle", is as far as I am concerned completely meaningless, whether this particle "exists" or not. I am convinced that the fundamental Principles of the Universe cannot be approached either by the various "- ons" or by Cosmology's arbitrary pronouncements.*

[Topology was first introduced in Mathematics by G. W. Leibniz who named it *Analysis Situs*. The term "Topology" was introduced by J. Listing with his work "*Vorstudien zur Topologie*" (Gottingen, 1848), a term which superseded the Leibniz term.

After Georg Cantor's Set Theory and Evariste Galois' Group Theory*, Felix Klein managed to define an "Abstract Geometry" as follows:

*"Let us imagine a set V of elements, which we call "points" and a set of "transformations", applied on these points, which form a group G . **The Geometry of set V , which has G as its main group, is the sum of the properties of set V remaining unaltered during the transformations of group G "**.*³³

Consequently, the definition of Topology demands the definition of the homeomorphic transformation:

"As elements of set V we consider the points of a space, e.g. a three dimensional one. On the points of a set V , we consider a set of G transformations applied, each of which satisfies the following attributes (axioms):

a) It is one-to-one, i.e. on each point corresponds one and only one point and conversely each point is the corresponding of one and only one point.

b) It is bilaterally continuous, i.e. it corresponds two neighboring points to two neighboring points and conversely two neighboring points correspond to two neighboring points.

*A transformation satisfying both of these attributes is called **Homeomorphism**"*.³⁴

Because the product of two homeomorphisms is a homeomorphism and because the reverse transformation of a homeomorphism is a homeomorphism, it follows that the set G_T of homeomorphisms forms a Group.

* "Let there be a set of V elements on which we have defined a set G of transformations. We claim that this set G of transformations forms a group, when: a) The product of two transformations of the set is a transformation of the set, and b) the inverse of any transformation of the set is a transformation of the set." (Panagiotis Ladopoulos, "Elements of Projective Geometry", Volume I; A. Karavias Publications, Athens, 1966, p. 115).

³³ P. Ladopoulos, op. cit. p. 117

³⁴ P. Ladopoulos, op. cit. p. 117

We already have Topology's definition:

***“Topology is the Geometry, which has as its main group,
the group of homeomorphisms G_T ”.***³⁵

Furthermore, Paul Alexandroff, a leading mathematician and Topology researcher, provides another concise conceptual approach of Topology:

*“We call one-to-one and bilaterally continuous correspondences as homeomorphic or topological transformations. Properties that are maintained by such correspondences are called topological invariables.”*³⁶

(The following Geometrical elaboration comes from the chapter: *“The texture of the straight line, plane and space in Projective Geometry”* by P. Ladopoulos, p.118 - 124).

I have already mentioned that the Projective straight line is a **closed line** via its point at infinity. From a topological view, however, the Projective straight line differs from any other closed line (e.g. circumference), which has no point at infinity. The only geometrical shape on a plane, which can be considered equivalent to the Projective straight line from the “textural”^{*} point of view, is the **Plane pencil of lines**, i.e. the set of all straight lines on a plane that pass through a single point^{**}.

Indeed, let us we consider the Projective straight line E and a point outside this line.

(See Fig. 1.4.13 on the next page)

If from point O we project the points of the Straight line, we get the plane pencil of lines OM. In this way, a **one-to-one** and **bilaterally continuous** correspondence is established between the points of Straight line E (M) and the plane pencil of lines O (OM).

³⁵ P. Ladopoulos, *op. cit.* p. 118

³⁶ Paul Alexandroff, *“Einfachte Grundbegriffe der Topologie”*, Kljasma Publ., Moscow, 1932.

* *“The term ‘textural’ designates the set of those topological properties of a geometrical shape, which are not contrary to the geometrical visualization”.* (P. Ladopoulos, *op. cit.* p. 118).

** *Please note the application of the Duality Principle at the Plane:
Projective Straight line = Set of plane **points lying on a straight line**.
Plane Pencil of lines = Set of **straight lines** on a plane that go through **a point**.*

Using O as the center and a random radius, we draw a semicircle.

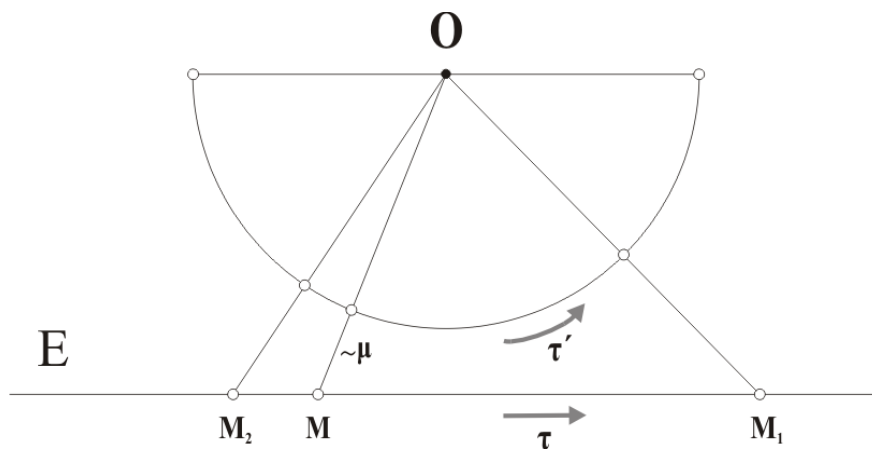


Figure 1.4.13

We observe that all points of the Straight line E are mapped in a **one-to-one** and **bilaterally continuous** way on the points of the semicircle, with the exception of the point at infinity of straight line's E , which is mapped at the two extreme points of the semicircle diameter which is parallel to Straight line E .

If, by a suitable transformation, we consider that these two extreme points coincide, so that the semicircle is transformed into a closed line, then we have achieved a one-to-one and bilaterally continuous correspondence between the points of the Projective Straight line E and the semicircle transformed as above so that these two forms have the same texture.

Let us now consider that straight line $OM \equiv \mu$ is rotated around O in a counter-clockwise direction. During this rotation, the intersection of straight-line μ with straight line E moves in the τ direction, i.e. from left to right, moving continuously away from initial point M , eventually passing from M_1 . If the rotation continues, the intercept passes from the Straight line E point at infinity and appears "on the other side" of it, whereas passing from point M_2 comes back to its initial position M , **moving always in the same direction**.

Also, we observe that if on Straight line E we consider a moving segment MM_1 in the same direction as τ , the corresponding part of the semicircle will move in the same direction τ' .

When segment MM_1 passes from the point at infinity of Straight line E and continues to move in the same direction τ , it will return to its initial position having its **initial direction τ** .

We characterize this property of the Projective Straight line by saying that:

The Projective Straight line is a bilateral line.

Up to here we did not face any difficulties in our elaboration.

The difficulties, however, start from this point onwards.

Let us examine the difference in texture between the Projective and the Euclidean Plane.

The Euclidean Plane straight lines are **open**, whereas those of the Projective Plane are **closed**. As a result, the Projective Plane is a closed surface via its line at infinity, in contrast to the Euclidean Plane, which is an open surface. Thus each Euclidean plane straight line separates the plane into two regions, **whereas no such** straight line exists in the Projective Plane.

Furthermore, **two** Euclidean plane straight lines separate said plane into **four** regions and **three** straight lines separate it into **seven**. By contrast, two straight lines of the Projective plane separate it into **two** regions and three straight lines into **four**.

The Projective plane, although a closed surface, differs topologically from any other closed surface, which does not have points at infinity (e.g. surface of a sphere). The only other geometrical shape that can be considered, from a “textural” point of view, equivalent to the Projective plane, is the **Central Beam** ^{*}.

Consider (Fig. 1.4.14) the Projective Plane **e** and a point O off of it.

If from point O we project the Plane, we establish a one-to-one and bilaterally continuous correspondence between the points and the straight lines of the Plane to the straight lines (beams) and planes of the Central Beam O.

^{*} *Central Beam is the set of straight lines and planes of Space that pass through a point.*

*Let us observe again the application of the Principle of Duality, this time in Space
The **Point**, i.e. the vertex of the Central Beam, corresponds to the Projective **Plane**.
The **Planes** of the Central Beam correspond to the Projective Plane **Points**.
The **Straight lines** (beams) of the Central Beam correspond to the **Straight lines** of the Projective Plane!*

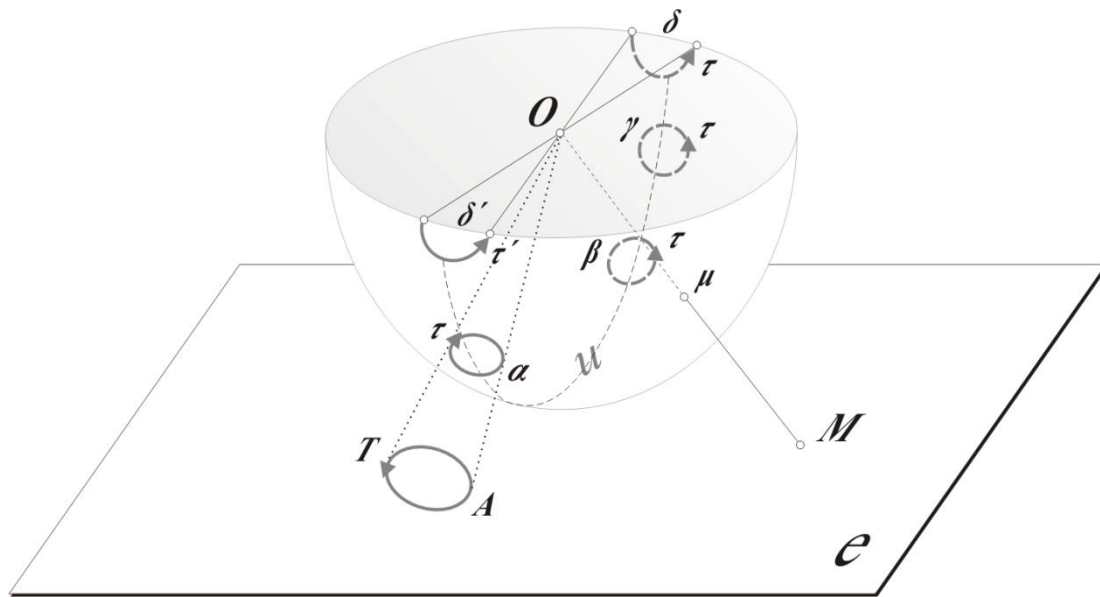


Figure 1.4.14

With center O and a random radius, we draw a hemisphere, which has its diametrical plane parallel to Plane e . Via the Central Beam of straight lines O we can map in a **one-to-one** and **bilaterally continuous** correspondence all points of Plane e on the points of the hemisphere (e.g. M on μ), except the points of the straight line at infinity of the plane which are mapped as pairs of points on the circumference of the circle on the diametrical plane of the hemisphere, which is parallel to plane e .

If, by a suitable transformation, we consider that the points of each pair **coincide to a point**, then the hemisphere becomes a closed surface and thus we achieve a complete one-to-one and bilaterally continuous correspondence of the points of the Projective Plane e with the points of the thus transformed hemisphere, so that the two shapes have the same texture.

Consider, on the hemisphere, a small circle α , on which direction τ has been defined. If we project circle α from point O onto Plane e , and as long as said circle is not intercepted by the diametric plane, on e will result an ellipse A and a direction T , which constitutes the projection of direction τ . We now imagine that we move circle α along line u on the surface of the hemisphere. Its projection (ellipse) will move correspondingly on the Projective Plane e .

Consider α , β , γ , δ and δ' four positions of the circle on the surface of the hemisphere, where δ and δ' the two semicircles in which the circle is divided by the diametric plane, never ceasing being a circle. To these four different positions of the circle will correspond the four different conic sections (its projections) A, B, Γ , Δ and Δ' .

However, something very impressive takes place!

Whereas the defined direction τ is preserved for the circles α , β and γ , **it is not preserved** for the two segments δ and δ' of the moving circle. Let us not forget that the pairs of the corresponding (diametrically opposite) points of the divided circle δ and δ' coincide into one.

Consequently, direction τ' of the circular segment δ' is the reverse of direction τ . So, when the moving circle passes from the diametric plane, its direction is reversed.

The same precisely phenomenon takes place also with regards to the direction on the circle projections on Projective Plane e , i.e. on the conic sections A, B, Γ , Δ and Δ' .

Conclusion:

*“On the projective plane, the direction which we have designated on one conic section is reversed when this conic section, moving along a line, returns to its initial position, having previously passed from the designated as the straight line at infinity of the projective plane”.*³⁷

Correspondingly, if we implement the same circle motion on the surface of a sphere, we will realize that when the circle returns to its initial position, the designated direction **remains the same and it is not reversed**.

Hence, there exists a fundamental texture difference between the closed surface of the sphere and that of the Projective Plane.

³⁷ P. Ladopoulos, op. cit. p. 122

It is, precisely, this "Texture Difference" that also creates the fundamental difference between the Theory of the Harmonicity of the Field of Light and the General Relativity Theory as well as all the relevant Theories that constitute today the "backbone" of modern Physics.

The Projective Geometry concepts introduced in Physics by the theory of Harmonicity, have never been used before and explain many "mysteries" of Quantum Physics, which neither the GRT nor the orthodox Quantum Mechanics interpretation dare touch and which, in order to be explained by other Theories (e.g. Dirac's), required the arbitrary introduction of "administrative measures"* and the mobilization of "traffic officers" and "paratroopers" to impose them in an entirely dictatorial fashion (e.g., see "antimatter").

Möbius first, in 1858, distinguished the surfaces into **orientable** and **non-orientable** ones. The sphere, for example, is an orientable surface, whereas the Projective Plane is a non-orientable surface.

He named the orientable surfaces **bilateral**, and the non-orientable **unilateral**.

Therefore: *"The Projective Plane is a unilateral surface"*³⁸

A very good and representative visualization of a **unilateral surface** is provided by the well-known "Möbius strip":

Consider rectangle ABCD with sides AD and BC much bigger than AB and CD. We twist the rectangle by 180° so that small sides AB and CD coincide and in particular points A and B coincide with C and D, respectively.

The flat shape has been transformed into a solid.

The resulting solid shape is called a "Möbius strip" (Fig. 1.4.15).

* The fatherhood of the expression "administrative measures" belongs to Stefanos Trahanas, Physics professor at the University of Crete. I use it therefore myself because I consider it extremely succinct to highlight the blind alleys of modern Theoretical Physics.

³⁸ P. Ladopoulos, op. cit. p. 123

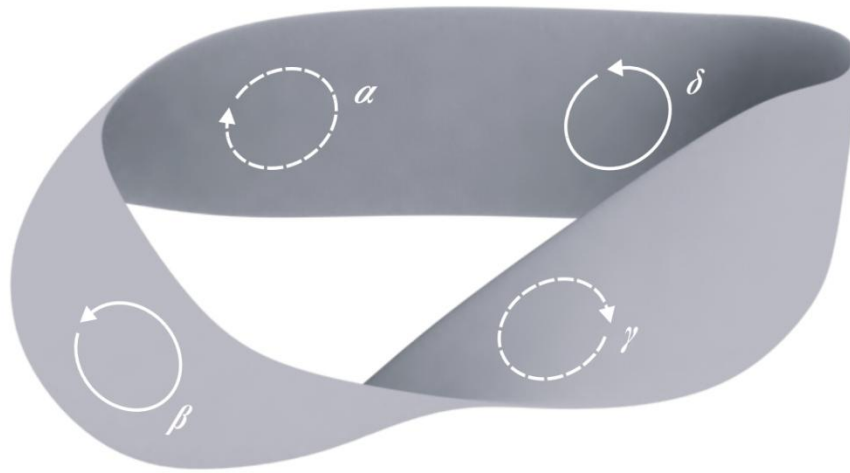


Figure 1.4.15

Consider a circle α on the Möbius strip and a direction defined on it. We observe that if we move the circle along a closed line on the surface of the Möbius strip, and the circle passes successively from positions α , β , γ and δ , the direction **is reversed** when the circle returns to its initial place.

To have the initial direction restored, it is imperative for the circle to **complete two runs*** along the Möbius strip.

The fact that the Möbius strip has the same texture as the Projective Plane can be also verified visually if we try to paint the strip. We observe that the entire Möbius strip can be painted **without the paintbrush transcending any of the strip edges**.**

In other words, the Möbius strip is a unilateral surface.

The paintbrush, however, must pass twice in front of the Observer.]

At this point, the Projective and Topological parenthesis that I considered necessary to open on page 201 is closed; I would, however, expect the reader, was to reasonably wonder what all this has to do with Physics.

Indeed it does and in a **fundamental** way!

* Please do not forget this **double** passing. **It is of fundamental importance in Physics.**

** This is impossible on a sphere or the Euclidean Plane, which are orientable, i.e. bilateral surfaces.

There is an inherent property of the so-called elementary particles (and not only), called **intrinsic angular momentum**^{*}, also widely known as *spin*.

The invention of the *spin*, also called the 4th quantum number, is one of the greatest conquests of modern Physics. However, perhaps it should be better to yield the floor to the true protagonists^{**} of this conquest.

“Goudsmit and I stumbled upon this idea while studying one of Pauli's works which stated his famous exclusion principle and four quantum numbers were attributed for the first time to the electron. This came rather routinely without any connection to a specific picture. This was a mystery to us. We were so familiar with the concept that each quantum number corresponds to a degree of freedom and simultaneously with the idea of a point electron, which, obviously, has only three such degrees of freedom, that it was impossible for us to accommodate the fourth quantum number. Thus the only way to understand it was to accept that the electron is like a small ball that can be rotated.” G. Uhlenbeck³⁹.

Wolfgang Pauli's exclusion principle and his proposed 4th quantum number were introduced in Physics to explain the atomic structure.

Without the Exclusion Principle, the electrons of atoms would accumulate at the fundamental level and the atomic volumes would be inversely proportional to the cube of the atomic number, something that would result in an **ultra dense** state of matter for the elements with relatively large atomic number, something that does not happen. Thus, in order for the electrons of the atom to continue to progressively populate the energy levels, the Exclusion Principle was formulated (one electron at each quantum state) and so they ended up being "burdened" with a 4th quantum number^{***} [...]

This number is the *spin*.

^{*} *In contrast to the orbital angular momentum.*

^{**} *G. Uhlenbeck and S. Goudsmit first introduced the concept of **spin** in Physics back in 1925.*

³⁹ Stephanos Trahanas, “Quantum Mechanics II”, (Volume Two), Chapter 9, The spin: a purely quantum angular momentum, p. 101, University of Crete Publ., Heraclion, 1986 (3rd Ed).

^{***} *This is yet another example of "Administrative Measures", traffic officers and "paratroopers" being arbitrarily introduced to explain the phenomena of Perceptible Space. Such "convenient" methods were always an anathema to the Ancient Greek Thinkers. Indeed, W. Pauli's exclusion principle is an archetypal "Administrative Measure", reminiscent of Administrative Provisions by the Hellenic Ministry of Industry such as: "On the capacity of elevator cabins", etc. [...]*

The size of an elementary particle's *spin* has always the same value and is expressed as an integer (zero included) or half-integer multiple of \hbar , where $\hbar = \frac{h}{2\pi}$.*

Thus, when we say that a particle has a *spin* of 1, we mean that its *spin* is \hbar (spin unit).

The intrinsic angular momentum of the elementary particles has always the same value; however, the direction of its "**spin axis**" varies. Of course, personally, I am unable to really comprehend the concept of the "spin axis" of an elementary (point) particle!

The incomprehensible, however, do not stop here.

Stephen Hawking, the contemporary, pioneer researcher, writes:

*“What the particle spin is really telling us is what the particle looks like from different directions. A particle with 0 spin is like a dot: it looks exactly the same from any direction (Fig. 5.6 - A).** But a particle with spin of 1 is like an arrow: it looks different from different directions (Fig. 5.6 -B).*** Only if we rotate it by a full circle (i.e. 360°) it will look the same as the initial one. A particle with a spin of 2 is like a double arrow (Fig. 5.6 -C)****: it looks the same if we rotate it by half a circle (i.e. by 180°). Similarly, particles with a large spin look the same if we rotate them by smaller fractions of the circle. All these appear reasonable enough, but the remarkable fact is that there are particles that do not look the same if we rotate them only by a single full circle; we need to rotate them by two full circles! We say that these particles have a spin of 1/2. (Fig. 5.6 - D)”***** 40*

* The term was introduced by P. Dirac: $h = \text{Plank's constant}$.

** Figure 5.6 - A, that the author shows is a round dot.

*** Figure 5.6 - B used by the author is a playing card displaying the ace of spades, with an arrow on it drawing a full circle on the card's plane.

**** Picture 5.6 - C used by the author is a playing card displaying the queen of hearts, with an arrow thereupon drawing half a circle on the card's plane.

***** Figure 5.6 - D does not show anything, neither a dot nor a playing card, only an arrow going around two full circles.

⁴⁰ Stephen Hawking, 1988, 1996. "The Illustrated A Brief History of Time".© Stephen Hawking.

So, the famous cosmologist seems to wonder of the fact that there exist particles having a *spin* of $\frac{1}{2}$, which must rotate **two** full circles in order to “look the same”...

Furthermore, he is unable to even visualize them with a meaningful "figure"!

This inability to provide a meaningful "figure", proves once more the impasses of modern Theoretical Physics.

Thus, the leading philosopher Immanuel Kant was not wrong when he warned:

“Visualization without a concept is blind...”

Concepts without visualizations are empty”.

I believe the time has come for all the High Priests and Elders of modern Theoretical Physics to **take into serious consideration the warning** from this brilliant mind and to quit serving concepts **lacking visualization**, i.e. **void of meaning**, while, at the same time, claiming that these concepts could explain the structure and the function of the Universe.

It starts to become evident that Physics, aided by the Theory of Harmonicity and the introduction of the **Projective Space**, is about to take a revolutionary turn.

The Space of the new consistent Physics is Projective!

The "stage" of events is **no more the Euclidean Space**, that we were taught at school and Newton worked in, **neither Riemann's nor Gauss's Space** that Einstein worked in.

The "stage" of events **is the Projective Space** where, **now**, the *spin* of $\frac{1}{2}$ makes sense:

Please note that the circle moving on the Möbius strip, (the "texture" of which, as we have proved, is the texture of the Projective Plane), must run the strip **twice**, so that the direction defined initially thereupon appears **again the same** to the Observer.

A single (simple) rotation of the circle around the Möbius strip **reverses** the defined direction.

Just as the Möbius strip, the Projective Plane is a unilateral (not orientable) surface **and this precise fact alone constitutes the cause and the fundamental explanation for the existence of elementary particles with *spin* of $\frac{1}{2}$.**

The above explanation, invokes neither "gods" and "demons", nor "traffic officers" and "paratroopers" and it is not the result of "Administrative Measures" as the Projective Space and its Geometry exist for nearly two centuries now. Projective Space was first introduced in Physics in a series of papers that I published in Athens in the early 80s which, alas, the Greek scientific establishment chose to ignore, blissful in the "safety" of fables and inconsistencies (See footnote p. 100).

There is no doubt, that the Projective Space offers us a superior comprehension of the relationships of the elements of Perceptible Space.

The comprehension, however, does not stop here.

As we know, elementary particles with *spin* in steps of one-half ($\frac{1}{2}$, $\frac{3}{2}$...), are called **Fermions***, also known as **matter particles** as they are considered the constituent of matter (protons, neutrons, electrons, etc). Elementary particles with an integer *spin* (0, 1, 2...) are considered the **interaction carrier particles** and are called **Bosons****.

Now this IS astonishing!

The texture and behavior of elementary particles that we consider as constituting matter itself is governed by a **purely Mathematical** Principle (Form):

The Unilaterality of the Projective Plane!!

My studies and training as an engineer have helped transform me over the years into an ardent **Aristotelian**. Thus, it comes as a big surprise to me to ecstatically recognize in the above a purely **Platonic** triumph:

At the microcosmic level, at least, Mathematical Principles (Forms) seem to govern the behavior and structure of Matter.

* *Fermions follow the Fermi - Dirac statistics. They also follow W. Pauli's Exclusion Principle.*

** *Bosons follow the Bose - Einstein statistics. They do not follow the Exclusion Principle.*

Furthermore, what I find extremely interesting is the fact that this Platonic Triumph was realized **through a purely Aristotelian Method**.

What have we then achieved so far in this fourth chapter?

We considered (perceived) a material point, position A, moving along the **Projective Straight line E**, with the speed of light C . Consequently, we could really be talking about a **photon**.

We examined **not what we perceive** but rather **what we observe and measure in the Perceptible Space***, i.e. conjugate position A', which, in general, does not move with speed C^{**} . Consequently, with regards to what "**appears**", we could really be talking about an elementary particle **which is not a photon**.

I therefore name **primary** and **secondary** the particles displayed at position A and at conjugate position A', respectively.

I wish to **emphasize** that our study was carried out by applying **strictly** Geometrical (Mathematical) Principles and the first fundamental hypothesis of the Theory of the Harmonicity of the Field of Light. **Nowhere and never** did we arbitrarily use additional axioms nor did we establish "Administrative Measures".

We discovered the following:

1. Orbital and radial accelerations acting on the secondary particle are, **at each position, equal in magnitude**.

* Thus, we were obliged to introduce **Observer O** in the "theater" of events. This action of ours is a consequence of a purely Aristotelian methodology, which "brings us down" us from the Physics of Angels to the Physics of Humans. However, the introduction of the Observer, who according to our theory **must be** a Real Human being and not an "Ethereal" one, also **necessitates** his placement **outside** the Projective Straight line E. Thus, based on founding axiom III of the Projective Space (See Introduction), the Projective Plane is **created and defined** and becomes essential in the description.

Therefore, behold the cause of spin creation.

In contrast, the Special Relativity Theory works with "Ethereal Humans", which **remain on the straight line E** and thus neither the plane and, consequently, nor the spin are defined.

** The speed of the conjugate position equals the speed of light C , **only** when the material point "**appears**" at the Foot of the Perpendicular.

2. When the secondary particle **is located** at the PF (i.e. the primary one "**appears**" to be at the PF), the above two accelerations are **perpendicular** to each other and at that point they are equal to $\frac{c^2}{r_0}$, where r_0 is the distance of the Observer from the PF.

Exactly there, the dynamic energy of the observed particle becomes: $E_{\delta v v} = m \cdot c^2$

3. The angular speed of the moving ray that connects the secondary particle with the Observer is **twice** the angular speed of the moving ray connecting the primary particle with the Observer; in other words:

$$\frac{d\theta'}{dt} = 2 \cdot \frac{d\theta}{dt} \quad \text{at any position.}$$

4. As the primary particle starting from the PF moves away from it, a **positive** angle ρ of the "**light deflection**" is created; this angle corresponds to the secondary particle's **positive reactive energy**, and thus our description resembles the description of the resistor-inductor (RL) AC circuit.

While the primary particle travels along the "semi-straight line" (P, $+\infty$), the secondary one travels along the "entire" straight line ($-\infty$, $+\infty$). When the primary particle appears at $-\infty$, angle ρ of the "deflection" **becomes negative** and corresponds to the **negative reactive energy** of the secondary particle, thus our description resembles the description of a resistor-capacitor (RC) AC circuit with the direction of angle ρ reversed.*

In other words, the complete path ($-\infty$, $+\infty$) that the secondary particle travels **reverses the direction of the "Angle of Light Deflection"**.

Because, at any position $\frac{d\theta'}{dt} = 2 \cdot \frac{d\theta}{dt}$ in magnitude, it follows that when the primary particle travels the "full" Projective Straight line ($-\infty$, $+\infty$), **the secondary particle travels twice the "full" Projective Straight line.**

When the second run is complete, the positive "Angle of Light Deflection" is also restored.

* *Modern Physics attributes this effect to "antimatter".*

This way however, anyone could "explain" any natural phenomenon simply by evoking at will the right kind of "demon" (e.g. why does the Earth tremble? Because ... Enceladus shakes it).

Consequently, if the primary particle has a *spin* equal to 1 (boson), then the *spin* of the secondary particle must **inevitably** be $\frac{1}{2}$ (fermion).

Hence the proposal:

If the primary particle (position) moves along the bilateral projective straight line, then the secondary particle (conjugate position) moves on the unilateral projective plane.

Thus, the degrees of freedom of the secondary (conjugate position) were increased by one*.

Thus, there lies **the Mathematical necessity** for the introduction of the 4th quantum number (*spin*), i.e. the extra degree of freedom, which, by the way, Pauli introduced **axiomatically**. Needless to point out that, in order to explain the 4th quantum number, electrons and all other elementary particles had to be considered as self-spinning "balls", concepts that, for me at least, are totally fictitious and unreal.

Summarizing all the aforementioned, that constitute **fundamental explanations** of events occurring in the **Perceptible Space**, I wonder:

a. Could this increase in the degrees of freedom (dimensions) of the secondary particle, be at **the base** of the Quantum Mechanics "mysteries"? Can it be that somewhere here dwell the hidden parameters (variables), claimed by Einstein, Bohm, De Broglie et al.? If the answer is yes, then we should also accept that Einstein, who tenaciously insisted on considering the orthodox interpretation of Quantum Mechanics by the Copenhagen school incomplete, was not entirely wrong?*

* To make this increase in degrees of freedom (dimensions) more comprehensible suffices to think how to generate the Möbius strip. The initial form was rectangle ABCD, i.e. a **flat shape having two dimensions**, which **we twisted** by 180° so that edges AB & CD coincided, and point A & B coincided with C & D, respectively. The resulting shape (Möbius strip) is **a solid shape**, i.e. it has **one additional dimension**.

** Einstein expressed his opposition to the orthodox interpretation of Quantum Mechanics many times. In a letter to Max Born, A. Einstein wrote: "In our scientific quests, we found ourselves at opposite ends. You believe in a God that plays dice and I in perfect laws in a world of things that exist as genuine objects, which I try to comprehend by wild speculation." Quote by Jeremy Bernstein in his book "Einstein", University of Crete Publ., Heraklion, 1995, p. 226 (in Greek).

b. Could it be that the secondary particle isn't really an "elementary" one, even if the primary one is? In other words, could the secondary particle **cease to have point-specific locality**? Could all this be the reason behind the "emergence" of de Broglie's material waves, Erwin Schrödinger's wave function and Max Born's probability waves?

c. Because the secondary particle is not really "different" to the primary one but just another manifestation of it, could it be that it does not "really exist" and that the various appearing secondary particles, i.e. the elements of the **Perceptible Space**, are the occasional "**SHADOWS**" of the **ONE AND ONLY** primary one?

If the answer to the above questions is affirmative, then the Triumph of the **Platonic Thought**⁴¹ would be absolute.

However, I happen to be a declared and ardent Aristotelian.

Thus, in this Chapter Four, I must seek something more tangible, something much closer to "Physical reality"; in other words, closer to **what I see and what I measure**:

Such as, for example, **the deflection of the rays of light passing close to sources of powerful gravitational fields**.

Some people, mistakenly, consider that it is only the General Relativity Theory that predicts the above deflection. It is a serious mistake that simultaneously constitutes an insult to Newtonian Mechanics, which **also** predict a similar deflection, the difference being simply that the angle of deflection calculated by the latter **is different** to the angle of deflection calculated by General Relativity.

We will therefore calculate the above angle of deflection both with Newtonian Mechanics and with the Theory of the Harmonicity and will also **compare** these results to each other, as well as to those obtained by General Relativity.

I am almost certain that, in addition to the interest of comparing the three results, the **comprehension** this quest has to offer will be exceptionally useful.

⁴¹ 1. Plato's, "Parmenides" (144e): *"Therefore, not only that which we have conclude that is "one", whatever could be uniquely examined, and also this "one" it is a great necessity to have been distributed by the really existing being (ὄντως ὄντως) to many other "ones"."*

2. Plato's, "Republic" (book VII), the cave with the shadows, etc.

A. NEWTONIAN MECHANICS

Consider a photon (position A), traveling on a tangential orbit to the surface of the Sun, whose center is O and radius r_0 .

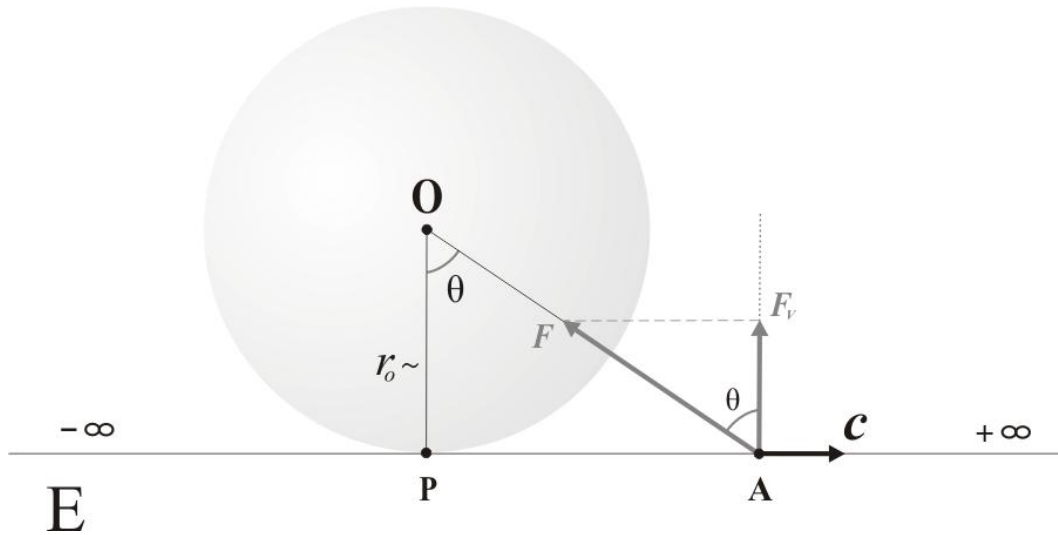


Figure 1.4.16

The path of photon A will deflect towards the Sun, due to the force of Gravity F , but for the sake of calculation simplicity and because an extremely small deflection is expected, we can consider the path as approximately a straight line.

The force of Gravity F , whose perpendicular projection on the path is F_v ($V = \text{vertical}$), acts on the photon. Thus, a perpendicular to the path **elementary change** of the photon momentum is generated:

$$dp_v = F_v \cdot dt = F \cdot \cos \theta \cdot \frac{dx}{c} \quad (1.4.33)$$

But (Newtonian Gravity):

$$F = \frac{G \cdot M \cdot m}{(OA)^2} \quad (1.4.34)$$

Where G is the universal gravitational constant, M is the mass of the Sun, and m is the mass of the photon under consideration.

By placing: $X = r_0 \cdot \tan\theta \Rightarrow dX = \frac{r_0}{\cos^2\theta} \cdot d\theta$ (1.4.35)

Finally, the considered photon mass is: $m = \frac{P}{c}$ (1.4.36)

where P is the photon momentum along the direction of motion.

By substituting (1.4.34), (1.4.35) and (1.4.36) in (1.4.33), we get:

$$dp_V = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \cos\theta \cdot d\theta \quad (1.4.37)$$

Therefore, the **perpendicular momentum** acquired by the photon on its way from the Perpendicular Foot to $+\infty$ (moving away phase) P_{V1} is:

$$P_{V1} = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \int_{\theta=0}^{\theta=\pi/2} \cos\theta \cdot d\theta = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot [\sin\theta]_{\theta=0}^{\theta=\pi/2} \quad \text{hence:}$$

$$P_{V1} = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.38)$$

Similarly, the perpendicular momentum acquired during the **approach phase** from $-\infty$ to the Perpendicular Foot ($-\infty, P$) is calculated as:

$$P_{V2} = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.39)$$

Consequently, the **total** acquired perpendicular momentum is:

$$P_{V\alpha\lambda} = P_{V1} + P_{V2} = 2 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.40)$$

Thus, the **angle of deviation** (deflection) is:

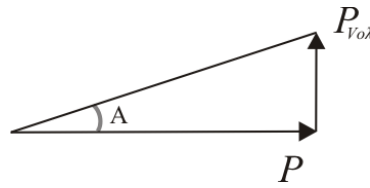


Figure 1.4.17

$$\tan A \cong A = \frac{P_{Vol}}{P} = 2 \cdot \frac{G \cdot M}{r_0 \cdot c^2} \quad (1.4.41)$$

Which is **extremely small** and for this I considered the tangent equal, approximately, with the arc. The German astronomer Von Soldner, prompted from a relevant reflection of Newton's, calculated this angle precisely, for the first time in 1801.

B. THE THEORY OF THE HARMONICITY OF THE FIELD OF LIGHT

The photon is subject to the force of Gravity F , which is **directed to and originates from the conjugate O' of O** ("light path").

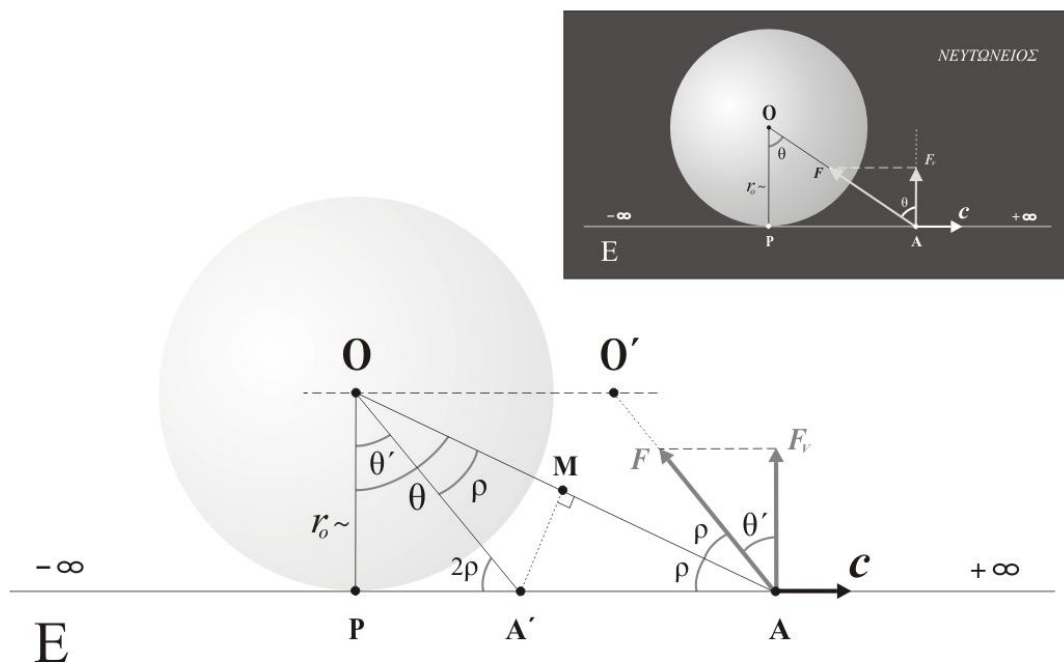


Figure 1.4.18

This variation* from the Newtonian law of Gravity is but the consequence of the first fundamental hypothesis of the Theory of Harmonicity, as we have already stated in detail. Thus the elementary change of the photon momentum perpendicular to the orbit is:

$$dp_V = F_V \cdot dt = F \cdot \cos \theta' \cdot \frac{dx}{c} \quad (1.4.42)$$

But, we have:

$$F = \frac{G \cdot M \cdot m}{(O'A)^2} = \frac{G \cdot M \cdot m}{(OA')^2} = \frac{G \cdot M \cdot P}{r_0^2 \cdot c} \cdot \cos^2 \theta' \quad (1.4.43)$$

Substituting equation (1.4.43) and (1.4.35) in (1.4.42), we have:

$$dp_V = \frac{G \cdot M \cdot P}{r_0^2 \cdot c} \cdot \cos^2 \theta' \cdot \cos \theta' \cdot \frac{r_0}{\cos^2 \theta} \cdot \frac{d\theta}{c} \Rightarrow$$

$$dp_V = \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \frac{\cos^3 \theta'}{\cos^2 \theta} \cdot d\theta \quad (1.4.44)$$

$$\text{But } \theta' = \frac{\pi}{2} - 2\rho \Rightarrow \cos \theta' = \sin 2\rho = 2 \sin \rho \cdot \cos \rho$$

$$\text{and } \rho = \frac{\pi}{2} - \theta \Rightarrow \sin \rho = \cos \theta \quad \kappa\alpha\iota \quad \cos \rho = \sin \theta$$

Thus, the elementary change of the momentum perpendicular to the path becomes:

$$dp_V = 8 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \sin^3 \theta \cdot \cos \theta \cdot d\theta \quad (1.4.45)$$

* In the insert of Figure (1.4.18), we present again Figure (1.4.16) for a more comprehensive understanding, by comparison, of the basic difference between Newtonian Mechanics and the Theory of the Harmonicity of the Field of Light.

Therefore, the **perpendicular momentum** acquired by the photon on its way from the Perpendicular Foot to $+\infty$ (moving away phase) P_{V1} is:

$$P_{V1} = 8 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \int_{\theta=0}^{\theta=\pi/2} \sin^3 \theta \cdot \cos \theta \cdot d\theta = 8 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \int_{\theta=0}^{\theta=\pi/2} \sin^3 \theta \cdot d(\sin \theta)$$

Therefore:

$$P_{V1} = 8 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \cdot \left[\frac{\sin^4 \theta}{4} \right]_{\theta=0}^{\theta=\pi/2} = 2 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.46)$$

We observe that the calculated momentum is **twice** the perpendicular momentum P_{V1} calculated by Newtonian Mechanics (equation 1.4.38).

The perpendicular momentum acquired during the **approach phase** to the Perpendicular Foot ($-\infty, P$) is calculated similarly, because the approach phase (3rd and 4th case) is **symmetrical** to the moving away phase (1st and 2nd case), as we have previously stated. Therefore:

$$P_{V2} = 2 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.47)$$

Consequently, the **total** perpendicular momentum acquired by the photon, due to the Sun's Gravity, is:

$$P_{Vo\lambda} = P_{V1} + P_{V2} = 4 \cdot \frac{G \cdot M \cdot P}{r_0 \cdot c^2} \quad (1.4.48)$$

Whereas, the **angle of deviation** (deflection) is:

$$\tan A \cong A = \frac{P_{Vo\lambda}}{P} = 4 \cdot \frac{G \cdot M}{r_0 \cdot c^2} \quad (1.4.49)$$

We observe that the angle of deflection as calculated by the Theory of the Harmonicity is **twice** the angle calculated by Newtonian Mechanics (equation 1.4.41).

And, at this point, the question arises:

What size deflection angle does General Relativity predict?

Exactly the same as the one resulting from equation (1.4.49) ! ^{42 43}

Thus, in the particular Problem of calculating the angle of deflection for light rays passing near sources of powerful gravitational fields, the Theory of Harmonicity **agrees** with the Theory of General Relativity, reaches the same exact result **using, however, an entirely different approach and methodology.**

Numerical Application :

Considering that:

The Mass of the Sun is: $M = 1,97074037 \cdot 10^{30} \text{ kg}$

The Radius of the Sun is: $r_0 = 6,953 \cdot 10^8 \text{ m}$

The Universal Gravitational Constant is: $G = 6,67 \cdot 10^{-11} \frac{\text{Nt.m}^2}{\text{kg}^2}$,

The Speed of Light is: $c = 2,997925 \cdot 10^8 \frac{\text{m}}{\text{sec}}$,

The magnitude of the deflection angle A resulting from equation (1.4.49) is:

$$A = 0,841398011 \cdot 10^{-5} \text{ rad} \cong 1,7355'' \text{ (seconds of a degree).}$$

This very angle, approximately, was **measured** for first time by the Astronomers of the Eddington mission during a of total eclipse of the Sun on May 29th 1919 on the island of Principe, West Africa, a fact that constituted the biggest, perhaps, triumph of General Relativity and, henceforth, made Einstein internationally famous [...]

⁴² See Wolfgang Rindler, “Essential Relativity”, Second Edition, 1977, Springer -Verlag, p. 147.

⁴³ See Albert Einstein, “The Theory of Relativity”, Korontzis Publ., Athens, p. 117 (in Greek). (without too much math).

REMARKS

1. As a self-proclaimed ardent Aristotelian, I ought to try to better understand the above result from a **practical** point of view.

Why is it that the angle A of light deflection is **twice** the one forecasted by Newtonian Mechanics?

I will attempt to give two answers, a "Relativistic" one and another from the Quantum Mechanics point of view.

A. «Relativistic» answer:

By observing Fig. 1.4.18, we realize that due to the fundamental hypothesis of the Theory of Harmonicity, "the Sun comes closer" to the photon under scrutiny, i.e. the distance between the photon and the Sun in the **Perceptible Space** is not the "noetic path" OA , but the "light path" $O'A$ which is smaller, and hence the force of Gravity attracting the photon is greater.

Also, whereas in Newtonian Theory, the vector of the force of Gravity F is "lying on" the moving ray OA , in the Theory of the Harmonicity this vector is "up" relative to the moving ray by an angle ρ equal to the "Angle of Light Deflection", thus generating a **longer projection** (F_V) of the force F on the axis perpendicular to the path.

Of course, the above two reasons apply **only** to the part of the photon path from $\theta = \pi/4$ to $\theta = \pi/2$. For the part of the path from $\theta = 0$ to $\theta = \pi/4$, **the exact opposite** is true.

However, the first part is (practically) infinite, whereas the second is finite and **equal with the radius of the Sun**. Thus, the two above reasons apply for **the maximum** part of the path.

Please note that:

$$\int_{\theta=\pi/4}^{\theta=\pi/2} \sin^3 \theta \cdot d(\sin \theta) = 3 \cdot \int_{\theta=0}^{\theta=\pi/4} \sin^3 \theta \cdot d(\sin \theta)$$

B. Answer from the Quantum Mechanics point of view:

From the point of view of Quantum Mechanics, the answer is elegantly short:

As we here examine the events in the **Perceptible Space**, i.e. we practice **Human Physics**, in contrast to Newton who studied **the Physics of Angels**, the measurable deviation concerns the "photon" moving in the Perceptible Space (secondary) appearing at the conjugate position A' (shadow), and not the one moving in the Noetic Space (primary) visualized at position A .

Therefore, as we have already discovered, as to a single path $(-\infty, +\infty)$ of the primary particle correspond **two paths** $(-\infty, +\infty)$ of the secondary one and as the force "always sees" upwards, it follows that the secondary will be subject to **twice the deflection!**

I promise you that this "two" (2) will pester us a lot in the future...

2. I sincerely hope that the reader has appreciated the true **Revolution** hidden in this second answer, which is the direct child of the **Projective Concepts and Methods** that the Theory of Harmonicity introduces in Physics and that he is also able to begin distinguishing, albeit somewhat vaguely, the wide avenues henceforth opened to Science.

Thus, let me be allowed to consider this fourth chapter as the **founding stone for the Unification** of General Relativity and Quantum Mechanics.

Let's say, something like ...matchmaking.

From matchmaking, however, to the wedding, we still have a long way to go!...

CHAPTER 5

KINEMATICS AND DYNAMICS OF A MATERIAL POINT MOVING WITH SUPERLUMINAL SPEED MEASURED WITH THE LASC THE UNIFICATION OF THE FOUR "FORCES"

"And before the throne there was a sea of glass like unto crystal: and in the midst of the throne, and round about the throne, were four beasts full of eyes before and behind."

John, Revelation 4:6

"We have seen that wherever science penetrated deeper, the spirit has recovered from nature whatever was invested in it. We have found a strange footprint on the shores of the unknown. We have devised profound theories, one after another, to account for its origins. At last, we have succeeded in reconstructing the creature that made the footprint. And lo! It is our own."

Sir Arthur Eddington, "Space, Time and Gravitation"

I. THE GEOMETRICAL ANALYSIS

Be it (Fig. 1.5.1) a material point approaching the Foot of the Perpendicular moving on the **Projective Straight line** E with speed U , always measured with LASC, greater than the speed of light ($U > C$).

Let the material point be **now** at position A.

We would like to know **where** the Observer at position O **sees it, measures it and from where he interacts** with it now.

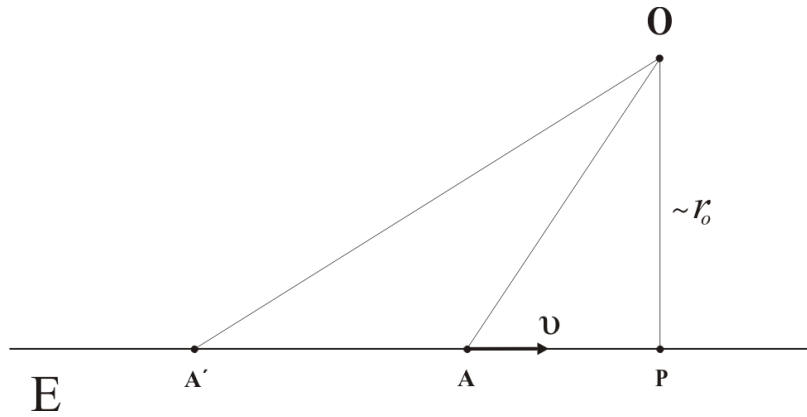


Figure 1.5.1

We will look in vain for the conjugate (A') of A "behind" (in the Euclidean sense) A . Because if the conjugate existed, it would be:

$$\frac{A'A}{A'O} = \frac{v}{c} > 1 \quad (1.5.1)$$

In other words, in the right triangle OAP , the part $A'A$ of the right side AP would be greater than the hypotenuse, which cannot be true.

Therefore, it seems that the conjugate does not exist.

This, of course, is no more a problem.

Already, from the previous chapter, we have become familiar enough with the Projective concepts and thus we will endeavor to find the conjugate.

Which condition must the conjugate satisfy? Obviously, equation (1.5.1).

Thus (Fig. 1.5.2), I divide OA internally with point M , so that: $\frac{MA}{MO} = \frac{v}{c}$.

There exists **a single** point M satisfying the above equation.

Similarly, on the extension of AO , I locate point H , so that: $\frac{HA}{HO} = \frac{v}{c}$.

There exists **but a single** point H satisfying the above equation.

With diameter MH , I draw the **Apollonian Circumference**, which in general intersects straight line E at two points A' and A'' , **which are indeed the sought conjugates** of A , satisfying equation (1.5.1).

This because, the Apollonian Circumference as previously drawn, is the **geometric locus**, on a plane, of the points whose ratio of distances from points A and O is the given $\frac{v}{c} > 1$. In other words it holds that:

$$\frac{A'A}{A'O} = \frac{A''A}{A''O} = \frac{v}{c} > 1 \quad (1.5.2)$$

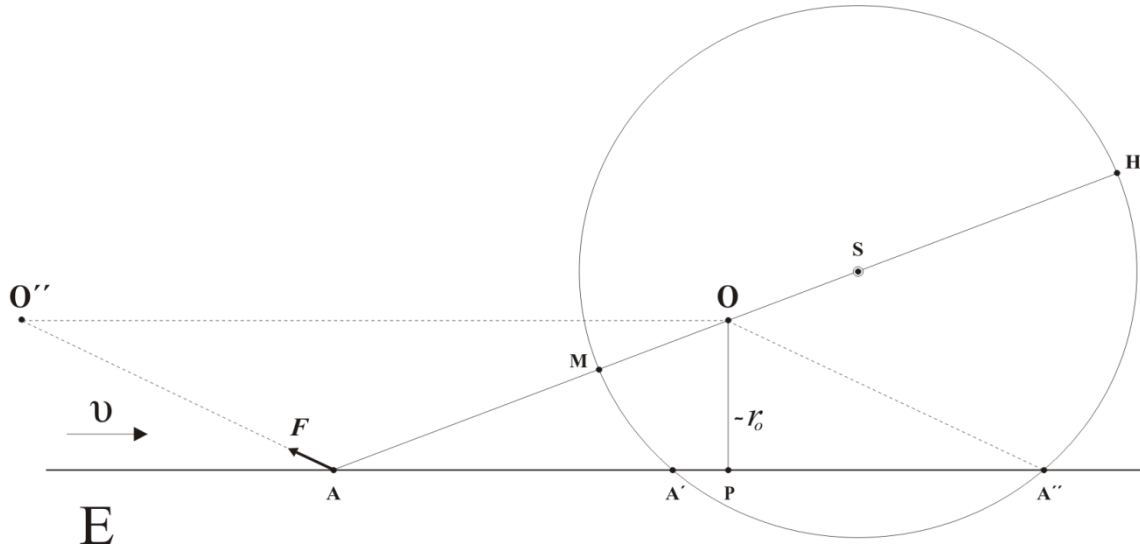


Figure 1.5.2

The points H, M, A, and O constitute a **Harmonic Tetrad**.

And this because: $(HMAO) = \frac{(HA)}{(AM)} : \frac{(HO)}{(OM)} = \frac{(HA)}{(HO)} : \frac{(AM)}{(OM)} = \frac{\frac{v}{c}}{-\frac{v}{c}} = -1$

As we know, the fact that the cross ratio (with signs) of a given four points equals -1, constitutes the **necessary and sufficient condition for their characterization as a harmonic tetrad**.

Similarly, straight line E and the pencil of lines parallel to it passing through points M, O and H, also constitute a **harmonic tetrad**.

Thus, the following questions emerge:

- How can it be possible for **the conjugate** of A, no matter which of the two (A' or A'') corresponds to the chosen direction of motion, to **precede** A?

Doesn't this collide with the Causality Principle?

No. It does not, because our space is the Projective Space.

In other words, the answer given in the previous chapter is still valid.

The conjugate of A never precedes, but **always follows** A.

- Which of the two, A' or A'' , **is** the conjugate of A for the chosen direction of motion?

Here, unfortunately, the answer is not so easy.

It appears at first that the theoretical quest, i.e. rational reasoning alone, is not enough. We will need to search for the answer by **also** taking into account the experimental evidence*.

However, prior to making a final decision on the "real" corresponding conjugate in the chosen direction of motion, let us first consolidate our geometrical description.

Thus we observe, (Fig. 1.5.3), that as point A is approaching the Perpendicular Foot, the Apollonian circumference that yields the solutions, "**is rising**" relative to straight line E.

This fact has the following two important consequences:

1. While A' moves in the same direction as A, A'' moves **in the opposite direction** to A. This phenomenon of the **conjugate moving in the opposite direction is very unusual!** We did not come across it neither in subluminal nor in speeds equal to that of light.

2. Since the Apollonian circumference yielding the solutions, "rises" relative to straight line E, while A is approaching the PF, we can imagine that there are positions of A, such that the corresponding Apollonian circumference **will not have any real intersection points** with straight line E, thus completely losing the conjugates!

The problem seems to be severe, because again we will be involved in the adventure of discovering a space void of any Field whatsoever!

* For an ardent follower of Ancient Greek Thought and a student of A. Einstein, such as me, this "crutch" approach is certainly not the most true to form. The reader, however, needn't worry. The experimental data will only be used here for reasons of documentation rather than synthesis. Further on, Ancient Greek Thought and A. Einstein's philosophy will be restored.

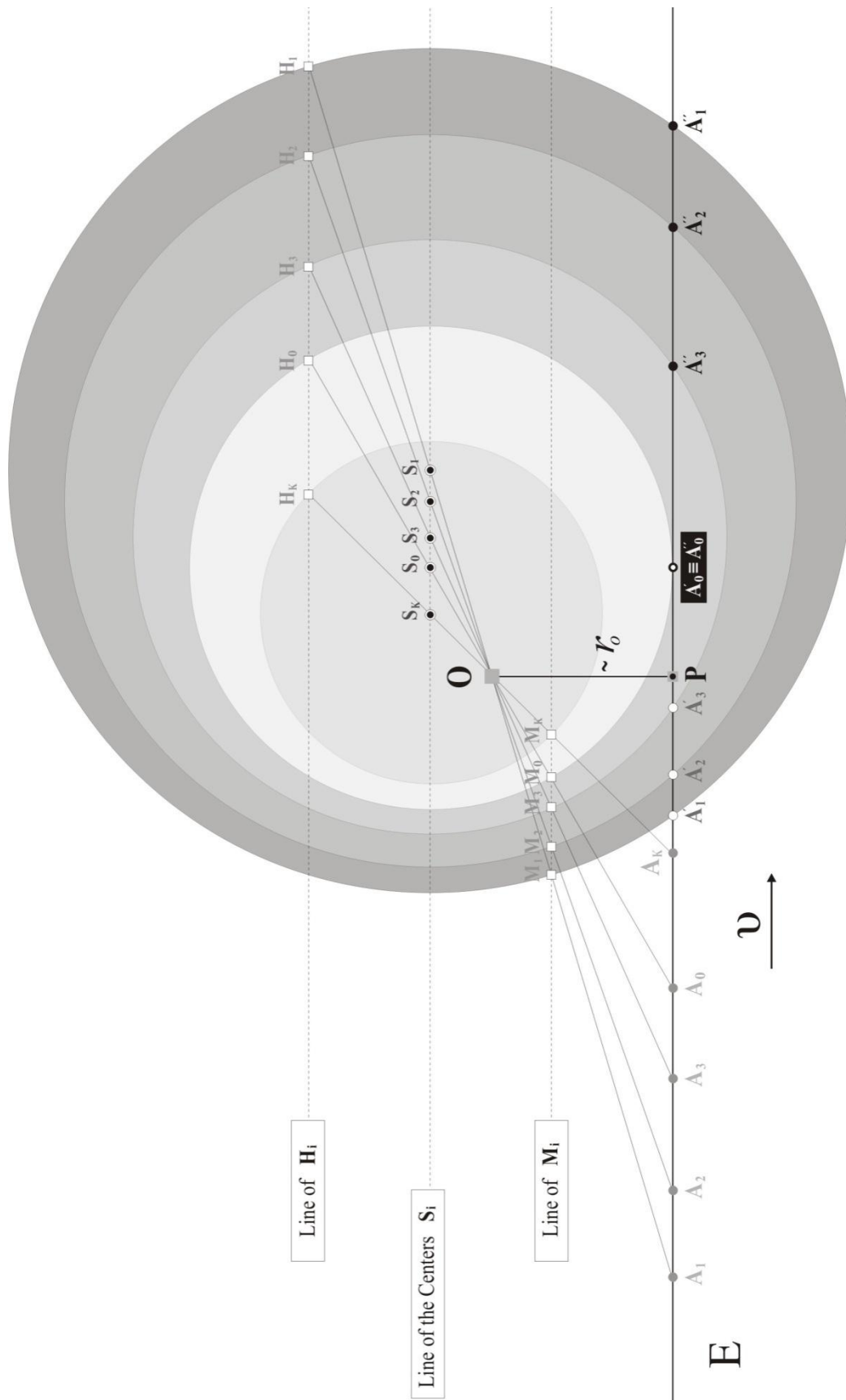


Figure 1.5.3

Finding the boundary Apollonian Circumference and boundary position A_0

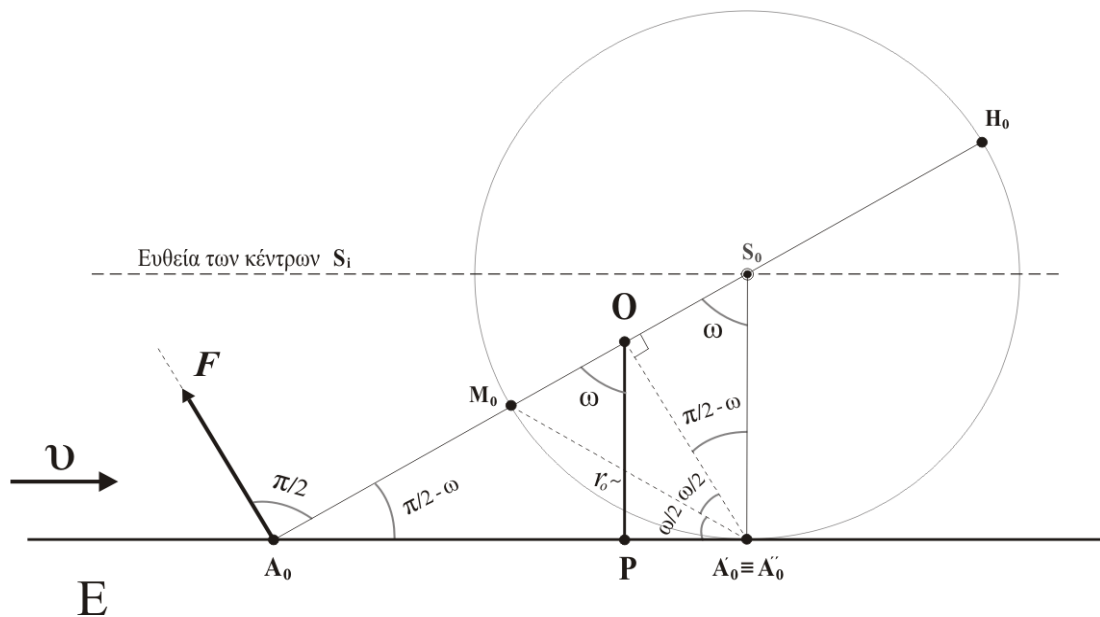


Figure 1.5.4

Obviously, the boundary Apollonian circumference is **tangential** to straight line E. Assume, therefore, that it has been drawn (Fig. 1.5.4) and it is tangential to straight line E at $A'_0 \equiv A''_0$.

There, I draw the perpendicular on E, which meets the straight line of centers S_i at S_0 . I draw the straight line S_0O and extend it until it meets straight line E at A_0 .

Point of intercept A_0 is the **boundary** position that has the **identical** $A'_0 \equiv A''_0$ as its conjugates.

Let angle A_0OP be ω , then angle $OS_0A'_0$ is also ω .

Moreover, the angle $M_0A'_0A_0$ is $\omega/2$ because it is formed by a string and a tangent and faces the arc $M_0A'_0$ whose angle is ω . But angle $M_0A'_0O$ is also $\omega/2$ by construction (A'_0M_0 is the bisector of angle $A_0A'_0O$).

Consequently, angle A'_0OS_0 is a **right angle**, and in the right triangle $OA_0A'_0$ it holds:

$$\sin\left(\frac{\pi}{2} - \omega\right) = \frac{A'_0O}{A'_0A_0} = \frac{c}{v} \quad (1.5.3)$$

Therefore:

$$\cos \omega = \frac{c}{v} \quad (1.5.4)$$

In other words, the **boundary position** A_o that has a **real conjugate**, results if from Observer O "we sweep" an angle, relative to the perpendicular OP, $\omega = \arccos\left(\frac{c}{v}\right)^*$

Thus, as soon as the material point, moving with the selected direction of movement, passes from point A_o , the corresponding Apollonius Circumference automatically "is in the air", i.e. ceases having real intersection points with straight line E and consequently the material point **does not have a conjugate** (e.g. case of point A_k in Fig. 1.5.3).

As we have already shown that the "force" of Gravity between A_i and O essentially **originates from the conjugate**, having "lost" the conjugate beyond the boundary position A_o , we are led to the discovery of a **Space void of any Field whatsoever!**

I am afraid, therefore, that we must revise the prevailing perception that "space void of any field does not exist". The segment of straight line E defined by A_o , P and the symmetrical of A_o in reference to P (A_{os}), **is space where the gravitational interaction with O does not exist**; moreover, the particle traveling the interval A_oPA_{os} (Fig. 1.5.5), **can not be seen by the Observer**.

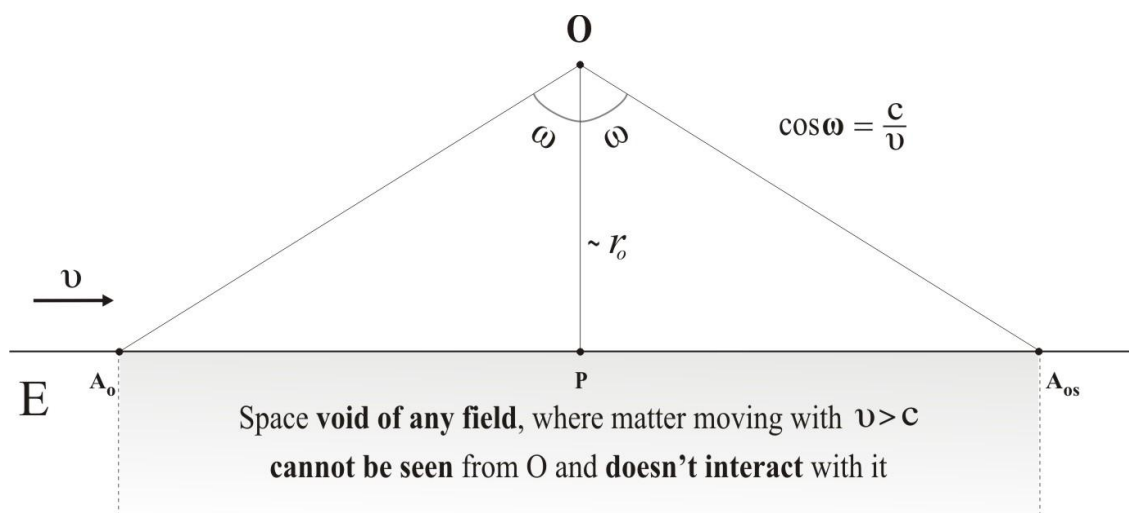


Figure 1.5.5

* Compare it with angle ω when dealing with subluminal speeds (Fig. 1.1.5), when the particle is found at the PF, where $\omega = \arcsin\left(\frac{v}{c}\right)$ and admire the beauty of Nature and the Wisdom of the Creator, the "Eternal Geometrician"...

Caution!

The above statement doesn't mean that in the interval A_0PA_{os} there exist **no** conjugate positions **at all**, i.e. this interval appears void. It simply means that **the positions within the above interval** have no conjugates. In other words, it is possible within the above interval to exist conjugate positions of **other positions located outside** this interval.

Thus, the interval A_0PA_{os} **does not appear void**.

In total, the existence of the above interval accounts for **a universal deficit of mass** (matter) as well as **a universal deficit of interaction** (energy). That is to say, if **all** Observers in the Universe were to measure **all** of its elements, each and every one of them would be missing those elements in the Universe that are moving with speed $v > c$ and are located in the interval A_0PA_{os} of the **respective Observer**.

Important Remark :

In nuclear reactor cooling water reservoirs (and not only), one can usually observe an intense bluish glow. This phenomenon was first discovered in 1934 and it is called "*Cerenkov Radiation*". This phenomenon was interpreted as being generated from the radiation of charged particles **interacting with the medium** (in this respect water) and moving within it **with a speed greater than the speed of light within said medium**. It should be noted that this phenomenon is not observed when the speed of the particles is less than the speed of light in the medium.

This is the fundamental explanation for the existence of **Dark Matter**.

The reason is simple:

If $v < c'$, (where c' is the speed of light in the medium, equal to $\frac{c}{n}$, where n the refraction coefficient), then the spherical light waves emitted by the particle **will cancel out everywhere in Space as not having a common surrounding surface**. In contrast, in the case of $v > c'$, a common surface surrounding spherical light waves **does exist**. This common surrounding surface is a conical surface defined as follows:

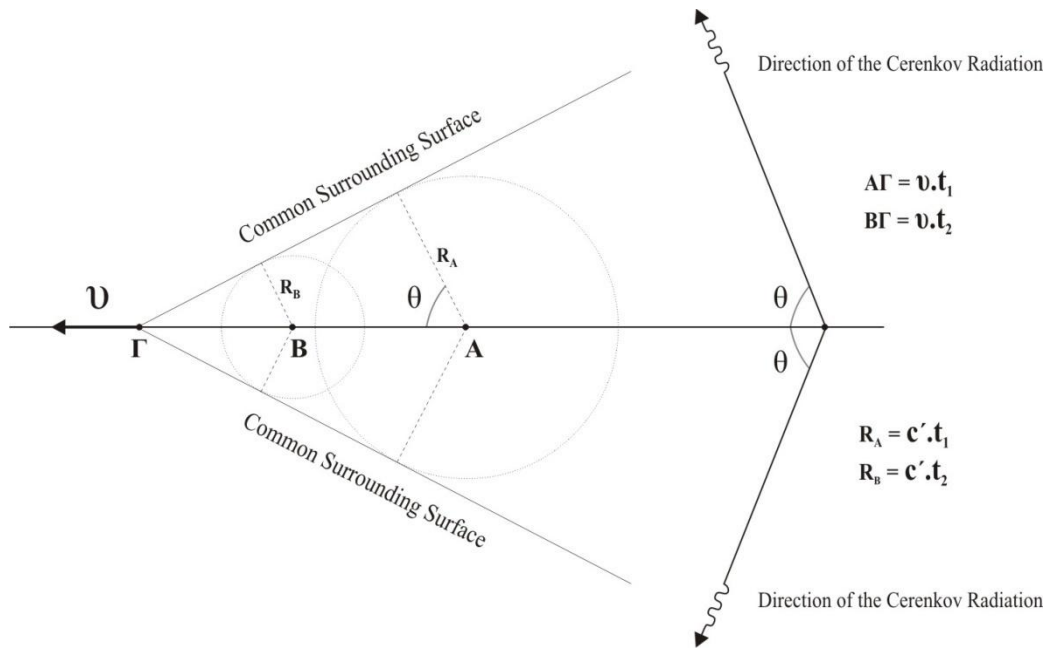


Figure 1.5.6

The angle θ that determines the direction of the *Cerenkov Radiation* is:

$$\cos \theta = \frac{c'}{v} \quad (1.5.6)$$

Please observe that angle θ that determines the direction of the *Cerenkov Radiation* is **no other than the angle** $A_oA'_oO = \frac{\omega}{2} + \frac{\omega}{2} = \omega$, $\left(\cos \omega = \frac{c}{v} \right)$ of the Theory of the Harmonicity (Fig. 1.5.4), where a tangential Apollonian circumference to straight line E of the motion, exists **only** at material point speeds **greater than the speed of light**.

I believe therefore, that the time has come for the proponents of Special Relativity to seriously question **the incomprehensible and certainly not provable*** proposal of the "doctrine", that the speed of light is boundary.

Nature speaks!

When the speed of light **within matter has been proved not to be boundary**, based on what reasoning it should be so ...in vacuum?

Not to mention the fact that in truly **Honest** Science, doctrines of any kind should have no place [...]

* See Chapter 1

TO SUMMARIZE:

When the observed material point moves with **superluminal** speed measured with the LASC ($v > c$), the Apollonian circumference giving the solutions (conjugate positions) **has a completely different behavior** from the Apollonian circumference in the case of subluminal speeds.

The existence of a boundary Apollonian circumference (tangential to E) for angle $\omega = \arccos(c/v)$ creates a Space void of any Field.

The above summary statement of the Theory of Harmonicity is true in general, i.e. when the distance of the Observer from the Perpendicular Foot (r_0) takes on "usual" or "large" values. If, however, the distance r_0 takes on **exceptionally small values**, then things begin to differ.

Here, precisely, is where "I am forced" to invoke the experimental data:

In 1910, at the University of Manchester Physics Laboratory, Sir Ernest Rutherford (1871-1937), a New-Zealander and father of Nuclear Physics, asked his associates Geiger and Marsden to bombard a thin leaf of gold with α particles (Helium nuclei), to study their scattering by the target and to measure the angles of scattering.

The results of this experiment were astonishing, because many very large scattering angles (up to 180°) were detected.

This could not be explained by the then valid model of the atom of matter composed by the British Physicist J. J. Thomson, according to which, the positive charge of the atom was distributed over the entire space of the atom. Thus, such large observed angles of scattering, causing certain nuclei to **bounce almost straight back to their source**, were impossible to achieve if the positive charge was distributed evenly over the entire space of the atom. Rutherford reported:

*"It was quite the most incredible event that ever happened to me in my life. It was almost as incredible as if you had fired a 15 inch shell at a piece of paper and it came back and hit you."*⁴⁴

⁴⁴ David Halliday - Robert Resnick, "Physics", Part II, John Wiley & Sons, Inc. New York, NY, 1962, p. 700.

Rutherford understood that in order to become so deflected, α particles ought to pass from regions where the intensity of the electrical field of the gold atom was very large. Thus, he considered that the positive electrical charge of the atom is concentrated in a very small region, **the nucleus** and, in 1911, he developed the nuclear model of the atom that is still in effect today.

Rutherford's discovery points me into two directions:

First, it leads me to a **choice** but at the same time it also gives me **a new idea**.

A. THE CHOICE

Previously, on page 228, the question did arise on which of A' and A'' is the conjugate of A, when the particle, located at position A, **is approaching** the PF? (Fig. 1.5.2.)

Rutherford's experiment leads me at first to choose A'' .

According to the Theory of the Harmonicity of the Field of Light, the interaction of Gravity acting on the material point at A, **originates from the conjugate O''** of O. This is located at the intersection of the following straight lines:

1. The parallel to line E drawn from point O.
2. The Parallel to OA'' drawn from A. (See Chapter Three)

Thus, now A "sees" O at O'' and interacts with it from there.

(Always, under the condition of identical Space and Time metrics in the two systems.)

Consequently, the "force" of Gravity F is **repulsive**, essentially "detering" A from ever approaching **both** the PF **and** the boundary position A_0 . Furthermore, while A continues on its path, this force in reality **increases**, as a result of distance OA'' (and thus distance AO') decreasing.

This repulsive (deterrent) **Gravitational "Force"** modern Physics called **Electromagnetic (electric) Interaction (repulsive)**, thus "charging" a "point" region of the atom (the nucleus) with an electrical charge that prevents entry in its space providing, this way, an explanation to Rutherford's experiment.

Thus, given that, as A can be located at a limitless distance from O, A'' can also be located at a limitless distance from O, it follows that:

The repulsive electromagnetic interaction has an infinite range.

The choice of A'' as the conjugate of position A however, can easily result by the use of common sense **alone**. This because, by running "backwards" on the Projective Straight line E, i.e. by "**moving to the past**", first we will meet A'', having already passed from its point at infinity.

The difference lies in the fact that, at subluminal speeds, the point at infinity of the Projective Straight line "separates" the conjugate points whereas, at superluminal speeds, it "does not separate" them. I used the verb "separate" in quotation marks, as in the Projective Straight line, being a closed line, such "separation" has no meaning.

Utilizing therefore strict formulation:

1. In the case of **subluminal** speeds, the following order is in effect for the selected direction of motion:

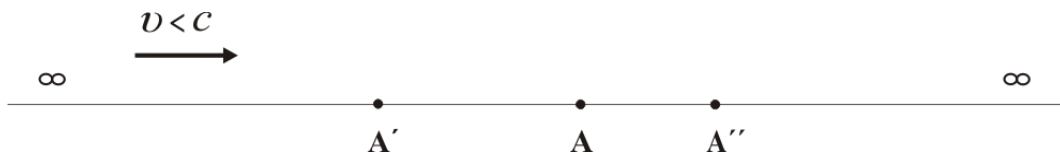


Figure 1.5.7

2. In the case of **superluminal** speeds, the following is in effect:

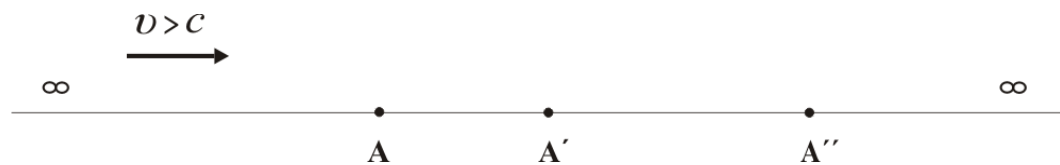


Figure 1.5.8

Thus in the case of subluminal speeds, moving "backwards" of A (towards the past) first we meet A', which is the conjugate for the selected direction of motion, whereas in the case of superluminal speeds, moving "backwards" of A, first we meet A''.

Consequently, I **was right** to select A'' as the conjugate of A for the selected direction of motion. I could also do so without invoking Rutherford's experiment (believing of course that the Creator is Reasonable...) while, at the same time, remaining loyal to the Ancient Greek Thought and to A. Einstein's way of thinking.

If I therefore insist on using the verb "to separate" sans quotation marks, I will have to, from now on, refer to **pairs of points**.

Thus, I formulate the following proposal:

In subluminal speeds, pair (A, ∞) **separates the pair of** conjugates (A', A'') , whereas in **superluminal** speeds, pair (A, ∞) **does not separate them**.

This proposal is **both** strictly Projective **and** mathematically complete.

Hence, the question arises:

What happens with the other conjugate A' ?

Logically, since we have considered that while particle A **is approaching** the PF, its conjugate is A'' , we must now consider that A' is the conjugate of A while A **is moving away** from the PF.

This of course occurs by moving "backwards" of A . Now we shall meet A' **first**.

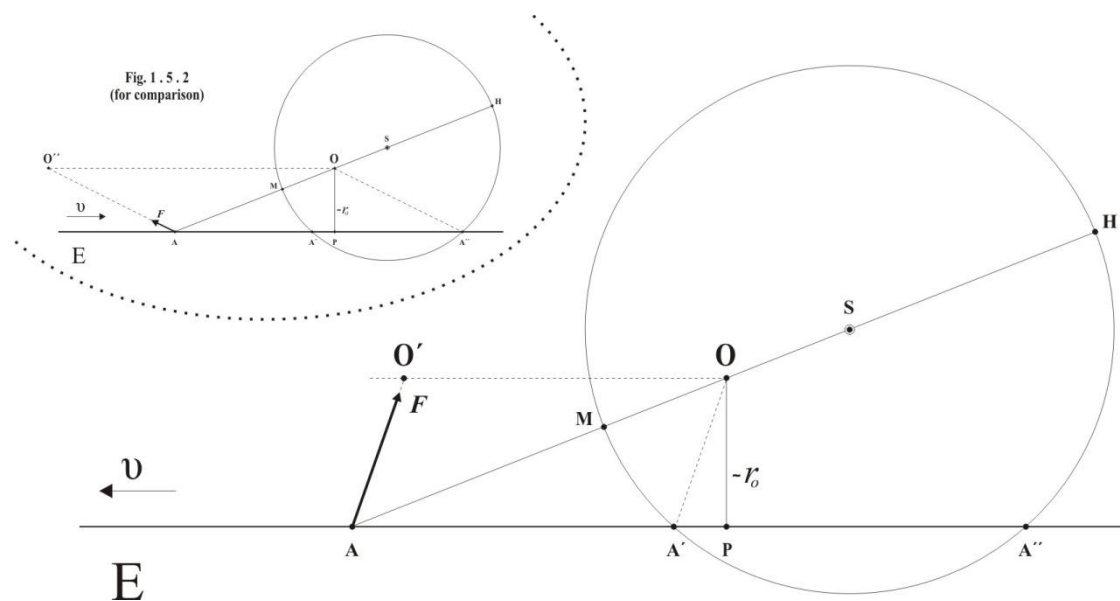


Figure 1.5.9

Here thus, the interaction of Gravity exerted on A due to the presence of O, originates from O', i.e. is parallel to A'O and is **attractive**.

This form of **Gravitational attraction** corresponds to what modern Physics called: **Electromagnetic (electric) Interaction (attractive)**

Furthermore, given that as A can be located at any distance from O, no matter how far, A' can also be located at any distance from O, it follows that:

The attractive electromagnetic interaction has an infinite range.

TO SUMMARIZE:

1. As the material point **is approaching** the PF with speed $v > c$, the Gravitational Field, corresponding to the conjugate A'', i.e. originating from O'', **repulses it**.

Then the direction of motion of A'' is **opposite** to the direction of motion of A.

2. As the material point **is moving away** from the PF with speed $v > c$, the Gravitational Field, corresponding to the conjugate A', i.e. originating from O', **attracts it (in general)**.

Then the direction of motion of A' is **the same** as the direction of motion of A.

The above could perhaps explain why the Universe is neither ultra dense, (as would be expected if the Gravitational interaction was **only attractive**) but, at the same time, neither a "diluted soup" of its elements

In No 2 above I emphasized the expression "**in general**", because here we are faced with something quite extraordinary:

It is possible for A' (Fig. 1.5.10) to be located **between** the Foot of the Perpendicular and the double point $A'_0 \equiv A''_0$, which is the conjugate of the boundary point A_0 .

In that case, the interaction exerted on A will not be attractive, **but repulsive!**

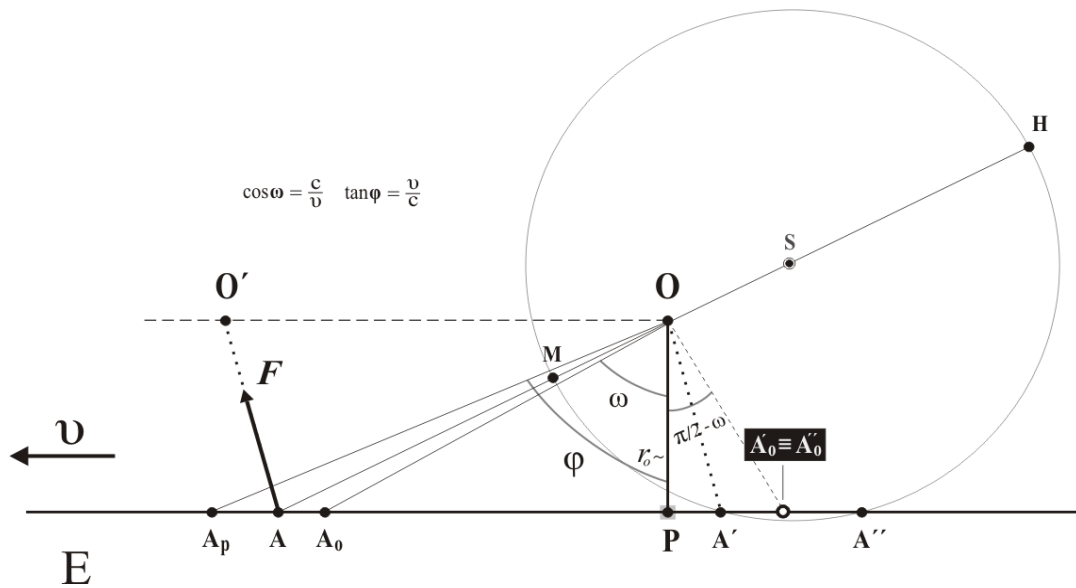


Figure 1.5.10

There exists therefore a **second boundary point**, critical to the structure of the Field.

This is the point **having the Foot of the Perpendicular as its conjugate**. Meaning that when A' moves between $A'_0 \equiv A''_0$ and P, then the interaction at A is **repulsive** because its carrier is parallel to OA' . I symbolize this boundary position with A_p as its conjugate is the Foot of the Perpendicular P.

Finding boundary position A_p :

Since the conjugate of A_p is P, it follows that:

$$\tan \varphi = \frac{v}{c} > 1 \quad (1.5.6)$$

and thus

$$\varphi_{\text{minimum}} = \frac{\pi}{4} \quad (1.5.7)$$

Consequently, if we want to locate A_p , we shall have to "sweep" from O, relative to the perpendicular OP, an angle $\varphi = \arctan(v/c)$

We observe that **for any given value** of the ratio $\frac{v}{c} > 1$, the following inequality is valid:

$$\varphi \geq \omega \quad (1.5.8)$$

Thus, when material point A, as it moves away from the PF, is located **within interval** A_0A_p , i.e. when its conjugate A' , is located within interval A'_0P , the electromagnetic interaction, mentioned above (2), which **in general** is attractive, **is now rendered repulsive**.

This Repulsive **Gravitational interaction** corresponds to what modern Physics called: **Weak (nuclear) interaction**.

As the weak nuclear interaction is present **only** when the material point travels the **finite** interval A_0A_p , while moving away from the Foot of the Perpendicular, it follows that:

The weak nuclear interaction acts upon a finite region.

In other words, the weak nuclear interaction is nothing but a transformation of the electromagnetic interaction (appearing when the conjugate positions are moving in the same direction), from **attraction** (in general) to **repulsion***.

B. THE NEW IDEA

Previously, we've stumbled upon a **space void of any Field**: The interval A_0PA_{0s} .

If we were, however, to remember Zeno's paradoxes, which constitute the fundamental ideas for the **quantization of length magnitudes**, and consider that the distance $OP(r_0)$ is very-very small, the question arises:

How **near** could points A and O be to each other?

Infinitesimal calculus will answer:

As near as we want.

* Somewhere here, perhaps, might lie the cause of the **spontaneous** disintegration of matter, known as **radioactivity**.

Nevertheless, our area of study here is not Math; it is Physics i.e. the study of Nature. And, as we know, in Nature we cannot slice and dice intervals indefinitely. Aristotle's “*potential infinity*” is a purely intellectual concept, which is restricted by **the thickness** of the knife blade we use to “slice” the intervals.

Thus, if the moving material point is located at a position A such that distance AO is **the smallest measurable distance in Nature not sliceable any further**, i.e. practically "null", **then it is possible** that the time $\frac{AO}{c}$ it takes for the interaction to reach from A to O, to be **practically** "null" and thus the light to return **practically** "instantaneously" from A to O, even though the speed of light is not infinite.

In this case, position A **coincides with its conjugate**.

And as the "force" of Gravity connecting the particle with O essentially originates from the conjugate, which in this respect coincides with the position, this force is **clearly Newtonian**, without any deflection.

It exists therefore another **critical** point on the Projective Straight line E, which is of **decisive importance** to the structure of the Field. It is point A_n , such that the distance A_nO is the absolutely minimum measurable, i.e. practically null. (Fig. 1.5.11).

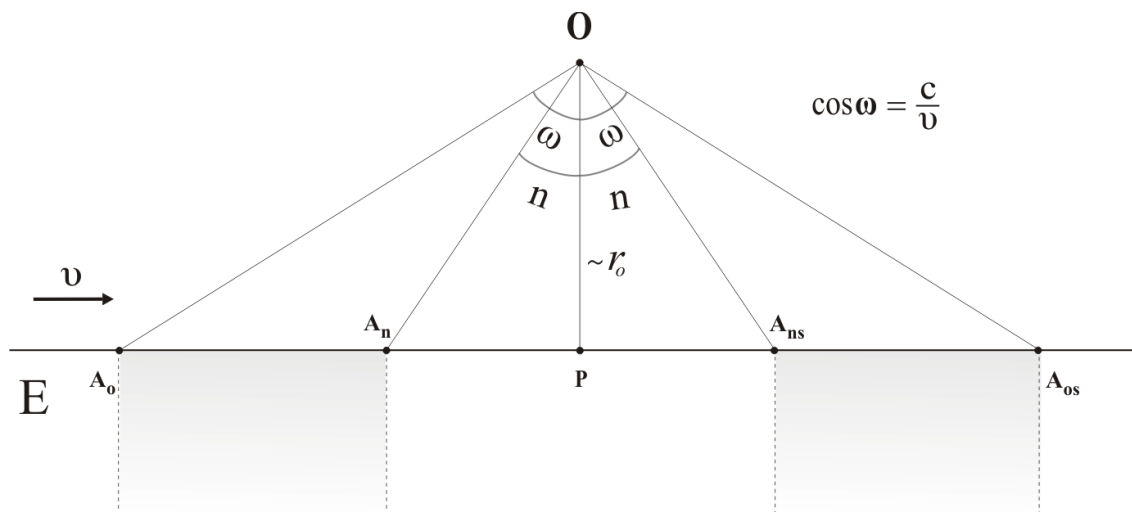


Figure 1.5.11

This **purely Newtonian Gravity (central)** appearing when the material point runs across the interval A_nPA_{ns} , where A_{ns} is the symmetrical of A_n with respect to the Foot of the Perpendicular P, corresponds to what modern Physics called:

Strong (nuclear) interaction.

Angle n , which determines the limits of the strong Field, can be less than, equal to, or even greater than angle ω , i.e. **the angle that determines the boundaries of the space that is empty of Field.***

And as the interval A_nPA_{ns} in which the strong nuclear interaction appears is finite, it follows that:

The strong nuclear interaction has a finite range and finite region of appearance.

The strong Field starts from point A_n and ends at A_{ns} .

While the material point runs interval A_nPA_{ns} , the position coincides with its conjugate, the Being coincides with its "shadow" and the interaction between the Being and O is a **purely attractive** one, without any deflection.

Within the strong nuclear Field there exist no "shadows".

The strong Field is **the place of Truth** where ...we don't "see dimly through a mirror, but face to face" ⁴⁵.

However, this is a prohibited** place, at least for **now*****, to humans.

This "prohibition" is in place due to the effect of the repulsive electromagnetic Field, i.e. the Gravitational Field appearing when the conjugate positions are moving in the opposite direction, which **deters the approach** to the region of the strong Field.

* In my paper "The nuclear interaction and the dual-nature of the world without -ons and without dice" published in the Bulletin of the Hellenic Association of Mechanical & Electrical Engineers, issue 122 Dec.1981 and 125 Mar. 1982, I described the Field considering the points A_o and A_n as identical ($\omega = n$). Here I examine it generally.

⁴⁵ Paul, "Corinthians, 1'" 13: 12.

** "And he said, thou canst not see my face: for these shall no man see me and live". "Exodus", 33: 20.

*** "Beloved, **now** we are children of God, and it is not yet revealed what we will be. But we know that, when He is revealed, we will be like him; **for we will see Him just as He is**". John's First Letter 3:2 (the bold are mine).

Consequences of this «prohibition» are the "boomerangs" noticed by E. Rutherford in his historical experiment.

Summarizing, the order of the various forms of the Field, considering that angle n is less than angle ω so the maximum possible cases will appear^{*}, is the following:

1. **Repulsive Electromagnetic** (Conjugates moving in opposite directions).
2. **Space void of Any Field** (No conjugate exists).
3. **Strong Nuclear** (Conjugate coincidence).
Of course, it appears in extremely minute distances, not for every r_0 .
4. **Space void of Any Field** (No conjugate exists).
5. **Weak nuclear** (Conjugates moving in the same direction).
6. **Attractive Electromagnetic** (Conjugates moving in the same direction).

Thus, the following repulsive Fields exist at the fringes of the attractive strong Field:

- a. Electromagnetic during the **approach** phase.
- b. The weak one during the **moving-away** phase from the PF.

Establishing the existence of the aforementioned repulsive Fields as well as of the space void of any field is of fundamental importance for describing the structure of World for the following reason:

We call coupling energy (E_c) of the nucleus of the atom of matter, the energy that must be spent in order to split the nucleus to its individual constituent nucleons, i.e. protons and neutrons. It has been demonstrated in the laboratory, that this coupling energy is (approximately) proportional to the number A of nucleons in the nucleus, i.e. the ratio $\frac{E_c}{A}$ is roughly constant, varying within a narrow margin of 6 to 8 MeV per nucleon.

The above finding is, however, very strange!

^{*} Please note that when angle n is greater than angle ω ($n > \omega$), then **there exists no space** Void of Field. It is understood that it is essential for r_0 to be **minute**, so as to make it possible for the strong Field to appear.

And this because, if **all** nucleons were to interact by attracting one another due to the existence of the nuclear force, E_c ought to be **proportional** to the **square of the total number of nucleons** (A^2).*

This strange phenomenon of the constancy of the ratio $\frac{E_c}{A}$ and not of the ratio $\frac{E_c}{A^2}$, called **nuclear force saturation**, is theoretically explained only if the nuclear forces **change mathematical sign** (i.e. if from attractive they become, at certain distances, repulsive).

However, the strong nuclear force is **only attractive!**

Thus, our endmost discovery of **the existence of repulsive Fields at the fringes of the strong Field as well as within the Space which is void of Any Field** explains, partly, the curious phenomenon of nuclear force saturation, without resorting to **any** additional assumption about the changing of the sign of the strong interaction, a phenomenon which without additional assumptions is **unexplainable**.

On the particular subject, the Great Soviet Encyclopedia writes:

*“The explanation of nuclear forces saturation, starting from the existing data on the interaction potential of two nucleons, is not possible yet (we know about 50 variants of nucleon potential within the nucleus, which yield satisfactorily the attributes of the Deuterium and the nucleon-nucleon scattering. None can describe the phenomenon of nuclear forces saturation in poly-nucleonic nuclei).”*⁴⁶

The action of the repulsive Fields at the fringes of the strong, and particularly at those of the weak, **which is also the cause of spontaneous disintegration of matter**, i.e. radioactivity, partly explains the phenomenon of nuclear forces saturation. Please make a note that there always exists a repulsive (electromagnetic) field during the **approach** phase, **regardless** of the presence of a strong one.

* More precisely, E_c ought to be proportional of the product $A \cdot (A-1)$. This can be better understood with the following example: Ten people having lunch together start clinking their wine glasses, each one with **all** the others once. How many” clinks” will be heard? Answer: $K = \frac{A \cdot (A-1)}{2}$ and, for $A = 10$, $K = 45$. The same formula is also used to find the number of sides (sides and diagonals with the classical meaning) of a random-shape polygon with A number of vertexes..

⁴⁶ Great Soviet Encyclopedia, Akademos Publ. S.A., Athens, 1982; Lemma: nucleus atomic

I believe we have completed the circle. In summarizing therefore, let us "travel" along the Projective Straight line E and let us describe the variations of **Gravity, in effect the one and only force in existence in the Universe** (Fig. 1.5.12).

Let us consider a Pole of Gravitational Attraction O and the Projective Straight line E not passing through it, on which a material point travels with speed U , measured with the LASC, greater than the speed of light C . The material point approaches the Foot of the Perpendicular from the left.

1. When the material point is at A_1 , the Gravitational interaction $F_{A'_1}$, corresponding to the conjugate A''_1 , which moves in **opposite direction**, is **repulsive**.

We called it: **Electromagnetic Interaction** (repulsive).

2. When the material point passes from boundary position A_0 , corresponding to an Apollonian circumference tangential to straight line E, the aforementioned repulsive Gravity disappears **and the material point enters a Space void of any Field**. The boundary position A_0 is determined by the angle ω , where $\omega = \arccos(c/U)$

3. When the material point passes from A_n where the distance A_nO is the **smallest measurable**, it enters in the **strong nuclear Field**, where the position coincides with its conjugate. Within this Field, Gravity is attractive, central (without deflection). The strong Field starts from A_n and ends at A_{ns} , its symmetrical with reference to P.

4. When the material point travels in the interval $A_{ns}A_{os}$, A_{os} being the symmetrical of A_0 relative to P, it again finds itself in a **Space void of any Field**. No conjugate exists.

5. When the material point, e. g. A_2 , moves away and travels the interval $A_{os}A_p$, where point A_p has as its conjugate the Foot of the Perpendicular P, (i.e. $\tan \varphi = U/C$), the Gravitational interaction $F_{A'_2}$, corresponding to conjugate position A'_2 is **repulsive**.

We called it: **Weak (Nuclear) Interaction**.

6. Finally, when the material point moves away beyond A_p , e.g. position A_3 , the Gravitational interaction $F_{A'_3}$, corresponding to conjugate A'_3 , which moves **in the same direction as A_3** , is **attractive**.

We called it: **Electromagnetic Interaction** (attractive).

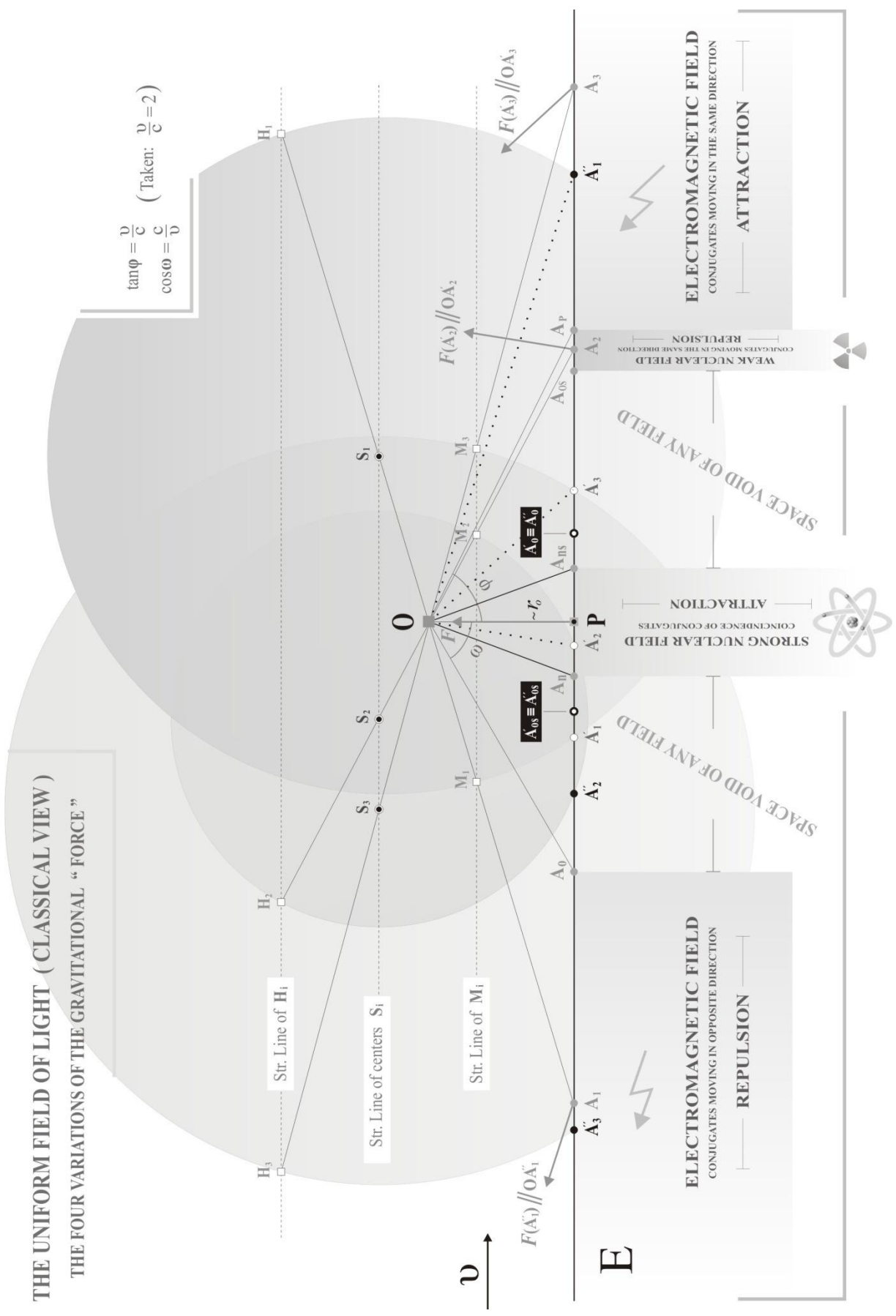


Figure 1.5.12

Needless to mention that, if the distance $OP = r_0$ is greater than the minimal measurable distance, the strong nuclear Field does not appear.

It is also possible that the distance OA_0 becomes less than or equal to the minimal measurable distance. Then **the Space empty of Field does not appear** and from the repulsive electromagnetic Field we pass **directly** on to the strong Nuclear Field and from that, **directly** on to the weak Nuclear Field or, in case the latter doesn't exist on to the attractive electromagnetic.

It therefore becomes obvious, why the Holy Grail of modern Science i.e. the **Unification of "Forces"** (...even a qualitative one to start with), has eluded Physicists for so long.

In my opinion, for two very explicit and concrete reasons:

- a. Because the theoretical Physicists **do not think Projectively**.
- b. Because, by embracing the erroneous Theory of Special Relativity and its resulting "Doctrine", **they could not or perhaps dared not exceed the speed of light**.

The only achieved unification so far, via an entirely different approach, is to be found in the works of Weinberg and Salam where the weak and the electromagnetic interactions have been unified in a single one, the **Electro-weak** interaction.

By observing Fig. 1.5.12, the agreement of the result of the above researchers with the present description becomes obvious.

Indeed, the Field of the weak "force" is a small part ($A_{os}A_p$) of the electromagnetic Field (in which the conjugates move in the same direction), which essentially starts from point A_{os} .

However, within this Field **the interaction changes direction**.

Thus in the part $A_{os}A_p$ it is **repulsive** (weak), while in the part $A_p \infty$ it is **attractive** (electromagnetic) with the conjugates, however, **moving in the same direction**.

Therefore, logically, the weak "force" must also be considered an integral part of the wider electromagnetic interaction.

I m p o r t a n t R e m a r k

It is possible, that some of the geometric solutions given by the Apollonian circumference can be found **within** the Strong Field. However, these conjugate positions while being mathematically acceptable are, from the physics point of view, to be rejected.

I will call these conjugate positions resulting **inside the Strong Field "potentially conjugate positions"**. We are going to deal in greater detail with the problem of the "potentially conjugate positions" in the next Chapter, where we will also implement the **Quantum Mechanics** approach to the Unified Field of Light.

Before I conclude the Geometrical analysis, I feel compelled to repeat a historical retrospection, related to the aforementioned description, according to which the nuclear texture of matter **is based** both on Geometrical properties and on the quantization of the spatial (or the time) distances.

I apologize for the repetition, but I strongly believe that Historical Truth ought to be emphasized, so that the importance of its messages is completely consolidated.

In the 5th century B.C., in the town of Elea in Southern Italy lived, researched and taught the Greek philosopher Zeno of Elea (490 - 430 BC.), whom Aristotle considered as the founder of Dialectic. In his quest on the nature of motion, Zeno formulated his eminent Paradoxes; four out of the rescued eight, are the most important ones: "The Dichotomy", "Achilles", "the Arrow" and "the Stadium". At the end of the first chapter, I referred to the "Swift-Footed Achilles" and the turtle paradox. Regarding the Arrow paradox, I copy:

*"In the arrow paradox, it is assumed that time is comprised from "indivisible moments" and it is concluded that a moving (launched) arrow "is always at rest", because at any moment the arrow is found at a certain position. And, because this is true for every moment, it "results" that the arrow is not moving."*⁴⁷

Lefkippos, one of Zeno's students, later settled at the town of Avdira in Thrace, where he founded a philosophical School. Perhaps Lefkippos transferred Zeno's ideas to Democritus, one of his students, and from this School of Avdira eventually sprang up the Atomic Theory of Matter.

⁴⁷ Great Soviet Encyclopedia, Akademos Publ. S.A., Athens, 1979, Lemma: Zeno of Elea (Zeno's Paradox).

Thus I wonder:

What if Zeno, by conceiving on one side the quantum states of Time distances (the Arrow paradox) and, on the other side, the quantum states of Space distances (Achilles paradox), paved the way for Lefkippos and Democritus, by further processing **precisely these** ideas, to arrive at the quantum states (atomic nature) of the matter?

Come to think about it, the proposals that:

- a. *"Time is comprised by indivisible moments"* (Arrow)
- b. *"Matter is comprised of indivisibly unbreakable units"* (Atomic theory)

are **almost identical proposals** as the concepts* of "Time" and "Matter" are, according to I. Kant, a priori concepts.

Regardless of what happened, the realization today that the nuclear interaction (or the nuclear nature of the matter) is not owed in some *-ons***, but it is the consequence of Geometrical attributes and quantum states of Space distances or Time Intervals, I cannot but humbly bow to the greatness of the Ancient Greek Thought, and to subscribe to Friedrich Nietzsche's position:

"There is nothing that the Greeks haven't already said".

* *These concepts will pester us enough in the 2nd and 3rd part of the book.*

* * *Elementary particles, and in this case, mesons and gluons. Here are more "gods" and "demons", "traffic officers" and "paratroopers", to **disorientate us** from fundamentally understanding the structure and operation of the World. As a result, Common Sense is forced to consider modern Theoretical (at least) Physics, a well staged mathematical mythology or, even worse, a childish, primitive Religion full of gods, i.e. all the types of **- ons**, thought to be **responsible** for natural phenomena! [...]*

II. THE MATHEMATICAL FORMULATION

I substitute $B = \frac{v}{c} > 1$

To facilitate the comprehension of the analysis and resulting conclusions, I distinguish the following cases:

1st Case:

The material point **moves away** from the PF and is found **beyond** A_p . I.e. it travels the interval $A_p \infty$ (**Attractive Electromagnetic Field**).

2nd Case:

The material point **moves away** from the PF and is found **within** the interval $A_{os}A_p$ (**Weak Nuclear Field**).

3rd Case:

The material point travels the intervals A_oA_n and $A_{ns}A_{os}$ (**Space void of any Field**).

4th Case:

The material point travels the interval A_nPA_{ns} (**Strong Nuclear Field**).

5th Case:

The material point approaches the PF, but is found before the boundary position A_o , i.e. it runs through the interval $-\infty A_o$ (**Repulsive Electromagnetic Field**).

I shall examine each of the above cases in more detail.

Inasmuch as we have familiarized ourselves with the concepts and the forms, already from Chapter Two, I shall omit many of the intermediary mathematical calculations.

1st Case

The material point moves away from the PF and is located beyond A_p , whose conjugate is P, traveling on the interval $A_p \infty$. In other words, the material point is located within the **Attractive** Electromagnetic Field* .

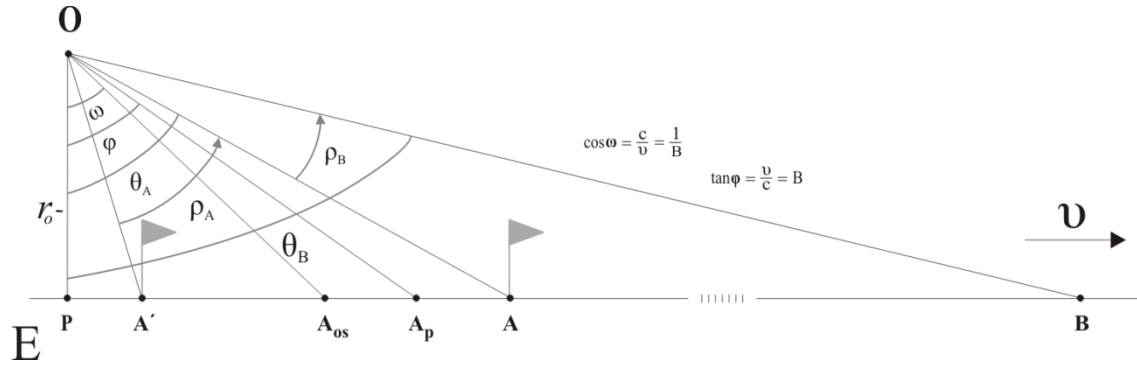


Figure 1.5.13

Inasmuch as the material point travels the interval $A_p \infty$, its conjugate (A') travels the Interval $P \infty$.

1.1 U_{ob} = Speed measurable with the local clock between conjugate positions

Suppose that we placed two flagged poles in position A and its conjugate position A' and asked the Observer O to measure the average speed of the material point in the interval $A'A$ with **his clock**.

Let A be the conjugate of B. Therefore, the sought speed is:

$$U_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot U \quad (1.5.9)$$

By applying the sine theorem in the triangle $OA'A$ and OAB we get:

$$\sin \rho_A = B \cdot \cos \theta_A \quad (1.5.10) \quad \text{and} \quad \sin \rho_B = B \cdot \cos \theta_B \quad (1.5.11)$$

* It is understood that the material point does travel the "entire" Projective Straight line E from $-\infty$ to $+\infty$ However our study in this 1st case concerns **the part of the path** from A_p to $+\infty$. The same applies to the other pertinent cases as well.

But also: $\frac{A'A}{AB} = \frac{\cos\theta_A}{\cos(\theta_A - \rho_A)}$. Consequently, (for $\cos\theta_A \neq 0$):

$$U_{ob} = \frac{U}{\sqrt{1 - B^2 \cdot \cos^2\theta_A} + B \cdot \sin\theta_A} \quad (1.5.12)$$

We observe that this is the same equation with the one we arrived at when we examined the moving-away phase with **subluminal** speed (equation 1.2.14).

By further studying equation (1.5.12) we arrive at the proposal:

When the material point is located within the Attractive Electromagnetic Field, i.e. it travels the interval $A_p \infty$, U_{ob} is not only smaller than U , but also smaller than the speed of light c^* .

Thus, even though U is **superluminal**, U_{ob} is **subluminal**.

1.2 $U' =$ Instantaneous **speed of the conjugate position** defined as $\frac{dx'}{dt}$

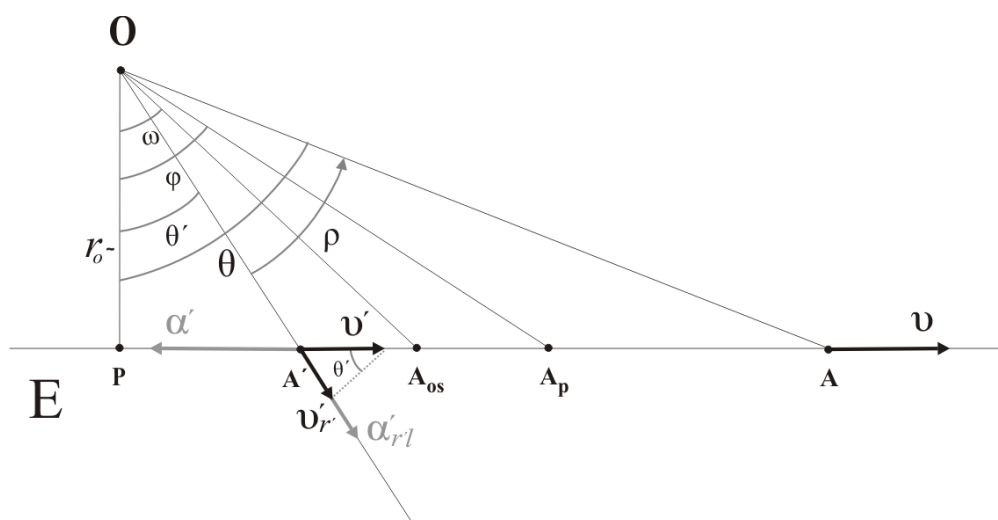


Figure 1.5.14

* The reader might want to try to prove this alone. It is a good opportunity for a self-check on the level of comprehension of the issues covered in this chapter.

It holds that: $\theta' = \theta - \rho$, $\sin \rho = B \cdot \cos \theta$, whereas the sought v' is:

$$v' = \frac{dx'}{dt} = r_0 \cdot \frac{1}{\cos^2 \theta'} \cdot \frac{d\theta'}{dt} \quad (1.5.13)$$

Taking into consideration that $\frac{d\theta}{dt} = \frac{v \cdot \cos^2 \theta}{r_0}$ we get:

$$v' = \frac{v}{\cos \rho \cdot (\cos \rho + B \cdot \sin \theta)} \quad (1.5.14)$$

or

$$v' = \frac{v}{1 - B^2 \cdot \cos^2 \theta + B \cdot \sqrt{1 - \cos^2 \theta} \cdot \sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.15)$$

and also:

$$v' = \frac{v_{ob}}{\sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.16)$$

We observe that precisely the same relations are also in effect during the **moving- away** phase from the PF with **subluminal** speed.

The difference being that here we substituted $B = \frac{v}{c} > 1$, whereas in the subluminal ones $b = \frac{v}{c} < 1$.

The question arises: When will the instantaneous speed of the conjugate position v' be equal to the speed of the position v ? Obviously, the denominator in equations (1.5.14) and (1.5.15) must equal to one.

This is the case when:
$$\cos \theta = \frac{1}{\sqrt{B^2 + 1}} \quad (1.5.17)$$

However, $\tan \varphi = B \Rightarrow \cos \varphi = \frac{1}{\sqrt{B^2 + 1}}$. Therefore: $\theta = \varphi$ (1.5.18)

Conclusion:

When the material point is at position A_p , i.e. it **appears** to be at the PF, then the **instantaneous speed** of its conjugate position equals the speed of the position. (Kinematic Agreement).

We observe that we've reached exactly the **same** conclusion during our research on the subluminal speeds and on the case when $U = C$.

By investigating when the speed v' is reduced to the speed of light, we get:

$$\cos^2 \theta_{v'=c} = \frac{2B-1}{B^2 \cdot (B^2 + 2B - 1)} \quad (1.5.19)$$

Finally, when angle θ tends to $\pi/2$, ($\cos \theta \rightarrow 0$), then we have:

1. Speed v_{ob} has no meaning.
2. Whereas v' tends to $\frac{v}{1 + \frac{v}{c}}$, which is subluminal.

1.3 a' = Instantaneous **orbital acceleration of the conjugate position defined as** $\frac{dv'}{dt}$

By applying the same methodology as in Chapter Two, we have:

$$a' = -\frac{c^2}{r_0} \cdot \frac{B^3 \cdot \cos^3 \theta}{(1 - B^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.5.20)$$

Precisely the same relation we had found for the subluminal speeds (see 1.2.45). The negative sign has the natural meaning that the conjugate position A' **slows down**, i.e. the magnitude of v' **decreases** as the material point **moves away**.

1.4 $U'_{r'}$ = **Instantaneous radial velocity defined as the projection of the velocity of the conjugate position U' on the moving ray of the conjugate position OA'**

By similar steps as in Chapter Two, it results:

$$U'_{r'} = \frac{U - U'}{B} \quad (1.5.21)$$

This relation is also true for subluminal speeds.

1.5 $a'_{r'l}$ = **Instantaneous radial acceleration of the conjugate position defined as $\frac{dU'_{r'}}{dt}$**

From (1.5.21) we get: $a'_{r'l} = -\frac{a'}{B}$.

Therefore:

$$a'_{r'l} = -\frac{a'}{B} = +\frac{c^2}{r_0} \cdot \frac{B^2 \cdot \cos^3 \theta}{(1 - B^2 \cdot \cos^2 \theta)^{3/2}} = +\frac{c^2}{r_0} \cdot \frac{1}{B} \cdot \tan^3 \rho \quad (1.5.22)$$

The positive sign has the physical meaning that the acceleration $a'_{r'l}$ is **in the same direction** with the velocity. This happens because $U'_{r'}$ **increases** as U' **decreases**, when the material point moves **away**.

As **in all previous cases**, the same precisely hold true for the corresponding case of subluminal speeds.

1.6 DYNAMICS

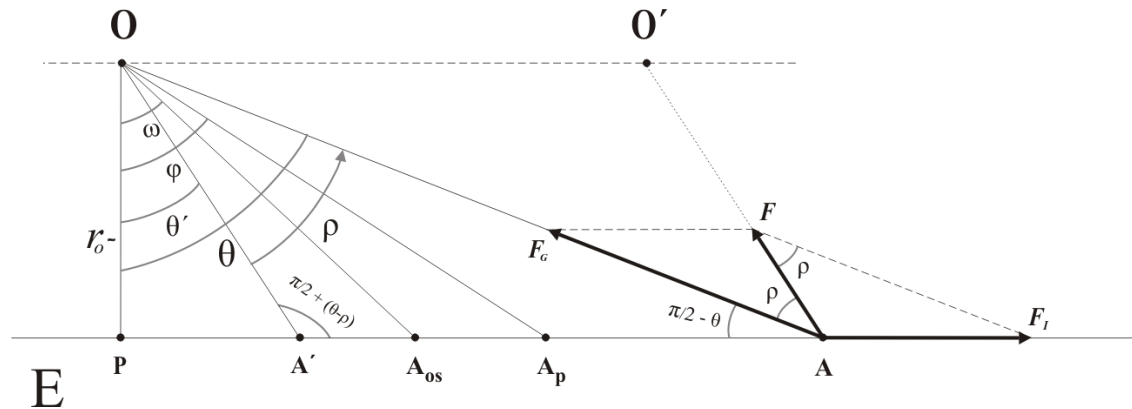


Figure 1.5.15

On particle A acts the force of Gravity F (attractive electromagnetic) originating from O' , i.e. F is parallel to the moving ray of the conjugate position OA' . This is broken down to the inertial F_I , (collinear with the movement) and to the gravitational F_G , (collinear with the moving ray at the position).

Because the triangle of the forces is similar to triangle $OA'A$, we have:

$$\frac{F}{\cos \theta} = \frac{F_I}{\sin \rho} = \frac{F_G}{\cos(\theta - \rho)} \quad (1.5.23)$$

Therefore:

$$F_I = \frac{v}{c} \cdot F \quad (1.5.24)$$

$$F_G = \frac{v}{v_{ob}} \cdot F \quad (1.5.25)$$

Precisely the same relations we had arrived at in the case of subluminal speeds. Here, however, we observe that **both** F_I and F_G are **greater than** F , moreover that F_I is less than F_G^* .

* This will become better understood by those who took the time to try and prove the statement on p. 252.

2nd Case

The material point **moves away** from the Foot of the Perpendicular P and is located within the interval $A_{os}A_p$, i.e. within the **repulsive** Weak Nuclear Field. Inasmuch as the material point A travels the **finite** interval $A_{os}A_p$, its conjugate travels the **finite** interval $A'_{os}P$. (The point $A'_{os} \equiv A''_{os}$ is the conjugate of A_{os} , which in turn is the symmetrical of A_o in reference to P).

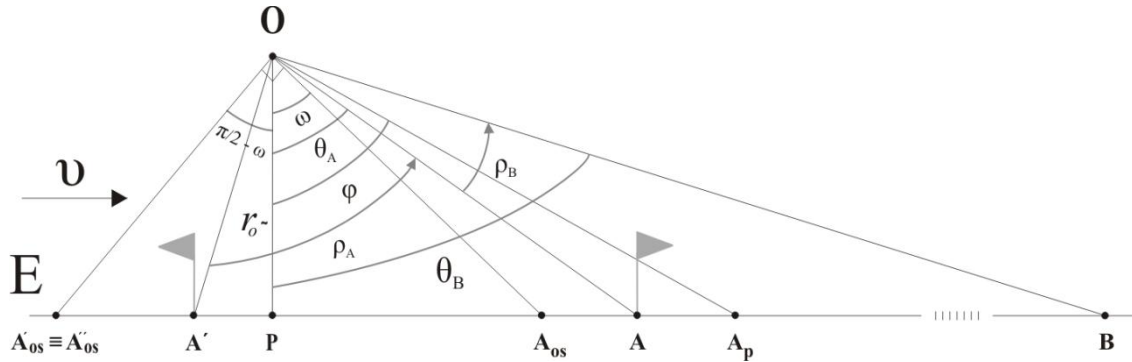


Figure 1.5.16

2.1 U_{ob} = Speed measurable with the local clock between conjugate positions

We placed again our flagged poles in the conjugate positions A' and A and we asked Observer O to measure with his clock the average speed of the material point in the interval $A'A$. Let A be the conjugate of B . Then, U_{ob} is:

$$U_{ob} = \frac{A'A}{T_{ob}} = \frac{A'A}{AB} \cdot U \quad (1.5.26)$$

$$\text{But } \sin \rho_A = B \cdot \cos \theta_A \quad (1.5.27) \quad \text{and} \quad \sin \rho_B = B \cdot \cos \theta_B \quad (1.5.28)$$

Also, we have:

$$\frac{A'A}{AB} = \frac{\cos \theta_A}{\cos(\rho_A - \theta_A)} \quad (1.5.29)$$

Therefore, the sought speed is:

$$U_{ob} = \frac{U}{\sqrt{1 - B^2 \cdot \cos^2 \theta_A} + B \cdot \sin \theta_A} \quad (1.5.30)$$

From equations (1.5.27) and (1.5.28) and because $B > 1$, it results that: $\cos(\theta_{\min}) = \frac{1}{B} = \frac{C}{U}$,
i.e. $\theta_{\min} = \omega$, where $\omega = \arccos(C/U)$, a verification which we carried out with the Geometrical Analysis (Boundary Apollonian).

The study of the above function (1.5.30) of U_{ob} **within the Weak Nuclear Field** is interesting because it reveals the splendid Harmony of the World and thus I believe that it deserves the labor to dedicate some time to it.

I examine the following special conditions (questions):

2.1.1 When does U_{ob} , (**speed measured with the local clock, i.e. the clock of Humans**), equal U , (**speed measured with the LASC - the clock of Angels**)?

Obviously, the denominator of equation (1.5.30) must equal one, i.e.

$$\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta = 1 \quad (1.5.31)$$

I symbolize angle θ that satisfies (1.5.31) with θ_e^* .

Solving (1.5.31), it results $\sin \theta_e = \frac{B}{2}$ i.e.:

$$\sin \theta_e = \frac{1}{2} \cdot \frac{U}{C} \quad (1.5.32)$$

* $\theta_e = \theta_{equal}$, i.e. that θ where $U_{ob} = U$.

We observe that we've arrived at precisely the same relation we had also found when we had asked the same question in the kinematics of **subluminal** speeds, (eq.1.2.24).

But here something extraordinary occurs!

As we know, the sine of any angle is less than or equal to one.

However, the ratio $B = \frac{v}{c}$ may take quite large values. Consequently, in order for (1.5.32) to make sense, it must be:

$$B \leq 2 \tag{1.5.33}$$

We could consider restriction (1.5.33) as sufficient. However, while it is necessary it is not sufficient because equation (1.5.32) resulted from the solution of (1.5.31). However, to solve (1.5.31) we had to raise to the square in order to cancel the radical.

By raising however an equation to the square, we also introduce one extra **fictitious solution** which, however, is not a valid solution of the initial equation.

In particular, by raising (1.5.31) to the square, we also introduced the solution:

$$-\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta = 1 \tag{1.5.34}$$

Thus, in order to avoid this fictitious solution, we must place **an extra restriction**:

The part of the denominator of (1.5.30) outside the radical must be less than or equal to one, i.e.:

$$B \cdot \sin \theta_e \leq 1 \tag{1.5.35}$$

and as $\sin \theta_e = \frac{B}{2} \Rightarrow B \cdot \frac{B}{2} \leq 1$, it follows:

$$B \leq \sqrt{2} \tag{1.5.36}$$

Conclusion:

If the ratio $B = \frac{v}{c}$ is greater than $\sqrt{2}$, then, within the Weak Nuclear Field, there **exists no** position such that U_{ob} , (speed measured with the **local** clock) be equal with v , (speed measured with the **LASC**).

2.1.2 When does U_{ob} **become equal** to the speed of light c ?

From (1.5.30) it follows that it should be

$$B = \sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta \quad (1.5.37)$$

I symbolize the solution of (1.5.37) with θ_c , thus:

$$\sin \theta_c = \frac{2B^2 - 1}{2B^2} \quad (1.5.38)$$

Now already we can order according to size those critical angles of the Weak Field:

a. The **minimal** $\theta_{\min} = \omega$, which corresponds to position A_{os} and results from the relation:

$$\cos(\theta_{\min}) = \frac{1}{B} \Rightarrow \sin(\theta_{\min}) = \frac{\sqrt{B^2 - 1}}{B} \quad (1.5.39)$$

b. θ_e , which results from $\sin \theta_e = \frac{B}{2}$, which makes sense only for $B \leq \sqrt{2}$.

c. θ_c , which results from (1.5.38), $\sin \theta_c = \frac{2B^2 - 1}{2B^2}$.

d. The **maximum** $\theta_{\max} = \varphi$, which corresponds to position A_p , i.e. $\tan \theta_{\max} = B$, consequently :

$$\sin(\theta_{\max}) = \frac{B}{\sqrt{B^2 + 1}} \quad (1.5.40)$$

ORDER OF THE WEAK FIELD'S CRITICAL ANGLES

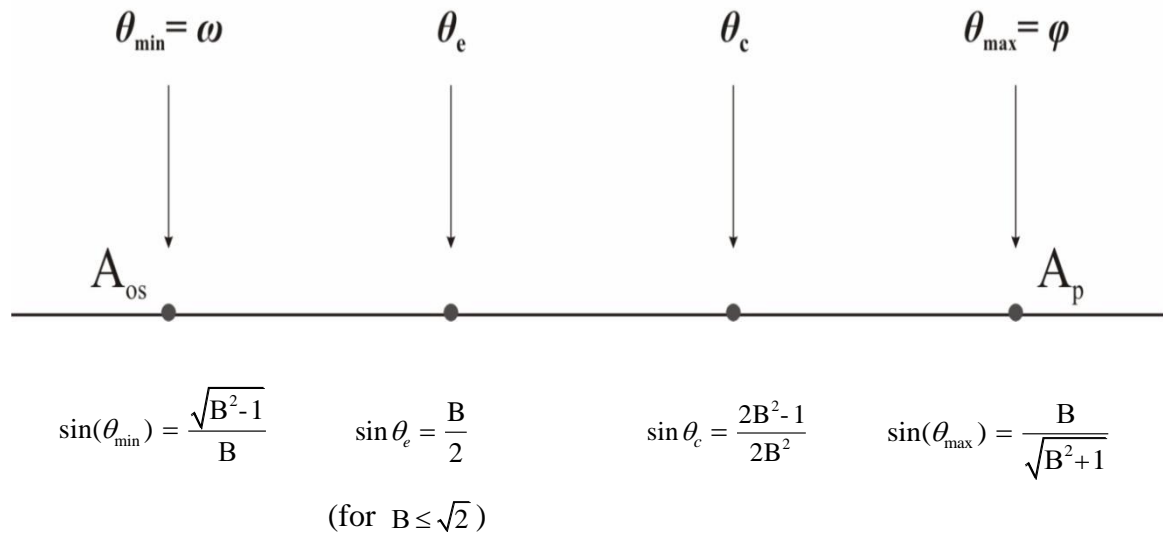


Figure 1.5.17

Because for each $B > 1$ it holds that $\frac{2B^2-1}{2B^2} < \frac{B}{\sqrt{B^2+1}}$, it is concluded that angle θ_c is

always less than θ_{\max} *.

After ordering the angles, let us examine the various likely cases, realizing firstly that as θ_c is always **less than θ_{\max}** , thus θ_c will be always **greater than θ_{\min}** .

2.1.3 When will θ_e equal θ_{\min} ?

In other words, for which value of B the speed v_{ob} will equal v , when the material point is located **at the start of** the Weak Field, i.e. at A_{os} ?

Obviously it must hold that: $\sin(\theta_{\min}) = \sin \theta_e$ or $\frac{\sqrt{B^2-1}}{B} = \frac{B}{2}$ (1.5.41)

Therefore: $B = \sqrt{2}$, then $\theta_e = \theta_{\min} = \pi/4$ (45°).

* This sentence also constitutes the proof that was requested from the reader in the 1st case, of the attractive electromagnetic Field, (footnote on p. 252).

The rest of the critical angles are:

$$\sin \theta_c = \frac{3}{4} \Rightarrow \theta_c = 0,84806208 \quad (48,59^\circ \dots)$$

$$\sin(\theta_{\max}) = \sqrt{\frac{2}{3}} \Rightarrow \theta_{\max} = 0,95531662 \quad (54,7356^\circ)$$

Thus for $B = \frac{v}{c} = \sqrt{2}$, the Weak Field **starts** from 45° , (where it is also in effect $U_{ob} = v$) and **finishes** at $54,7356^\circ \dots$

2.1.4 When will θ_c equal θ_{\max} ?

In other words, for which value of B the speed U_{ob} will equal v , when the material point is located **at the end of** the Weak Field, (or else at the beginning of the attractive electromagnetic Field), i.e. at position A_p ?

$$\text{Obviously, it must be: } \sin(\theta_{\max}) = \sin \theta_c \Rightarrow \frac{B}{\sqrt{B^2+1}} = \frac{B}{2} \quad (1.5.42)$$

Therefore: $B = \sqrt{3}$. Caution, however!!

As for $B > \sqrt{2}$ there **is no position within the Weak Field** where U_{ob} equals v , it is concluded that the requirement we placed **is not met**.

I believe, however, that it is interesting to search what really happens for $B = \sqrt{3}$ and more specifically to calculate U_{ob} at the **boundary** position A_p i.e. for $\theta = \theta_{\max}$.

$$\sin(\theta_{\max}) = \frac{B}{\sqrt{B^2+1}} = \frac{\sqrt{3}}{2} \Rightarrow \theta_{\max} = \frac{\pi}{3} \quad (60^\circ) \quad \kappa\alpha\iota \quad \cos(\theta_{\max}) = \frac{1}{2}$$

And U_{ob} is calculated as:

$$U_{ob} = \frac{v}{\sqrt{1 - \frac{3}{4} + \sqrt{3} \cdot \frac{\sqrt{3}}{2}}} = \frac{v}{\frac{1}{2} + \frac{3}{2}} = \frac{v}{2} \quad !!!$$

In other words:

As the condition $B \leq \sqrt{2}$ **is not met**, the U_{ob} resulting for B **that satisfies** the (1.5.42), does not equal U , **but rather one half of it!**

Here, I ought to simply point out that if we divide a guitar string in two and we then hit it again, we receive **the same note**, but an octave higher.*

We observe that if we simply change the sign of the radical from positive to negative, U_{ob} **results equal** to U . It is the introduction of the **fictitious solution**, which I note that it corresponds to the second conjugate position A'' (See 5th case).

The rest of the critical angles are:

$$\sin(\theta_{\min}) = \frac{\sqrt{B^2-1}}{B} = \sqrt{\frac{2}{3}} \Rightarrow \theta_{\min} = 0,95531662 \quad (54,7356^\circ \dots)$$

$$\sin \theta_c = \frac{2B^2-1}{2B^2} = \frac{5}{6} \Rightarrow \theta_c = 0,98511078 \quad (56,44269^\circ \dots)$$

Thus, for $B = \sqrt{3}$, the **lower limit** of the Weak Field **coincides** with the **upper limit** of the same Field for $B = \sqrt{2}$.

In general, when $B_2^2 = B_1^2 + 1$ (1.5.43), then **the upper limit** of the Weak Field corresponding to the ratio B_1 **is converted to the lower limit** of the Weak Field that corresponds to the ratio B_2 .**

I would prompt the reader to pay particular attention at this point, as this verification of the **Exchangeability of the Extremes** that takes place when equation (1.5.43) is satisfied, will constitute for us a future region of exhaustive research, because this exchangeability of the extremes constitutes a **Structural Rule** of the world where we live in.

* This observation is attributed to Pythagoras, who remained speechless in front of the Harmony of the integer and the rational (fractions of integers) divisions of the musical scale and, among others, let to believe that all the splendid natural phenomena emanate from the Harmony of Numbers.

** This equation (1.5.43) results by placing $(\theta_{\min})_{B_2} = (\theta_{\max})_{B_1}$ i.e. $\frac{\sqrt{B_2^2-1}}{B_2} = \frac{B_1}{\sqrt{B_1^2+1}}$. We observe

that equation (1.5.43) is the law of production (based on reiteration of the Pythagorean Theorem) of **the coil**, which is met in a lot of structures of Nature, and mainly in shells. Once more we admire the wisdom of the Creator "the Eternal Geometrician" [...]

2.1.5 The reader may reasonably wonder:

Why did I decide that angle θ_e is less than angle θ_c in the diagram that presents the arrangement of the angles of the Weak Field (Fig. 1.5.17)? How can I be sure of this, so that the diagram drawn would be accurate? The answer, of course, is that θ_e makes sense **only for** $B \leq \sqrt{2}$ and for **such** values of B it holds that:

$$\sin \theta_e < \sin \theta_c \quad (1.5.44)$$

It would, however, be interesting to find from which **exact** value of B the inequality starts to become valid (1.5.44). In order to establish that, it is necessary and sufficient for the following equation to be solved:

$$\frac{B}{2} = \frac{2B^2 - 1}{2B^2} \quad (1.5.45)$$

or

$$B^3 - 2B^2 + 1 = 0 \Rightarrow (B - 1) \cdot (B^2 - B - 1) = 0$$

Therefore, the third degree equation has the following solutions:

1. $B_1 = 1$ **Rejected**
2. $B_2 = -0, 618033988\dots$ negative Golden Section. **Rejected**
3. $B_3 = 1, 618033988\dots$ Golden Number (G.N.) **Acceptable**

The Golden Number (G.N.) is the inverse if the Golden Section (G.S.)

Conclusion:

For $B < 1,618033988\dots$, the ratio $\frac{B}{2}$ is less than the ratio $\frac{2B^2 - 1}{2B^2}$.

As $\sqrt{2}$ is less than $1,618033988\dots$, it follows that the diagram that presents the arrangement of the angles of the Weak Field (Fig. 1.5.17), is correct.

It is fascinating that, once more, we discover the Golden Ratio to be tightly interwoven with **the structural foundations** of our world.

2.2 $v' =$ **Instantaneous speed of the conjugate position defined as $\frac{dx'}{dt}$**

Through pondering and methodology similar to the corresponding case of subluminal speeds in chapter 2, (conjugate positions "at both sides" of the Foot of the Perpendicular - third case), we find:

$$v' = \frac{v}{\cos \rho \cdot (\cos \rho + B \cdot \sin \theta)} \quad (1.5.46) \quad \text{or}$$

$$v' = \frac{v}{1 - B^2 \cdot \cos^2 \theta + B \cdot \sqrt{1 - \cos^2 \theta} \cdot \sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.47)$$

and also:

$$v' = \frac{v_{ob}}{\sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.48)$$

where θ , the angle $OP \angle OA$ and ρ , the angle $OA' \angle OA$.

2.3 $a' =$ **Instantaneous orbital acceleration of the conjugate position defined as $\frac{dv'}{dt}$**

Similarly as in the second Chapter, we get:

$$a' = -\frac{c^2}{r_0} \cdot \frac{B^3 \cdot \cos^3 \theta}{(1 - B^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.5.49)$$

2.4 $U'_{r'}$ = Instantaneous radial velocity defined as the projection of the velocity of the conjugate position U' on the moving ray of the conjugate position OA'

Similarly, we get:

$$U'_{r'} = \frac{U' - U}{B} \quad (1.5.50)$$

2.5 $a'_{r'l}$ = Instantaneous radial acceleration of the conjugate position defined as $\frac{dU'_{r'}}{dt}$

From (1.5.50) we get: $a'_{r'l} = \frac{1}{B} \cdot a'$. Therefore:

$$a'_{r'l} = -\frac{c^2}{r_0} \cdot \frac{B^2 \cdot \cos^3 \theta}{(1 - B^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \frac{1}{B} \cdot \tan^3 \rho \quad (1.5.51)$$

We note that the equations we ended-up with, are precisely the same with those in the case of subluminal speeds.

2.6 DYNAMICS

The force of Gravity F (Weak Nuclear) originating from O' is exerted on the material point. In other words, F is parallel to OA' (the moving ray of the conjugate position) and is **repulsive**. This is broken down to F_G and F_I , defined earlier (Fig. 1.5.18).

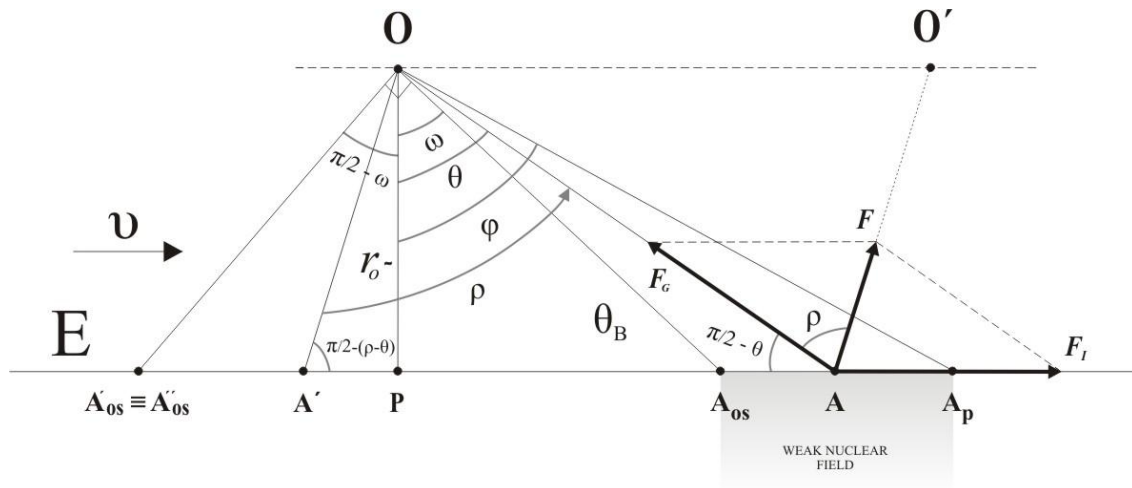


Figure 1.5.18

As the triangle of the forces is similar to triangle $OA'A$, we have:

$$\frac{F}{\cos \theta} = \frac{F_I}{\sin \rho} = \frac{F_G}{\cos(\rho - \theta)} \quad (1.5.52)$$

Therefore:

$$F_I = \frac{v}{c} \cdot F \quad (1.5.53)$$

and

$$F_G = \frac{v}{v_{ob}} \cdot F \quad (1.5.54)$$

2.7 Mathematical «Irregularities»

We observe that, as it results from equations (1.5.47) and (1.5.48), the instantaneous speed v' of the conjugate position, when position A is located at A_{0s} (start of the Weak nuclear Field - end of the Space void of any Field), becomes infinite.

In other words, for $\theta = \omega$, v' , v'_r , a' and $a'_{r'l}$ become infinite.

Therefore, **at the limit of** the Space void of any Field, i.e. where the Weak Field starts, there exists a point of "irregularity" which, from a Physical viewpoint, is unacceptable. This observation, able to instill terror into the minds of many a Mathematician, shouldn't bother us at all as, already in Chapter 2, I believe I sufficiently explained the weaknesses and limitations of infinitesimal calculus.

We did not **measure** the aforementioned magnitudes that become infinite; we simply **calculated** them by applying the rules of infinitesimal calculus.

They are not quantum magnitudes; v_{ob} is the sole quantum magnitude.

From a Physical point of view, the only certainty is that:

At the limit of the Space void of any Field, the accelerations and, accordingly, the "apparent forces" are immense.

Zero ("nothing") and **Infinite** seem to be entangled in a strange boundary coexistence.

Additionally, when the particle **is found at the beginning of the Weak Field** (A_{os}), i.e. $\theta = \omega$ where $\omega = \arccos(c/v)$, v_{ob} becomes:

$$v_{ob} = \frac{v}{\sqrt{\frac{v^2}{c^2} - 1}} \quad (1.5.55)$$

And is **less than** v for $B = \frac{v}{c} > \sqrt{2}$, **equal to** v for $B = \sqrt{2}$ and **greater than** v for $B < \sqrt{2}$. *

Also, when the material point **is located at the end of the Weak Field** (A_p), i.e. $\theta = \varphi$ where $\varphi = \arctan(v/c)$, then v_{ob} becomes:

$$v_{ob} = \frac{v}{\sqrt{\frac{v^2}{c^2} + 1}} \quad (1.5.56)$$

* Compare equation (1.5.55) with equation (1.1.9) of v_{ob} at the PF, $v_{ob} = \frac{v}{\sqrt{1 - v^2/c^2}}$ in the case of **subluminal** speeds. There, v_{ob} is **always** greater than v .

The above relation is also true in the case of subluminal speeds, when the material point is located at a position whose conjugate is the Foot of the Perpendicular (Position K, Fig. 1.1.5).

There is therefore a **topological resemblance** between intervals $A_{os}A_p$ of superluminal speeds (Weak Field) and interval PK of subluminal speeds, where point P (subluminal) **corresponds** to point A_{os} (superluminal) and point K (subluminal) **corresponds** to point A_p (superluminal).

This resemblance is not accidental.* We observe that in both intervals PK and $A_{os}A_p$, **Gravity is repulsive**, although it shouldn't.

In the case of subluminal speeds, we called interval PK **Window of Antigravity**. In the case of superluminal speeds, the corresponding interval $A_{os}A_p$ corresponds to the **Weak Nuclear Field**.

Before I conclude this description of the Weak Field, it would be worth to make a historical note. In 1956, the Chinese-born American Physicists Tsung-Dao Lee and Chen-Ning Yang, in their published work, theoretically predicted that in certain reactions among particles, the **fundamental law of parity (symmetry)** was violated, i.e. that those reactions were not symmetrical.

Furthermore, they attributed the cause of this "break" in symmetry to the **Weak Nuclear force**. Confirmation (and the Nobel Prize) came shortly thereafter with the experiments of the also Chinese-American woman Physicist Wu Chien-Hsiung and, independently, from Leon Lederman's team.

* This resemblance has deep roots going back to the special case in which $A_o \equiv A_n$, i.e. where the Space void of Field **coincides** with the Strong Field.

What kind of a point is P?

It is the Foot of the Perpendicular, i.e. the point of the path **at minimum distance** from the Observer.

What kind of a point is A_{os} ?

It is the **boundary separating** the Strong Field from the Weak one (in this special case where $A_n \equiv A_o$).

The distance OA_{os} is the **minimum measurable distance** from the Observer.

It is not, therefore, a coincidence that these points correspond. Similarly the correspondence of K and A_p is not accidental, as both of them have as conjugate the Foot of the Perpendicular.

Now, it would be necessary to study carefully Figure 1.5.12, so as to comprehend, this time from a **fundamental** point of view, the importance of the discovery of the above Researchers.

Thus, we observe that the introduction of the Weak Field as a "wedge" on the right of the Foot of the Perpendicular **breaks the remarkable symmetry of the Figure and, therefore, the symmetrical "structure" the World.**

This is because the Weak Nuclear Field appears **only during the moving-away phase** from the Foot of the Perpendicular. Thus, the Figure cannot be symmetrical.

This constitutes the **fundamental reason** for the "break" of the Symmetry!

In therefore seems that in Nature, **Harmony** rather than Symmetry is the dominant rule. Harmony springs from the **fight of opposites**, as we shall come to realize in future chapters where we will develop and expand Harmonicity further.


Thus, the great thinker Heraclitus was perhaps right when he declared that *"War is the father of everything"*.

Following the above, it is of course ironic that in the next Chapter, while attempting the Quantum Mechanics approach of the Unified Field of Light, we shall restore the symmetry of the Figure. The reason for doing so will become evident there...

3rd Case

The material point travels intervals A_oA_n and $A_{ns}A_{os}$, i.e. the Space void of any Field. Nothing appears then. The material point **does not interact** with O. The material point doesn't even "exist" in the **Perceptible** Space of the Observer.

We observe that in the case under consideration, where distance OA_n is less than the distance OA_o , the "Space of Nothing" **encompasses** the "Space of Truth"* , i.e. the Strong Field. In the case that distance OA_n was greater than distance OA_o , then simply the "Space of Nothing" **would not exist and its place would be covered** by the "Space of Truth".

* Here, I would like to remind the reader of the **Yin Yang**, the known symbol of the Chinese Tao philosophy, , which the great **Niels Bohr** had selected as his emblem...

4th Case

The material point travels along the interval A_nPA_{ns} , i.e. it is located **within** the Strong Nuclear Field that is to say within the "Space of Truth".

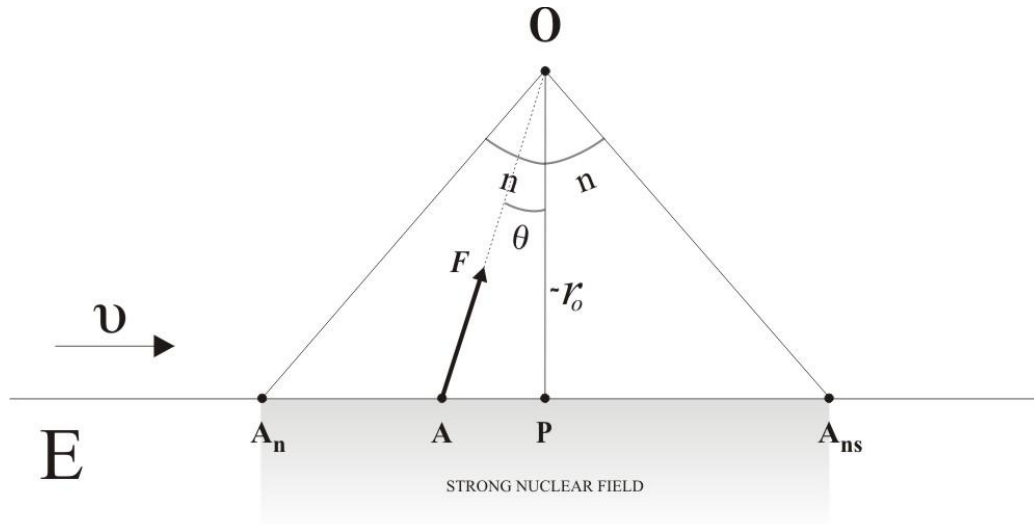


Figure 1.5.19

Here ($\theta \leq n$), position A **coincides** with its conjugate A' and thus $v_{ob} = v' = v$.

Henceforth, Newtonian Mechanics is in effect and consequently the "Physics of the Angels" apply (instantaneous transmission of information and interaction).

Here the force of Gravity F is central without deflection (Strong Nuclear).

I call Δt_{\min} the time it takes Light to travel the **minimal** measurable distance A_nO , and I emphasize that I refer to the minimal distance, measurable **via the Light**. This means

that time $\frac{A_nO}{c}$ is also the minimal measurable.

Then:

$$\Delta t_{\min} = \frac{A_nO}{c} = \frac{r_0}{c} \cdot \frac{1}{\cos n} \quad (1.5.57)$$

The time the particle needs to covers the **entire** area of the Strong Field is:

$$\Delta T = \frac{2 \cdot A_nP}{v} = \frac{2 \cdot r_0 \cdot \tan n}{v} \quad (1.5.58)$$

By sidewise division of (1.5.58) and (1.5.57) we get:

$$\frac{\Delta T}{\Delta t_{\min}} = \frac{2}{B} \cdot \sin n \quad (1.5.59)$$

Consequently, the necessary (but not sufficient) condition for time ΔT to be greater than Δt_{\min} is: $B < 2$.

Conclusion:

If the speed of the material point is greater than **twice** the speed of light, then the Strong Field is **not detectable**, no matter how close the material point passes from the pole of attraction O , as **the Strong Field is traversed practically instantaneously** ($\Delta T < \Delta t_{\min}$).

Within the Strong Field, the "Being" **coincides with its shadow**, "TO BE" coincides with "TO APPEAR", the way of Geometric Space, i.e. the way of intellect **coincides** with the way of Light, i.e. the way of Perception.

The **Angle of Light Deflection** ρ is either null or integer multiples of 2π .

In other words, the Light particle interacts "**face-to-face**".

This Field is the "Space of Truth".

This is precisely Plato's place of...*the kingdom of eternal forms of "the true Being"*. On one hand this kingdom in Phedro is called "*the over heavenly* (i.e. transcendental) *place*" whereas in the Republic, it is called "*the intellectual place*".*

5th Case

This, mathematically speaking, is the most difficult region.

The material point approaches the PF located before boundary position A_0 , traveling the interval $-\infty A_0$, i.e. it is located within the **repulsive electromagnetic Field** (Fig. 1.5.20).

* See Great Soviet Encyclopedia, Akademos Publ. S.A., Athens, 1982, Lemma: Plato.

Let us suppose that **now** the material point is located at position A approaching the PF with speed v , measured with the LASC. Its conjugate is A'' , because it is the first conjugate that we will meet going back to the past of A; this A'' moves **in opposite direction** to A, thus: $\frac{A''A}{A''O} = \frac{v}{c} = \beta$.

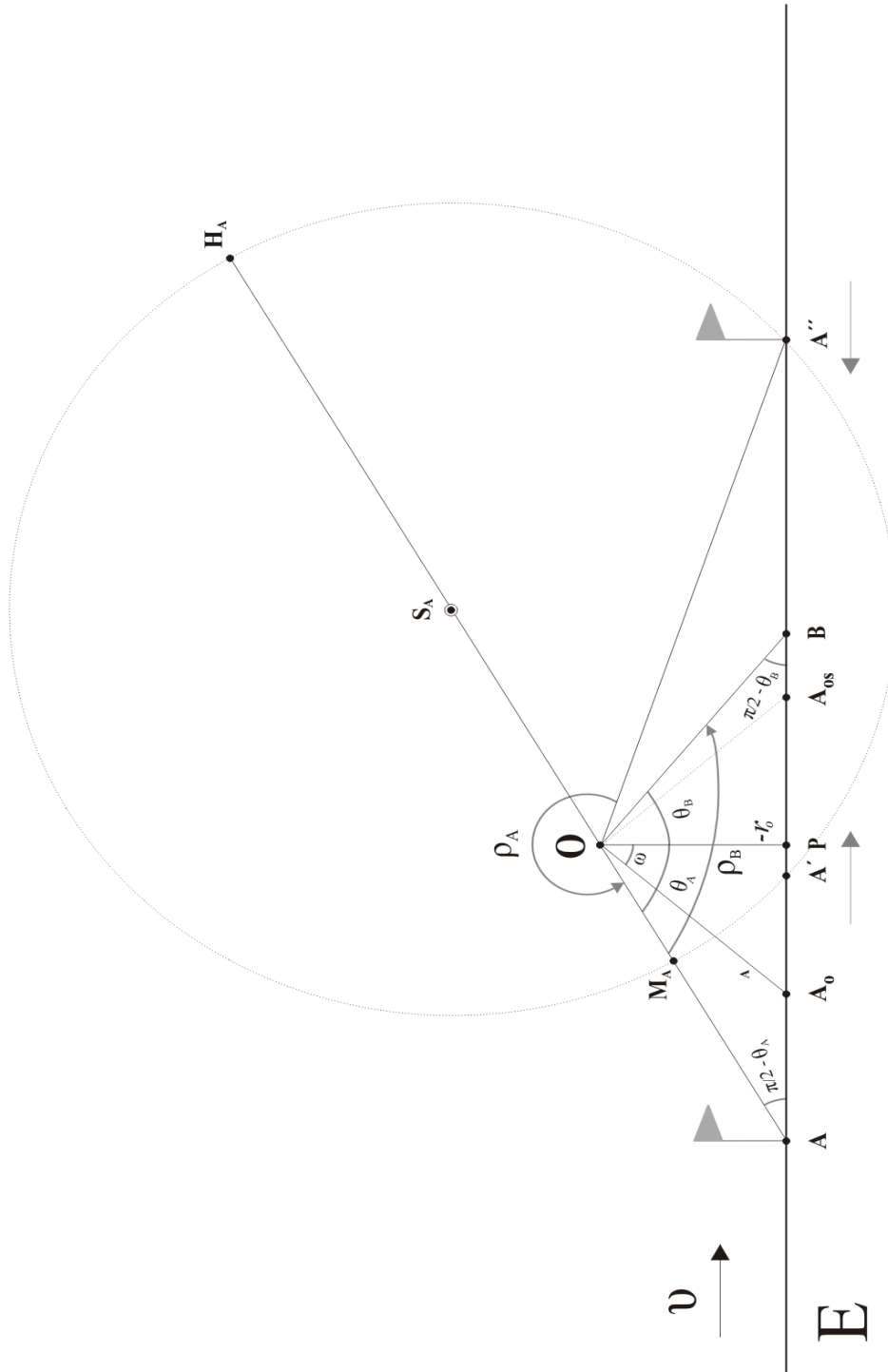


Figure 1.5.20

5.1 v_{ob} = Speed **measurable with the local clock between conjugate positions***

Suppose that we placed two flagged poles in position A and its conjugate position A'' and asked the Observer O to measure the average speed of the material point in this interval. Let A be the conjugate of B, i.e. it holds that: $\frac{AB}{AO} = B = \frac{v}{c} > 1$

To start with, I must **prove** that point B **exists**.

That is to say, I must prove that point B is **beyond** A_{os} , which is the **symmetrical** to A_o . Because if point B was located **within** the interval A_oPA_{os} , then "it wouldn't exist", as there exists no point inside the above interval that has a conjugate (with the exception, of course, of positions in the Strong Field, all of which **coincide with their conjugates**).

I imagine A approaching to the limit A_o .

I must prove that the interval $\frac{v}{c} \cdot AO$, that determines point B, is **greater than or equal to** the interval AA_{os} . At the **boundary**, I must prove that $\frac{v}{c} \cdot A_oO \geq A_oA_{os}$.

That is to say, for every $v > c$ it must be:

$$\frac{v}{c} \cdot \frac{r_0}{\cos \omega} \geq 2 \cdot r_0 \cdot \tan \omega \text{ or } \frac{r_0}{\cos^2 \omega} \geq 2 \cdot r_0 \cdot \tan \omega \text{ or } 1 \geq 2 \cdot \sin \omega \cdot \cos \omega = \sin 2\omega$$

which is true. Consequently, point B **exists** for every $v > c$.

The proof of the more general case, i.e. that $\frac{v}{c} \cdot AO \geq AA_{os}$, for every position A of the interval under examination, is left to the reader.

Given that, when the material point is at A, the Observer sees it at A'' and when the material point is at B, the Observer sees it at A, it follows that speed v_{ob} we seek is:

* Henceforth, whenever in the symbolism of intervals I write e.g. (A''A), I shall imply the **signed** value of the interval A''A. Alternatively, with $|A''A|$ or A''A, I shall imply the **absolute** value of the same interval.

$$U_{ob} = \frac{(A''A)}{T_{ob}} = \frac{(A''A)}{(AB)} \cdot U = -\frac{|A''A|}{|AB|} \cdot U \quad (1.5.60)$$

The negative sign implies that the conjugate under observation moves **in the opposite direction** of position A.

Angles below are considered as absolute values only.

In triangle OAA'', by the application of the sine theorem, we get:

$$\frac{|A''A|}{\sin(2\pi - \rho_A)} = \frac{|A''O|}{\sin(2\pi - \theta_A)} \quad (1.5.61)$$

Therefore:

$$\sin \rho_A = -B \cdot \cos \theta_A \quad (1.5.62)$$

We also observe, that the angle ρ_A lies within the interval

$$\pi \leq \rho_A \leq \frac{3\pi}{2} \quad (1.5.63)$$

Consequently, both the sine and the cosine of the angle ρ_A are also **negative**.

Also by the application of the sine theorem in the triangle OAB we get:

$$\sin \rho_B = B \cdot \cos \theta_B \quad (1.5.64)$$

Additionally, from triangles OAA'' and OAB that have equal altitudes and a common base carrier we get:

$$\frac{|A''A|}{|AB|} = \frac{|OA''| \cdot |\sin \rho_A|}{|OB| \cdot \sin \rho_B} = \frac{|OA''| \cdot \cos \theta_A}{r_0} = \frac{\cos \theta_A}{\cos(\rho_A + \theta_A)} = \frac{1}{\cos \rho_A + B \cdot \sin \theta_A}$$

$$\text{for } \cos \theta_A \neq 0 \quad (1.5.65)$$

Where $\sin \rho_A = -B \cdot \cos \theta_A$ και $\cos \rho_A = -\sqrt{1 - B^2 \cdot \cos^2 \theta_A}$.

Therefore, U_{ob} becomes:

$$U_{ob} = - \frac{U}{-\sqrt{1 - B^2 \cdot \cos^2 \theta_A} + B \cdot \sin \theta_A} \quad (1.5.66)$$

Thus, as **for each value of** $B > 1$ **and for each value of** θ_A **of the interval under examination, the denominator is always positive,*** it follows that U_{ob} it is always **negative.**

Fundamental Remark

While in the calculation of U_{ob} at **subluminal** speeds, the sign of the factor outside the **radical** ($\pm b \cdot \sin \theta_A$) changed at either side of the Foot of the Perpendicular, in the case of **superluminal** speeds it is the sign of the **radical** ($\pm \sqrt{1 - B^2 \cdot \cos^2 \theta_A}$) that changes. This observation has **fundamentally related** to the "Mysteries" of Quantum Physics as well as to the complex numbers that enter into the description of Quantum Mechanics (probability amplitudes).

More specifically, the expressions $P_i = \pm \sqrt{1 - B^2 \cdot \cos^2 \theta} \pm B \cdot \sin \theta$, **correspond to the probability amplitudes**, whereas their squares P_i^2 , **to the probabilities of Quantum Mechanics.**

This is eventually no Mystery because:

Based on the Law of the inverse square, **as this was modified by the theory of Harmonicity**, forces are functions of the **square of the distances of the conjugate positions** from O and **not** of the squares of the distances of the positions.

* *The proof of why this is true, is left to the reader.*

However, the distances of the conjugate positions are of the form:

$$OA' \cdot OA'' = \frac{OA}{P_i} \quad (\text{See next chapter}).$$

The **intensities** of the fields are inversely proportional of the squares of OA' or OA'' , i.e. proportional to $(P_i)^2$. Hence, logically, the probabilities are proportional to the squares of the probability amplitudes. In conclusion, for all of the above, the law of the inverse square is accountable.

However, the deeper comprehension of how Nature works requires the modification of the above law; this modification is introduced by the Theory of the Harmonicity of the Field of Light, where, for the first time, **the "forces" are related to the conjugate positions**, as a consequence of its first fundamental hypothesis.

I ask the question:

When would the speed of the material point, measured with the local clock (the clock of Humans), **equal in magnitude** the speed of the material point measured with the LASC (the clock of "Angels")?

In other words, when would $|v_{ob}| = v$?

$$\text{Obviously, it must be: } -\sqrt{1 - B^2 \cdot \cos^2 \theta_A} + B \cdot \sin \theta_A = 1 \quad (1.5.67)$$

The above equation is satisfied for angle θ_e , where:

$$\sin \theta_e = \frac{B}{2} \quad (1.5.68)$$

As, however, on account of (1.5.67), the quantity $1 - B \cdot \sin \theta_e$ should be negative or zero, we conclude that: $B \cdot \sin \theta_e \geq 1$ or $B \geq \sqrt{2}$

Consequently, there exists an angle θ_e that satisfies our requirement when:

$$2 \geq B \geq \sqrt{2} \quad (1.5.69)$$

Therefore:

a. When $B > \sqrt{2}$, no position exists **within the Weak Field** as well as within the **attractive electromagnetic field** such that $v_{ob} = v$.

b. When $B < \sqrt{2}$, no position exists **within the repulsive electromagnetic field** such that $|v_{ob}| = v$.

Moreover, the following sentence is valid:

Within the repulsive electromagnetic Field, where the conjugates move in opposite directions, speed v_{ob} is **always superluminal**.*

5.2 $v'' =$ Instantaneous speed of the conjugate position defined as $\frac{dx''}{dt}$

I set P as the origin of the coordinates. Absolute values of the angles are taken.

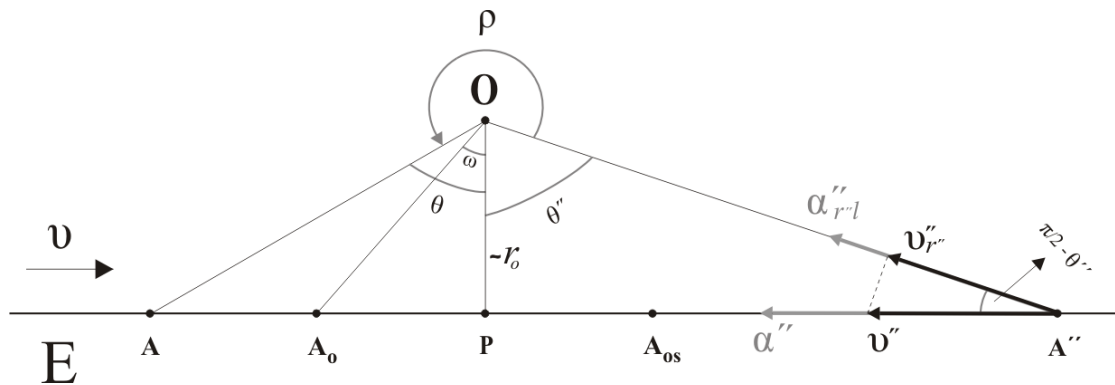


Figure 1.5.21

If X is the abscissa of A, then:

$$X = -r_0 \cdot \tan \theta \quad \Rightarrow \quad \frac{d\theta}{dt} = -\frac{v}{r_0} \cdot \cos^2 \theta \quad (1.5.70)$$

* The proof of this sentence is also left to the reader.

Let us remember the corresponding proposal, which is true for the attractive electromagnetic Field where the conjugates move in the same direction. There, speed v_{ob} is **always subluminal**.

If X'' is the abscissa of A'' , then: $X'' = r_0 \cdot \tan \theta''$, but $\theta'' = 2\pi - (\rho + \theta)$.

Therefore, $\tan \theta'' = -\tan(\rho + \theta)$ or $X'' = -r_0 \cdot \tan(\rho + \theta)$

Therefore, the sought speed is:

$$v'' = \frac{dx''}{dt} = -\frac{r_0}{\cos^2(\rho + \theta)} \cdot \frac{d(\rho + \theta)}{dt} \quad (1.5.71)$$

$$\text{But } \sin \rho = -B \cdot \cos \theta \Rightarrow d\rho = \frac{B \cdot \sin \theta}{\cos \rho} \cdot d\theta \quad (1.5.72)$$

Therefore, (1.5.71), taking into consideration (1.5.70) and (1.5.72) becomes:

$$v'' = \frac{v}{\cos \rho \cdot (\cos \rho + B \cdot \sin \theta)} \quad (1.5.73)$$

where $\cos \rho = -\sqrt{1 - B^2 \cdot \cos^2 \theta}$. Also, (1.5.73) is written as:

$$v'' = \frac{v}{1 - B^2 \cdot \cos^2 \theta - B \cdot \sqrt{1 - \cos^2 \theta} \cdot \sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.74)$$

Finally, by taking (1.5.66) into consideration, we get:

$$v'' = \frac{v_{ob}}{\sqrt{1 - B^2 \cdot \cos^2 \theta}} \quad (1.5.75)$$

Speed v'' results **negative** due to the fact that conjugate position A'' moves in the **opposite direction** to position A ($v_{ob} < 0$).

I now ask the question: When does v'' **equal in magnitude** v ?

Obviously, the denominator of equation (1.5.74) must equal minus one.

This is true when:

$$\cos^2 \theta = \frac{B^2 - 4}{B^2 \cdot (B^2 - 3)} \quad (1.5.76)$$

As $\cos \theta$, which constitutes a solution of the above, is less than $\cos \omega$, i.e. as $\theta > \omega$, the above solution leads to an acceptable position A. However, (1.5.76) **makes sense** only when $B \geq 2$.

Conclusion:

For $B < 2$, **no position exists** within the repulsive electromagnetic Field (where the conjugates move in opposite direction), where the instantaneous speed of conjugate position v'' **equals in magnitude** the speed of position v .

5.3 $a'' =$ **Instantaneous orbital acceleration of the conjugate position defined as** $\frac{dv''}{dt}$

I substitute $y = \sin \theta$ and $z = \cos \rho = -\sqrt{1 - B^2 \cdot \cos^2 \theta}$.

Thus, (1.5.73) is written as:

$$v'' = \frac{v}{z^2 + B \cdot y \cdot z} \quad (1.5.77)$$

Therefore:

$$a'' = \frac{dv''}{dt} = -\frac{v}{(z^2 + B \cdot y \cdot z)^2} \cdot \left[2 \cdot z \cdot \frac{dz}{dt} + B \cdot y \cdot \frac{dz}{dt} + B \cdot z \cdot \frac{dy}{dt} \right] \quad (1.5.78)$$

$$\text{But: } \frac{dy}{dt} = -\frac{v}{r_0} \cdot \cos^3 \theta \quad (1.5.79)$$

$$\text{and } \frac{dz}{dt} = -\frac{B^2 \cdot v}{r_0} \cdot \frac{y}{z} \cdot \cos^3 \theta \quad (1.5.80)$$

Thus, by replacing (1.5.79) and (1.5.80) in (1.5.78), we have after several easy calculations:

$$a'' = \frac{dv''}{dt} = -\frac{c^2}{r_0} \cdot \frac{B^3 \cdot \cos^3 \theta}{(1 - B^2 \cdot \cos^2 \theta)^{3/2}} = -\frac{c^2}{r_0} \cdot \tan^3 \rho \quad (1.5.81)$$

Because $\tan \rho > 0$, it follows that $a'' < 0$, i.e. the acceleration of the conjugate position has the direction shown in the figure, meaning that when A **approaches** the Foot of the Perpendicular, **the magnitude** of speed v'' **increases** in absolute value.

The elegance of equation (1.5.81) and the stability of its form in all the examined cases (subluminal, "luminal", superluminal speeds - approaching or moving away phase) **are indeed astonishing!**

5.4. v''_r = **Instantaneous radial speed of conjugate position, defined as the projection of the instantaneous speed of the conjugate position v'' on the moving ray of the conjugate position OA''**

From Fig. 1.5.21 we have:

$$v''_r = v'' \cdot \cos\left(\frac{\pi}{2} - \theta''\right) = v'' \sin \theta'' \quad (1.5.82)$$

But $\sin \theta'' = -\sin(\rho + \theta)$.

Thus, after a series of simple mathematical operations, we are lead to:

$$v''_r = \frac{v'' - v}{B} \quad (1.5.83)$$

5.5 $a''_{r''l}$ = Instantaneous radial acceleration of the conjugate position defined as $\frac{dv''_{r''}}{dt}$

From (1.5.83) we have: $a''_{r''l} = \frac{dv''_{r''}}{dt} = \frac{a''}{B}$. Therefore:

$$a''_{r''l} = -\frac{c^2}{r_0} \cdot \frac{1}{B} \cdot \tan^3 \rho \quad (1.5.84)$$

5.6 DYNAMICS

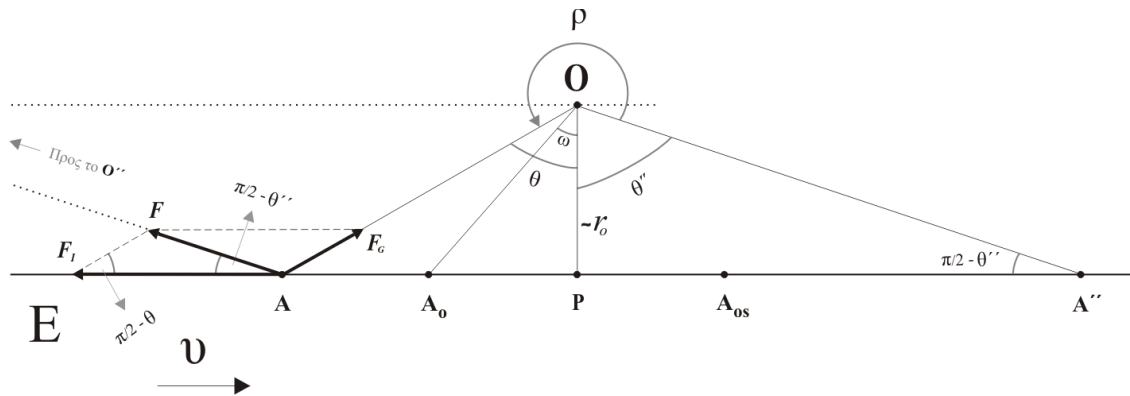


Figure 1.5.22

The force of Gravity F (repulsive electromagnetic) originating from the conjugate O'' of O , acts on particle A (Fig. 1.5.22). This is located at the intersection of the parallel to the E , drawn from O and the parallel to OA'' , drawn from A . This force is broken down to F_I and F_G , as these were defined earlier.

As the triangle of the forces is similar to triangle OAA'' , we get:

$$\frac{F}{\sin\left(\frac{\pi}{2} - \theta\right)} = \frac{F_G}{\sin\left(\frac{\pi}{2} - \theta''\right)} = \frac{F_I}{\sin(2\pi - \rho)} \quad (1.5.85)$$

Consequently, we end-up with the following equations:

$$F_I = \frac{U}{C} \cdot F \quad (1.5.86)$$

$$F_G = \frac{U}{|U_{ob}|} \cdot F \quad (1.5.87)$$

In all the examined cases, the stability of the ratios of forces to the ratios of speeds is henceforth the rule.

5.7 Mathematical «Irregularities»

I ask the question:

When does the radial acceleration $a''_{r''l}$ constitute the **right projection** of the orbital acceleration a'' on the moving ray of the conjugate position?

For this to happen, it is **necessary and sufficient** that: $a''_{r''l} = a'' \cdot \sin \theta''$.

But $a''_{r''l} = \frac{1}{B} \cdot a''$, and therefore it is necessary and sufficient that: $\sin \theta'' = \frac{1}{B}$ (1.5.88)

Solving equation 1.5.88, we obtain:

$$\cos \theta = \frac{1}{B} = \cos \omega \quad (1.5.89)$$

In other words, our requirement is satisfied when the material point A is located at the boundary A_0 and consequently A'' is located at the dual point $A'_0 \equiv A''_0$ that constitutes also the **point of contact** of the boundary (tangential) Apollonian circumference.

However, this **boundary position** A_0 is in fact an "irregular" point and this because the magnitudes U'' , U''_r , a'' and $a''_{r''l}$ **become infinite**.

The explanation I gave in paragraph 2.7 is also valid here.

The above magnitudes **are not** quantum magnitudes. The **only** quantum magnitude is U_{ob} which in this case becomes:

$$U_{ob} = - \frac{U}{\sqrt{\frac{U^2}{C^2} - 1}} \quad (1.5.90)$$

Conclusion:

From the Physical point of view, the only thing certain is this:

At the exact limit of the **repulsive** electromagnetic Field, with the conjugates moving in opposite direction, i.e. where the Space Void of Any Field starts (or the Space of the **Strong Field** starts in the case of $OA_n > OA_o$), the manifested accelerations and, accordingly, the manifested "forces" **are enormous**.

Finally, the above conclusion **is in total agreement** with the experimentally observed "boomerangs", by Rutherford and his associates Geiger and Marsden, which led, eventually, to the synthesis of the nuclear model of matter and to the birth of modern Nuclear Physics.

CHAPTER 6

THE COEXISTENCE OF THE CONJUGATE POSITIONS (STATES) OF THE MATERIAL POINT - THE QUANTUM MECHANICS APPROACH TO THE UNIFIED FIELD OF LIGHT

“Let us try to comprehend things that are comprehensible; let us safeguard the incomprehensible ones with calm awe”.

Johann Wolfgang Goethe

“On the other hand, I can say with enough safety that no one understands Quantum Mechanics”.

Richard Feynman

Paul Dirac, the leading British physicist, maintained that beauty divulges truth. Einstein, also, claimed that the beauty of his mathematical models bolstered the truth of his Theories.

Certainly, the previous Chapter on the **Unification of the four Interactions in Nature and their reduction to a single one, Gravity, whose nature albeit is still unknown**, contains enough Geometrical "beauty" stemming exclusively from the research of the Ancient Greeks Geometers, amongst who, **Apollonius of Perga** (260 - 200 BC) stands out, as the truest advocate of the Synthetic Spirit.

I wonder, however:

Can Physical Truth be “conceived” solely on the basis of Mathematical Beauty?

And in any case, assuming that Mathematical Beauty divulges Mathematical Truth, how can I be sure that Mathematical Truth **will lead me eventually to the Physical Truth**, if by "Physical Truth" I define **what I sense and what I measure** and not what I imagine or approach with mathematical insight?

However, notwithstanding the fact that the above questions urgently require a persuasive answer, I feel compelled, as a self-appointed "trustee" of Aristotelian Logic, to become my own devil's advocate, with regards to certain logical issues that I left "floating in the air" already from the previous chapter.

More specifically:

Whereas I claimed that the distance A_nO is the smallest **measurable** distance and, consequently, light travels **this and any other mathematically smaller distance instantaneously** (hence, the position coincides with its conjugate, thereby defining the boundaries of the Strong Nuclear Field), **within** those very same boundaries I accepted conjugate positions **that do not coincide** with the (corresponding) positions which I called "potentially conjugate positions", shamelessly utilizing an Aristotelian term while, by this acceptance, I was brutally offending Aristotelian Logic.*

I am therefore afraid that, "potentially conjugate positions", mathematically acceptable as they might be, are definitely not acceptable from a **Physical** point of view.

In other words, **under no circumstances** can the term I used make-up for the Logical "fault" that I created.

Such an **unacceptable, from a Physical point of view**, conjugate position is A'_2 in Fig. 1.5.12 as it is located **within** the Strong Field. Thus, with regards to this, figure 1.5.12 is **wrong from a Physical point of view**.

Of course, we could immediately correct that, if we were to narrow the boundaries of the Strong Field so that A'_2 falls **outside its bounds**. Notably, the boundaries of the Strong Nuclear Field are not restricted by the way of drawing figure 1.5.12, as they were freely selected.

Thus, **within** the measurable Strong Field, not only must the positions coincide with their conjugates, but also the **true** conjugate positions must coincide with the positions, on account of the fact that, as light returns to O instantaneously, the "potentially conjugate position" **has no time** to become conjugate, thus **remaining** a position.**

* I applied, in other words, the known trick of certain Middle age monks, who, in times of fasting, desperate to enjoy every now and then some meat, used to "baptize" it as fish.

** Here some might consider that I have been influenced by Zeno (Arrow paradox). Who knows, maybe they are right. I, for one, have no reason whatsoever to hide it...

Summarizing:

Within the Strong Nuclear Field not only does "WHAT IS" coincide with "WHAT APPEARS" but, conversely, "WHAT APPEARS" must also coincide with "WHAT IS".

Based, therefore, on all the aforementioned, it seems that I ought to develop a more "refined" and certainly a more "Physical" approach/description of the Unified Field, whose **fundamental** mechanism - operation I described in the previous chapter.

As with regards to the methodology, Richard Feynman, the Great American Physicist, considered that the "Babylonian" (empirical) approach to the Cosmos is always better than the "Aesthetic" (insightful) ancient Greek method. I however, regardless of my deepest respect for R. Feynman, I intend to side, on this one, with both Dirac and Einstein and thus continue to apply the Greek method.

This does not imply that I will thoughtlessly dismiss the "Babylonian evidence"; what it does imply is that foremost, whenever possible, **I will endeavor to comprehend them within the strict framework of Logic**; if that fails, without rejecting them, I will mark them down with awe as "incomprehensible".

I ought to be excused, however, for not accepting that simply the accumulation of a pile of "Babylonian evidence" **could eventually, on its own, lead us to fundamental comprehension.**

So let us start.

In Chapter One of the subliminal speeds, while defining the concept of the conjugate position, I proved that, **in the Euclidean Space**, the two overlapping point series of positions / conjugate positions are associated **one-to-one** for a given measure of speed U and a given direction of motion of the material point on straight line E.

In other words, **one and only one conjugate position** corresponds to a single position, **and vice versa**. This is true because, if we travel to the past, i.e. if we move in opposite direction to the direction of motion, for each position A we shall encounter **one and only one** conjugate position A' (or A''), satisfying the relation:

$$\frac{A'A}{A'O} = \frac{v}{c} \quad \text{or the relation} \quad \frac{A''A}{A''O} = \frac{v}{c} \quad (\text{opposite direction}).$$

Similarly, if we move to the future, i.e. if we move in the same direction as that of the material point's motion, for each conjugate position A' we shall encounter **one and only one** position A (or A₁), satisfying the relation:

$$\frac{A'A}{A'O} = \frac{v}{c} \quad \text{or the relation} \quad \frac{A'A_1}{A'O} = \frac{v}{c} \quad (\text{opposite direction}).$$

All of the above are of course true, **only** in the Euclidean Space.

In Projective Space, this is all overturned due to the fact that "infinity" is no longer considered a boundary, as the Projective Straight line is in fact a **closed line**. Thus:

Now, in **subluminal** speeds, starting from a given position A and moving to the past, we shall meet the first conjugate position A' (or A') and, **after passing first from the point at infinity of straight line E**, we will also meet the second conjugate position A'' (or A''), before we finally return to position A.

In contrast, in **superluminal** speeds, starting from the given position A and moving to the past, **two** things can happen:

1. Either we reach the point at infinity of projective line E without passing **any** conjugate position and, after passing this point at infinity, we meet **both** conjugate positions prior to returning to position A (approach phase to the PF)
2. Or, we **meet both** conjugate positions **before** we reach the point at infinity of straight line E, pass it, and then return to position A (moving-away phase from the PF).

Of course, the above take place because, as we've established in the previous Chapter, the following Projective Proposal applies:

In the case of subluminal speeds, the pair (A,∞) **separates** the pair of conjugate positions (A', A'') whereas, in contrast, at superluminal speeds **it does not separate it**.

Thus, things start to get complicated and, more obviously at superluminal speeds, we are faced with the dilemma **of which** conjugate position (corresponding to a given position) **to select**, for a given magnitude of speed v and a given direction of movement.

This serious dilemma becomes clearly visible, while examining the case of **moving away** from the Foot of the Perpendicular with **superluminal** speed v , measured with the LASC.

Let the material point be at position A, moving away from P with speed $v > c$.

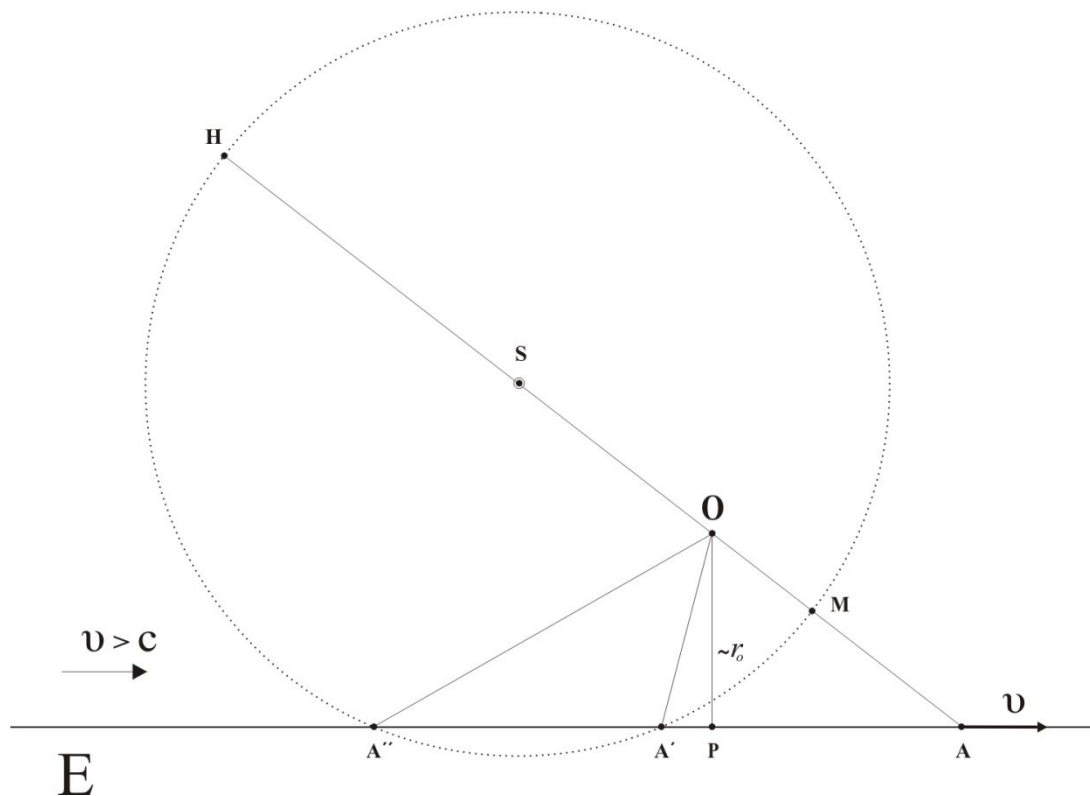


Figure 1.6.1

By applying the Apollonian Circumference method, we locate conjugate positions A' and A'' , **both of which** are acceptable.

Indeed, when the material point was at A'' , it emitted a light signal which **reaches** O when the material point is at A, as it holds that:

$$\frac{A''A}{A''O} = \frac{v}{c} \tag{1.6.1}$$

Similarly, when the material point was at A' , it emitted a light signal **reaching** O when the material point is at A , as it holds that:

$$\frac{A'A}{A'O} = \frac{v}{c} \quad (1.6.2)$$

F u n d a m e n t a l C o n c l u s i o n :

It is indeed possible, for the material point to appear simultaneously at two distinct and separate positions!!

As a result of the aforementioned conclusion, I am forced to accept that the one-to-one relationship between position and conjugate position, valid in the Euclidean Space, is invalidated in the Projective Space.

Thus I am led to the following **general** proposition:

**In the Projective Space, the two conjugate positions
of the material point exist simultaneously.**

The coexistence of the two conjugate positions of the material point also entails the coexistence of its **different states** as each conjugate position has different kinematic (v_{ob} , v' , $v'_{r'}$, a' , $a'_{r'}$ etc.) and dynamic (F , F_I , F_G) magnitudes.

Precisely, this coexistence of the different states probably provides an interpretation of the Quantum Mechanics Mysteries, like the Schrödinger's cat paradox, which, poor cat, is considered to be, **simultaneously**, at two different states (live and dead) and for which more tons of ink rather than teardrops have been poured...

Here, therefore, I ought to point-out the difference between the description given in this Chapter (Quantum Mechanics) and the description in the previous one (Classical).

In the previous Chapter, I **correlated the two conjugate positions A' and A''** that the Apollonian circumference yields as solutions, **with the two opposite directions of motion*** that are defined on the Projective Straight line.

* *Eighth founding axiom of the Projective Space. See Introduction.*

This correlation is arbitrary. It was imposed by the inherent need of the human mind to arrange things chronologically*.

Let me now renounce the chronological arrangement.

Both solutions A' and A'' are acceptable, as neither one is **privileged** from a "physical" point of view.

This "liberation from the bonds" of the chronological order is **absolutely essential** for the interpretation of **both types** of Quantum World Mysteries, as distinguished by the Oxford Physicist and Mathematician, Roger Penrose:

The - **Z** mysteries, such as the phenomena stemming from the Einstein-Podolsky-Rosen paradox, and the - **X** mysteries, such as Schrödinger's cat.⁴⁸

Both types of Mysteries can now be precisely interpreted by this simultaneous existence of the two solutions provided by the Apollonian Circumference.

In my opinion, there exists only **one single** Mystery:

LIGHT!^{**}

** This correlation is carried out if we **arbitrarily** consider as the conjugate of a given position A, for a given direction of motion, that conjugate position that we shall meet **first** moving to the past of the position. This correlation **is by no means arbitrary** if I examine the Euclidean Space and subluminal speeds. (See Chapter 1). Then **I am obliged** to consider as conjugate **the one and only** position lying to the past of the position. Thus, the "reasoning" of the Euclidean Space and subluminal speeds, when brought over in the Projective Space and superluminal speeds, creates arbitrariness.*

Now, therefore, I can understand the source of this arbitrariness:

*It stems from the Mind's endeavor "to arrange" in a **chronological** order events that for centuries now has been trained to incorporate in a Euclidean Space. In our case, this "arrangement" took place when I subconsciously considered as a conjugate position the one located **temporally nearest** to the position. Moreover, this **temporally nearest** in subluminal speeds originated from my "fear" of infinity. However, it might just be possible that Nature itself is not "afraid" of infinity...*

⁴⁸ Roger Penrose, "The Shadows of the Mind", © Roger Penrose, 1994.

** * I begin to suspect that Light includes something divine. Perhaps Light is Itself the Creator. Or at least it is the form He takes in our world. Indeed, I will note also the following "coincidence": The word God (Greek. Θεός) is etymologically derived from the ancient Greek (Homeric) verb **θέω**, meaning to hurry, to run, to rush (from which also the Greek. Θων = the jackal). The Light, on the other hand, is **the World's only true** component constantly in motion. In other words, no "motionless" Light exists at any system of reference! In a different etymology, the verb **θέω** means to shine, as in the lightning bolt!!...*

Summarizing:

In the Projective Space, the one-to-one correspondence between position and conjugate position, which we've considered up until now for a given magnitude of speed v and a given direction of motion, ceases to exist. Thus, in the **Projective Space**, to a position A and a given magnitude of speed v , correspond **two conjugate positions** A' and A'' . Furthermore, to a conjugate position A' correspond two positions A and A_1 , which are **symmetrical** to each other with respect to A' .

The Mathematical (Geometrical) description, therefore, appears as **time-independent**, i.e. as not recognizing the direction of motion. Let us observe that the two solutions provided by the Apollonian Circumference for a given position A as well as a given **magnitude of speed v are independent** of the direction of motion of the material point on the straight line. In fact, **their spatial arrangement** in relation to the pair (A, ∞) is different when $\frac{v}{c} < 1$ than when $\frac{v}{c} > 1$.

I am thus led to formulate the proposal, which I designate:

FIRST QUANTUM MECHANICS PROPOSITION

In the Projective Space, the two conjugate positions of the material point yielded as solutions by the Apollonian circumference, co-exist (simultaneously) as its “shadows” i.e. its past positions. (Platonic perception of the World, “*Republic*” book VII).

Things here begin to get complicated.

The strict language and precision we used, until now, to describe the phenomena and the Unified Field where, even though we were working in the Projective Space, we had established a one-to-one correspondence between a position and its conjugate, starts to get diluted. The two, **thus far distinct**, conjugate positions begin to get **entangled**.

We've come face-to-face with **the very foundations** of the Quantum World Mysteries.

However, despite the fact that things may appear more complicated, they also begin to unclutter; and this because, by now it is clearly shown that the Platonic concept of the “*Shadows of WHAT IS*”, lies at the base of the (revised by the Theory of Harmonicity) Relativistic Description as well as the Quantum Mechanics Description.

Owing to this idea of Plato, we have managed to avoid, with the Theory of Harmonicity, the contradictions and errors of the Theory of Special Relativity and, by formulating our first Fundamental Hypothesis (partly due to the Theory of Special Relativity which, in turn, is partly due to Lorenz's Electrodynamics), we've caught ourselves, practically without realizing it, treading at the foundations of Quantum Mechanics.

And all this great adventure started with just a fainthearted, tiny little step:

I am referring to the step we decided to take **just a bit outside** straight line E which, instantly, transformed us from RoT Observers to Observers at a distance (real life), transforming thus the Relativistic Description into a Quantum Mechanics Description. **This precise, tiny step, led us eventually to the Apollonian Circumference which constitutes the key to the New Physics.**

We can now make steady progress towards the unification of the two main and mostly incompatible 20th century Physics Theories. The Theory of the Harmonicity of the Field of Light would not be worthy of its name, if nothing else, if it did not try to achieve a "harmonic compromise" of these two "clashing" interpretations of the Cosmos.*

Einstein, while criticizing the orthodox Quantum Mechanics interpretation provided by the School of Copenhagen probabilistic description, which stems from the above entangled states of the "WHAT IS", expressed the famous position that: *"God does not play dice with the World"*. That triggered the leading Danish Physicist Niels Bohr who in a slightly reproachful and ironic tone warned Einstein: *"Do not tell God what to do"***.

I don't know what God does.

What I do know, however, is that Man, while practicing the science of Physics and in particular experimental Physics, i.e. when he **observes and measures** the Cosmos, is not (usually) drunk. Thus, while experimenting, he **doesn't see things in double!**

* I hereby remind the reader of the definition of Harmony: *"Ἔστι οὖν Ἀρμονία πολυμιγέων ἐνωσις καὶ δίχα φρονούντων συμφρόνησις"* (Harmony is the union of multiple composites and the compromise of opposites).

** *Fifth Solvay Congress, 1927. Some writers do not believe that the Einstein-Bohr dialog, during this conflict, was so abrupt and nasty. Daniel Styer, quoting Bohr, says: "Bohr answered by pointing out the deep circumspection, recommended by the ancient thinkers, with which the spoken language must be used when predicates are attributed to the Divine Providence". (Daniel Styer, "The Strange World of Quantum Mechanics", 2000; 1st Edition, Cambridge University Press.)*

Austrian Physicist Paul Ehrenfest (1880 - 1933), Einstein's and Bohr's mutual friend, an exceptionally honest scientist and follower of consistency who lived the drama of Physics during the birth of Quantum Mechanics, experienced this conflict between his Titan friends. His tragic end (suicide) has as its main cause this intense conflict of the sovereign perceptions about the Cosmos.

It has been proven experimentally that, **when we look in (measure)** Schrödinger's box, we will find the cat either alive or dead; hence, the entangled states of "WHAT IS" are thereby untangled.

Behold, another Mystery!

It is as if, in some magic way, Nature selects which of the two entangled states of "WHAT IS" will present to us, **when we decide to look at it!!!**

Nobody, so far, has understood what really happens.*

If, however, one wishes to further enjoy these "Mysteries", which become all the more impressive in the famous two slit (or hole) experiment and others, such as the Mach-Zehnder interferometer, I refer the reader to Richard Feynman's^{49,50} and Roger Penrose's^{51,52,53} books.

However, based on the Theory of the Harmonicity, we can comprehend henceforth **the first leg** of the Mysteries, i.e. **the entangled states of "WHAT IS"**. They are due to:

1. The **first fundamental hypothesis** of the Theory of Harmonicity of the Field of Light, as a consequence of which, the conjugate of a given position A must satisfy the equation $\frac{A'A}{A'O} = \frac{v}{c}$; a fact leading to the discovery of the solution via the Apollonian Circumference, which in general intersects straight line E **at two positions (solutions)**.
2. The fact that the Geometrical Space is Projective.

The combination of the aforementioned two reasons constitutes the simplest possible interpretation of the superposed (entangled) states of "WHAT IS".

* "On the other hand, I can say with enough safety that no one understands *Quantum Mechanics*". Richard Feynman, "The Character of Physical Law", © 1967, Richard Feynman, 2nd Edition, MIT Press)

⁴⁹ Richard Feynman op cit., Chapter 6 (Probability and uncertainty. The Quantum Mechanics View of the Nature. p. 109 – 127, in Greek).

⁵⁰ Richard Feynman, "QED", 1985, Princeton University Press, Princeton, New Jersey.

⁵¹ Roger Penrose, "The Emperor's New Mind", © Oxford University Press.

⁵² Roger Penrose, "The Shadows of the Mind", © Roger Penrose 1994.

⁵³ Roger Penrose, "The Big, the Small and the Human Mind". Cambridge University Press, 1997.

There has never been and, perhaps, neither will there ever be a simpler interpretation, as this one is based solely on **fundamental (archetypal)** concepts.

However, the second leg of the Mysteries, i.e. the fact that when **we take a look** in order to establish (or measure) the **true state** of "WHAT IS", this manifests itself in **only one** of the two entangled states, currently escapes comprehension.

Modern Physics called this procedure **Reduction of the state vector** or alternatively **collapse of (Schrödinger's) wave function**. This is where we shall focus our attention while pursuing our objective, which is none other than to describe, as "Physically" as it is possible, the Unified Field of Light.

Both Plato and Paul the Apostle, with their concepts of the "shadows" of beings and the "looking glass" vision respectively, assisted us considerably in our efforts to comprehend the first leg of the Mysteries.

What about the second leg however?

Here, fortunately, Aristotle comes to rescue.

What did the wise man from Stagira believe?

*"Aristotle immersed himself in almost all sectors of knowledge that were accessible in his time. In his **First Philosophy (the Metaphysics)** he reprimands Plato's theory of ideas and offers a solution to the ontological problem of the relation between the "Universal" (καθόλου) and the "Particular" (καθ' ἕκαστον).*

"Particular" is what only exists "somewhere" and "now" and is perceptible through the senses. "Universal", on the other hand, is what exists "everywhere" and "always" and, under certain circumstances, appears in the "Particular" and thus becomes known. The "Universal" is the subject of scientific knowledge and is obtained intellectually".⁵⁴

Aristotle hit the bull's eye.

Twenty-four centuries ago, he had **already** grasped what modern Quantum Mechanics calls "reduction of the state vector", or "collapse of the wave function":

The transition from the "Universal" (καθόλου) to the "Particular" (καθ' ἕκαστον).

⁵⁴ Great Soviet Encyclopedia, Akademos Publ. S.A., Athens, 1978, Lemma: Aristotle.

The great Philosopher and Founder of the Human Physical Science* had **already** pinpointed the crucial processing by the **senses** that is required for such a transition. He had **already**, in a wider sense, approached the Uncertainty Principle, by claiming that the “*Universal*” (*καθόλου*) **can be isolated neither spatially nor temporally!**

Let us therefore bow twice before the greatness of the Ancient Greek Thought and, specifically, before Aristotle's genius.

What already was so elegantly approached by Aristotle’s insightful Thought, has turned out to be the incomprehensible stumbling block in 20th century Physics Labs!

And I use the term incomprehensible, invoking the honest acknowledgement by a famous scientist such as Richard Feynman, a truly Great Researcher** who, in front of a wide audience in one of his lectures on the experimental Mysteries of Quantum Mechanics, did not hesitate to admit:

“Why are you going to sit here all this time, when you won't be able to understand what I am going to say? It is my task to convince you not to turn away because you don't understand it. You see, my physics students don't understand it either. That is because I don't understand it. Nobody does!”⁵⁵

And the leading Physics Master elsewhere continues:

“I will tell you how nature behaves. If you simply accept that perhaps it is true that it behaves like that, you will realize that it is something full of charm and magic. So stop wondering, if you can avoid it, "but how can it be like that" because "you will be trapped" and find yourself up a blind-alley, from which none has escaped yet. Nobody knows why what I am about to tell you happens”⁵⁶

Thus, with Aristotle acting as my scout, I formulate the:

* *In other words the Physics of Humans.*

** *I consider Richard Feynman to be a truly Great Researcher, firstly because (with J. Schwinger and Sin-Itiro Tomonaga) he is the composer of the splendid Quantum Electrodynamics (QED) Theory, and secondly, because he was one of the few Physicists who not only ever became arrogant, but who also always maintained full awareness of the **limits** of his science while approaching the big "Truth".*

⁵⁵ Richard Feynman, "QED", 1985; Princeton University Press, Princeton, New Jersey.

⁵⁶ Richard Feynman, "The Character of Physical Law", 1967; 2nd Edition, MIT Press.

SECOND QUANTUM MECHANICS PROPOSITION

In the Perceptible (i.e. observable and measurable) Space, the two aforementioned entangled (coexisting) conjugate positions of the material point do not appear at the same time, but each appears only once at every local observation or measurement from the minutest possible distance*.

(Aristotelian view of the Cosmos, i.e. the differentiation between the "Particular" and the "Universal" imposed by the senses; in modern terms: **collapse of the wave function**).

Nevertheless, the second leg of the Mystery remains:

- What does really happen when we decide to take a look and Nature **selects which** of the two entangled states of "WHAT IS" to show us?

- What are the **criteria**, on Nature's behalf, for such a selection?

To answer those difficult questions, I must first rectify, once and for all, the "Logical Fault" from the previous Chapter, regarding the existence of what I called "potentially conjugate positions".

Thus, I formulate the last:

THIRD QUANTUM MECHANICS PROPOSITION

Within the Strong Nuclear Field, i.e. the range of "Truth", the mathematically acquired conjugate positions (which I called "potentially" conjugate) are, in fact, not observable,*** because, if they were, they would have to COINCIDE with their corresponding positions. They are, in other words, located BELOW THE MINIMAL measurable limit hence they have no time to become conjugates, because Light returns INSTANTLY to the Observer or to his observation instrument.**

* This concept of the "local, from the minutest possible distance" observation or measurement will be explained further on, following the formulation of the third Quantum Mechanics Proposition.

** Where we do not "see in a mirror dimly", but "we... see face to face" (Paul, 1 Corinthians 13:12). I repeat Plato's characterizations for this Space: "Kingdom of the eternal forms of the 'true being'", "the hyper celestial (transcendental) place", "the intellectual place" (see p. 272).

*** "And being asked by the Pharisees, when the kingdom of God should come, he answered them and said: The kingdom of God cometh not with observation; neither shall they say; Behold here, or behold there. For lo, the kingdom of God is within you". (Luke 17: 20, 21).

Finally, the coast is clear!

When one of the two sections of the Apollonian Circumference lies within the Strong Field, then it is not considered as a coexisting second solution.

Within the Strong Field, every conjugate position **not coinciding with the position is rejected as not observable.**

Thus, the Strong Nuclear Field apart from being place of Truth is also the place where the state vector is reduced.

In other words, **within the Strong Nuclear Field**, either the position coincides with its conjugate^{*}, or any random section of the Apollonian Circumference is not observable and therefore the observable conjugate position is the other section. In both cases, the entangled states of "WHAT IS" disappear, i.e. the wave function collapses.

The aforementioned reason for the collapse of the wave function is also valid for each ***“local, from the minutest possible distance”*** observation or measurement i.e. whenever the Observer or his instrument is located so close to an observed conjugate position, that the distance between them becomes the **minutest measurable**. Then, based on our Third Quantum Mechanics Proposition, the conjugate position in question **ceases being observable as a "conjugate position"** and becomes a position.

Thus, there exist **two** distinct ways for the wave function to collapse:

1. **The Natural:** When a section (and sometimes both sections) of the Apollonian Circumference is located within the Strong Field, thus ceasing being observable.
2. **The Factitious:** When the Observer places the instrument of measurement at the minutest possible distance from an observed conjugate position “forcing” it, by this action, to automatically transform into a position.

We therefore observe that there exists a slight difference between the two ways a wave function can collapse. The reason, however, behind this phenomenon is but a single one:

The violation of the “minutest measurable distance” threshold.

^{*} We shall investigate this proposal in detail below. (See Strong Nuclear Field Investigation).

Based on the above 3 Quantum Mechanics Proposition, **which however we reached by following the "path" opened solely by the Theory of the Harmonicity of the Field of Light**, it appears that we are slowly led to the clarification of the Greatest Mystery of modern Physics.

The mathematical treatment follows and, unfortunately, it is very laborious.

The reader will have certainly noticed that in previous chapters I have been a stringent critic of A. Einstein. My criticism was focused mainly on the errors and contradictions of the Theory of Special Relativity to the extend, at least, that these offend common sense and Aristotelian Logic.

In this particular case, however, I begin to see that somewhere, deep down, Einstein might have been partly right.

It seems that the famous Einstein-Bohr "war" essentially referred to the fundamental problem of Knowledge, precisely like the "war" between Plato and Aristotle.*

Plato and Einstein both claimed that the real is **the noetic (mathematical)**, whereas Aristotle and (to a greater extent) Bohr claimed as real the **perceptible and measurable**.

How anyone could chose a side, "trapped" between such Giants of intellect?

Still, "taking a plunge in the deep end" with the following **quantitative** treatment of the Quantum Mechanics Problem, I will attempt to demonstrate those regions of Space where Einstein's philosophy is vindicated and, additionally, those where the Orthodox interpretation of Quantum Mechanics is correct, i.e. where indeed "*God plays dice*".

I apologize to the reader, beforehand, for the boring and tedious "work" that follows. However someone, sooner or later, must take it on.

* *This fundamentally different approach to the Cosmos is splendidly depicted in Rafael's masterpiece "The Faculty of Athens". In this exceptional mural, located in the Vatican, Plato is depicted pointing up with his hand (i.e. to the World of the Ideas and Intellect) while Aristotle next to him points with his hand below (to the World of the Senses). I wonder which of the two, shows us where the Truth really is.*

I. THE UNIFIED FIELD OF LIGHT FOR SUPERLUMINAL SPEEDS

As the chapter regarding superluminal speeds is also the most recent one, this time I shall deviate and will start from the difficult part first, i.e. specifically from the case of **superluminal speeds**.

THE APOLLONIAN CIRCUMFERENCE FOR SUPERLUMINAL SPEEDS

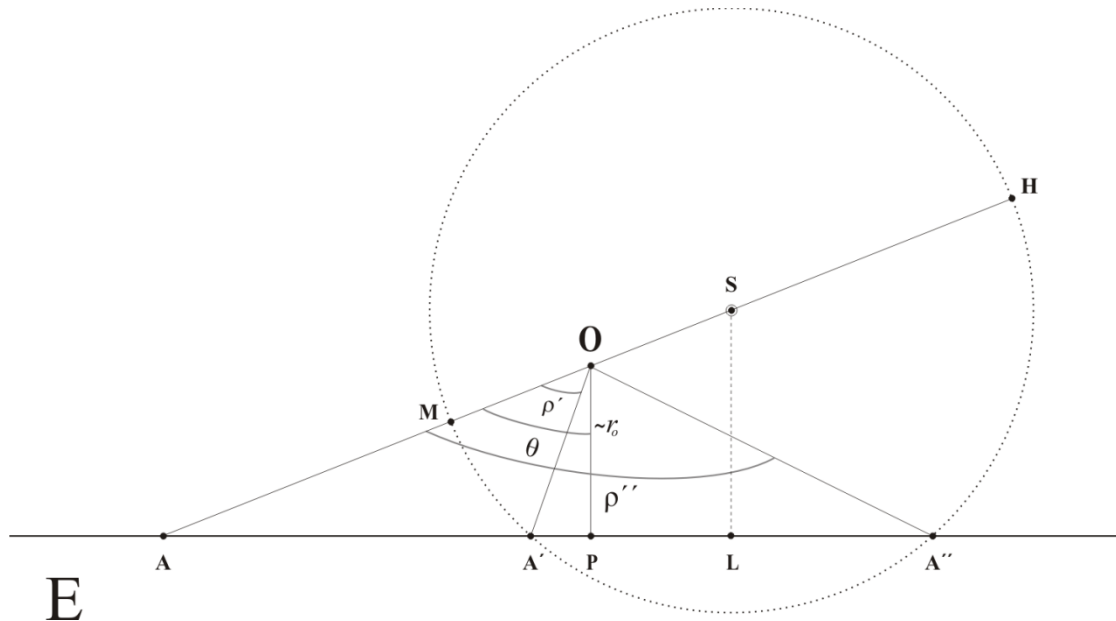


Figure 1.6.2

Consider position A moving on the Projective Straight line E with speed v , measured with the LASC and **higher** than the speed of light c ($B = v/c > 1$).

For a given measure of speed v corresponding to A and to the particular Observer O, the Apollonian circumference is **one and only one, singly-defined and independent of A's direction of motion**.

First, I will develop a list of the basic geometrical relations of the elements of the Apollonian Circumference, which is essential for our research:

Point M divides OA **internally** in a v/c ratio. Point H divides OA **externally** in a

$$v/c \text{ ratio. Thus: } \frac{MA}{MO} = \frac{HA}{HO} = \frac{v}{c} = B > 1 \quad (1.6.3)$$

(All measurements are considered as Absolute values).

From above, we get the following relations:

$$MO = \frac{OA}{B+1}, \quad MA = \frac{B}{B+1} \cdot OA, \quad HO = \frac{OA}{B-1}, \quad HA = \frac{B}{B-1} \cdot OA \quad (1.6.4)$$

The Radius of the Apollonian Circumference is calculated as:

$$R = \frac{B}{B^2-1} \cdot OA \quad (1.6.5)$$

The distance of the Apollonian Circumference's center from straight line E, which is **constant** and independent of position A, is:

$$SL = \frac{B^2}{B^2-1} \cdot OA \cdot \cos \theta = \frac{B^2}{B^2-1} \cdot r_0 \quad (1.6.6)$$

By applying the sine theorem in the triangle OA'A, we get:

$$\sin \rho' = B \cdot \cos \theta \quad \text{and} \quad \cos \rho' = \sqrt{1 - B^2 \cdot \cos^2 \theta} \quad (1.6.7)$$

Also, we have:

$$A'A = \frac{OA \cdot B}{\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta} \quad (1.6.8)$$

And also:

$$OA' = \frac{OA}{\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta} \quad (1.6.9)$$

By applying the sine theorem in the triangle OA''A, we get:

$$\sin \rho'' = B \cdot \cos \theta \quad \text{and} \quad \cos \rho'' = -\sqrt{1 - B^2 \cdot \cos^2 \theta} \quad (1.6.10)$$

Also, we get:

$$A''A = \frac{OA \cdot B}{-\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta} \quad (1.6.11)$$

And also:

$$OA'' = \frac{OA}{-\sqrt{1 - B^2 \cdot \cos^2 \theta} + B \cdot \sin \theta} \quad (1.6.12)$$

I placed the equations that give distances OA' and OA'' within frames, because these relations play a decisive role in the formation of the force of Gravity (as it originates from the conjugate) i.e., they essentially **determine the intensity of the Field**; also because these distances are related to the complex numbers (probability amplitudes) of Quantum Mechanics. Specifically, probability amplitudes correspond to the denominators of these equations.

As the denominator of equation (1.6.9) is greater than the denominator in equation (1.6.12), it follows that: $OA' < OA''$.

These two distances become equal only when A coincides with A_0 , which corresponds to a tangent Apollonian, i.e. when $\theta = \omega$, where $\cos \omega = \frac{C}{v} = \frac{1}{B}$.

We observe also that the two angles ρ' and ρ'' of the "**light deflection**" add up to 180° , i.e. $\rho' + \rho'' = \pi$ (1.6.13); thus OA bisects the angle created by OA' and the extension of $A'O$.

Now, we are ready to deal with the Problem.

First, I will arrange all the critical points of the Field on Straight line E, prior to the appearance of the boundaries of the Strong Nuclear Field (Fig. 1.6.3).

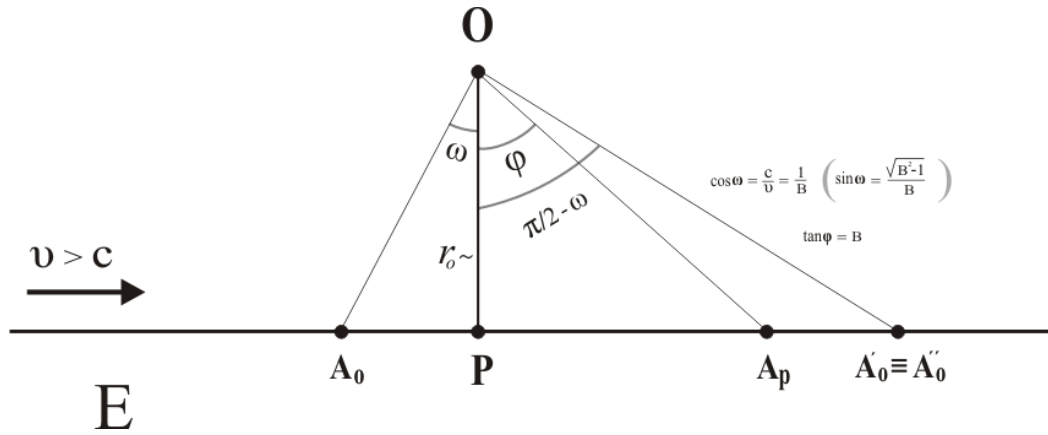


Figure 1.6.3

A_0 is boundary, and has as double conjugate the coinciding $A'_0 \equiv A''_0$ that constitute the tangent point with the **marginal** Apollonian Circumference.

Angle $A_0OA'_0$ is always $\pi/2$ (90°).

Thus, the first big category of our study emerges.

We shall distinguish the case where $B < \sqrt{2}$, $\omega < \frac{\pi}{4}$ (45°) and $\frac{\pi}{2} - \omega > \frac{\pi}{4}$, from the case where $B > \sqrt{2}$, $\omega > \frac{\pi}{4}$ (45°) and $\frac{\pi}{2} - \omega < \frac{\pi}{4}$.

However, this distinction alone is not sufficient!

And this because there exists also a critical point A_p , which has as conjugate the Foot of the Perpendicular P, i.e. $\tan \varphi = \frac{v}{c} = B$.

We have already realized from the fifth chapter that **for each value of B**, it is $\varphi \geq \omega$. However, we must distinguish the different cases regarding the relation between A_p and A'_0 i.e. the relation of angle φ with angle $\frac{\pi}{2} - \omega$.

In order for these two angles to become equal, it must be $\tan\left(\frac{\pi}{2} - \omega\right) = B$, which

leads to the equation: $B \cdot \sqrt{B^2 - 1} = 1$ (1.6.14)

The solution of which is: $B^2 = \frac{1 + \sqrt{5}}{2} = 1,618033988... =$ the **Golden Number** (G.N.) !!

Therefore, the first big category to be studied (I.A), is when:

$$B \leq \sqrt{G.N.} = \sqrt{1,618033988...} = 1,272019649..., \text{ then angle } \varphi \leq \frac{\pi}{2} - \omega.$$

I arrange, therefore, in the following figure, the critical points of the Field for the case where $B \leq 1,272019649...$ (When $B = \sqrt{G.N.}$ then $A_p \equiv A'_o$)

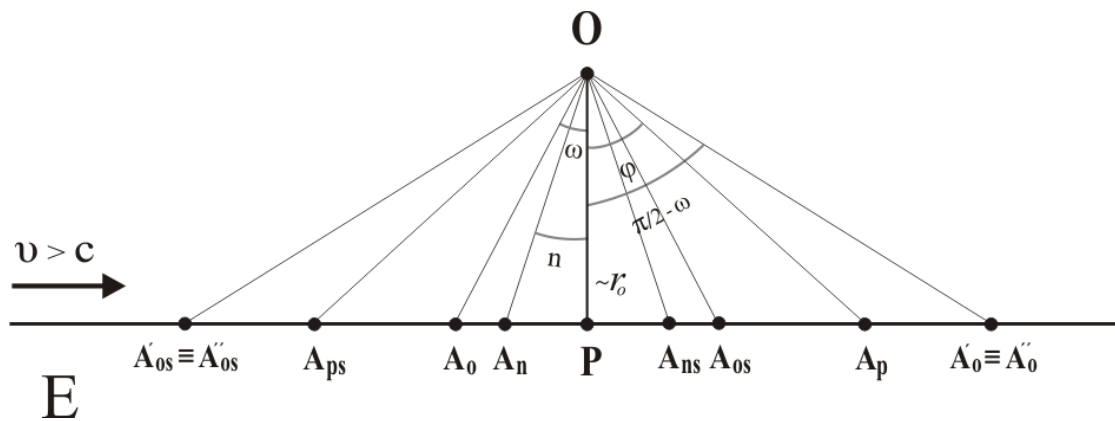


Figure 1.6.4

The above figure indicates the arrangement of the critical Field points, where subscript S indicates the corresponding symmetrical points relative to P.

Thus A'_{os} , which is double ($A'_{os} \equiv A''_{os}$), is symmetrical to the double $A'_o \equiv A''_o$, A_{ps} is symmetrical to A_p and A_{os} is symmetrical to A_o .

It remains to arrange points A_n and A_{ns} , i.e. the ones defining the boundaries of the Strong Nuclear Field.

It is obvious that these boundaries are determined by angle n (angle A_nOP), which can be less than, equal to, or greater than angles ω and $\frac{\pi}{2} - \omega$.

Therefore, another subclass is henceforth generated depending on the size of angle n . Let us first consider $n \leq \omega$.

Thus, we are lead to the first category to be examined:

I. A. 1. CATEGORY ($B \leq \sqrt{G.N.} = 1,272019649\dots, n \leq \omega$)

It is obvious that the maximum ω results for the maximum B, thus:

$$\sin(\omega_{\max}) = \frac{\sqrt{B_{\max}^2 - 1}}{B_{\max}} = \frac{\sqrt{G.N. - 1}}{\sqrt{G.N.}} = 0,618033988\dots \quad \text{Golden Section (G.S.) !!}$$

hence $\omega_{\max} = 0,66623943\dots (38,1727^\circ)$.

I designate conjugate position A', the **first conjugate position** and conjugate position A'', the **second conjugate position**.

Let there be a material point, at position A, approaching the Foot of the Perpendicular from the left, moving with speed $v > c$.

The first conjugate position (A') is moving in the same direction with position A, whereas the second conjugate position (A'') moves in the opposite direction, as it approaches the PF from the right. As the point where those two conjugate positions, moving in opposite directions, meet is the double point $A'_0 \equiv A''_0$, it follows that the second conjugate position (A'') **cannot** enter the interval $A_n P A_{ns}$, **which is the interval of the Strong Field**, for the case under examination.

Therefore, here, the behavior of the first conjugate position (A') will determine the structure of the Field. In this fashion, a first marginal position for A is generated, the one whose first conjugate position (A') will be identical with point A_n , i.e. with the start of the Strong Field.

Let us designate this marginal position A_{on1} .

The choice of subscripts is obvious. The “o” stands for marginal (οριακή = marginal), “n” reflects the first conjugate position that enters the nuclear field (“nucleus”), “1” stands for “first” (this one).

As long as A_n is the first conjugate of A_{on1} , based on (1.6.9) it follows that:

$$OA_n = \frac{OA_{on1}}{\sqrt{1 - B^2 \cdot \cos^2 \theta_{on1}} + B \cdot \sin \theta_{on1}} \quad (1.6.15)$$

Considering that angle θ_{on1} is the angle between OA_{on1} and OP.

Thus, (1.6.15) is written:

$$\frac{r_0}{\cos n} = \frac{r_0}{\cos \theta_{on1} \cdot \left[\sqrt{1 - B^2 \cdot \cos^2 \theta_{on1}} + B \cdot \sin \theta_{on1} \right]} \quad (1.6.16)$$

and finally, we get:

$$\cos \theta_{on1} \cdot \sqrt{1 - B^2 \cdot \cos^2 \theta_{on1}} = \cos n - B \cdot \sin \theta_{on1} \cdot \cos \theta_{on1} \quad (1.6.17)$$

Raising (1.6.17) to the square and replacing the sine and cosine of θ_{on1} with their expressions as a function of the tangent, we are lead to the equation:

$$\cos^2 n \cdot \tan^2 \theta_{on1} - 2B \cdot \cos n \cdot \tan \theta_{on1} + \cos^2 n + B^2 - 1 = 0 \quad (1.6.18)$$

which has as solutions* : $\tan \theta_{on(1,2)} = \frac{B \pm \sin n}{\cos n}$.

Thus, the two boundaries for position A have been automatically defined. When the first conjugate of position A coincides with A_n , then angle θ_{on1} is:

$$\tan \theta_{on1} = \frac{B + \sin n}{\cos n} \quad (1.6.19)$$

When the first conjugate of position A coincides with A_{ns} , the other boundary of the Strong Field, then angle θ_{on2} is:

$$\tan \theta_{on2} = \frac{B - \sin n}{\cos n} \quad (1.6.20)$$

Here, however, caution is needed as well as a clarification.

* Here, Dirac comes to mind: "Beauty divulges truth". Our solution is aesthetically pleasing and elegant, hence we could be on the right course...

It is known that for any given conjugate position, **correspond two positions**. Thus for a given conjugate position A_n , correspond two positions A_{on1} and A_{on2} , symmetrical **relative to A_n** . To those two, specifically, equations (1.6.19) and (1.6.20) correspond.

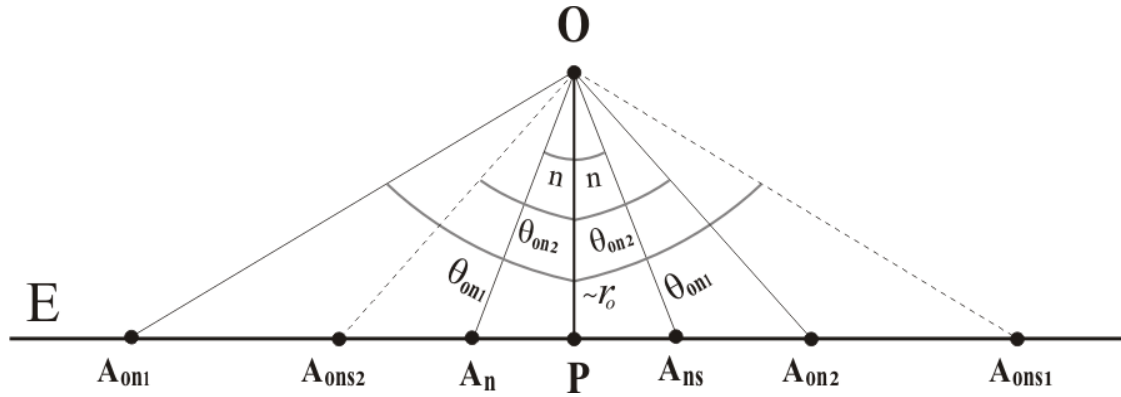


Figure 1.6.5

Indeed (Fig. 1.6.5), it holds that:

$$\tan \theta_{on1} = \frac{A_{on1}P}{r_0} = \frac{A_{on1}A_n + A_nP}{r_0} = \frac{B \cdot A_nO + A_nP}{r_0} = \frac{B \cdot \frac{r_0}{\cos n} + r_0 \cdot \tan n}{r_0} = \frac{B + \sin n}{\cos n}$$

Also:

$$\tan \theta_{on2} = \frac{PA_{on2}}{r_0} = \frac{A_nA_{on2} - A_nP}{r_0} = \frac{B \cdot A_nO - A_nP}{r_0} = \frac{B \cdot \frac{r_0}{\cos n} - r_0 \cdot \tan n}{r_0} = \frac{B - \sin n}{\cos n}$$

Exactly the same is true for both positions (A_{ons1} and A_{ons2}) having A_{ns} as their conjugate. Consequently, A_{ons1} is symmetrical of A_{on1} relative to P, and A_{ons2} is symmetrical of A_{on2} relative to P.

As the symbolism regarding the subscripts of Fig. 1.6.5 begins to get complicated, I shall adopt a simpler one, reserving subscript “s” exclusively for symmetry. Thus A_{ons2} in Fig. 1.6.5, becomes A_{on2} in Fig. 1.6.6.

This way, the two angles given by equations (1.6.19) and (1.6.20) determine the boundaries of position A, (A_{on1} and A_{on2}), when its first conjugate travels across the Strong Field (Fig. 1.6.6). Therefore, it becomes obvious that the first boundary A_{on1} is **always located outside** the Strong Field.

However, we cannot be sure for the second boundary A_{on2} .

For the same thing to happen, it should be:

$$\tan \theta_{on2} > \tan n \Rightarrow \frac{B - \sin n}{\cos n} > \frac{\sin n}{\cos n}, \text{ and therefore:}$$

$$\sin n < \frac{B}{2} \tag{1.6.21}$$

In our case where $n \leq \omega$, $\sin n_{\max} = \sin \omega = \frac{\sqrt{B^2 - 1}}{B}$, which is less than $\frac{B}{2}$ (because $B < \sqrt{2}$), consequently equation (1.6.21) is satisfied.

Therefore, **both** marginal positions A_{on1} and A_{on2} **are outside** the Strong Field.

Now, we are ready to draw and describe the form of the **Unified Field of Light**, of the case under examination, by observing the motion of the material point traveling with speed $v > c$.

Since the first conjugate of A_{ps} is the Foot of the Perpendicular P, it follows that the two **marginal** points A_{on1} and A_{on2} are arranged at either side of A_{ps}^* . From equations (1.6.19) and (1.6.20), we locate A_{on1} and A_{on2} and by drawing Fig. 1.6.6, where the unified Field of Light is displayed, at a higher than usual scale on the next page, we observe that this is divided in the following distinct regions:

REGION 1

When the material point moves within the interval $-\infty A_{on1}$, then both conjugate positions A' and A'' are acceptable, i.e. observable. Thus we have entangled states.

The Gravitational interaction originating from the two conjugate positions is:

- a) The one corresponding to A' , **attractive**,
- b) The one corresponding to A'' , **repulsive**.

However, as $OA' < OA''$, **we conclude that the main interaction is attractive**.

* Even though it is not of great importance to Physics, I note for the sake of the completeness of our study, that to arrange A_{on1} and A_{on2} at either side of point A'_{os} , i.e. A_{on1} to be towards the side of $-\infty$ relative to A'_{os} , it should be:

$$\sin n > \frac{1 - B^2 + \sqrt{2 - B^2}}{B} \tag{1.6.22}$$

Please notice that as B increases, $\sin n$ given by equation (1.6.22) decreases quite rapidly and for $B^2 = G.N. = 1,618033988\dots$, i.e. at the limit of the case under examination, **becomes zero**, that is to say this arrangement occurs for every n . In Fig. 1.6.6, I've chosen an n , whose sine is **less than** the one calculated from equation (1.6.22).

THE ANATOMY OF THE UNIFIED FIELD OF LIGHT

FOR $B < \sqrt{G.N.}$ ($B < \sqrt{1,618...}$) AND $n < \omega$

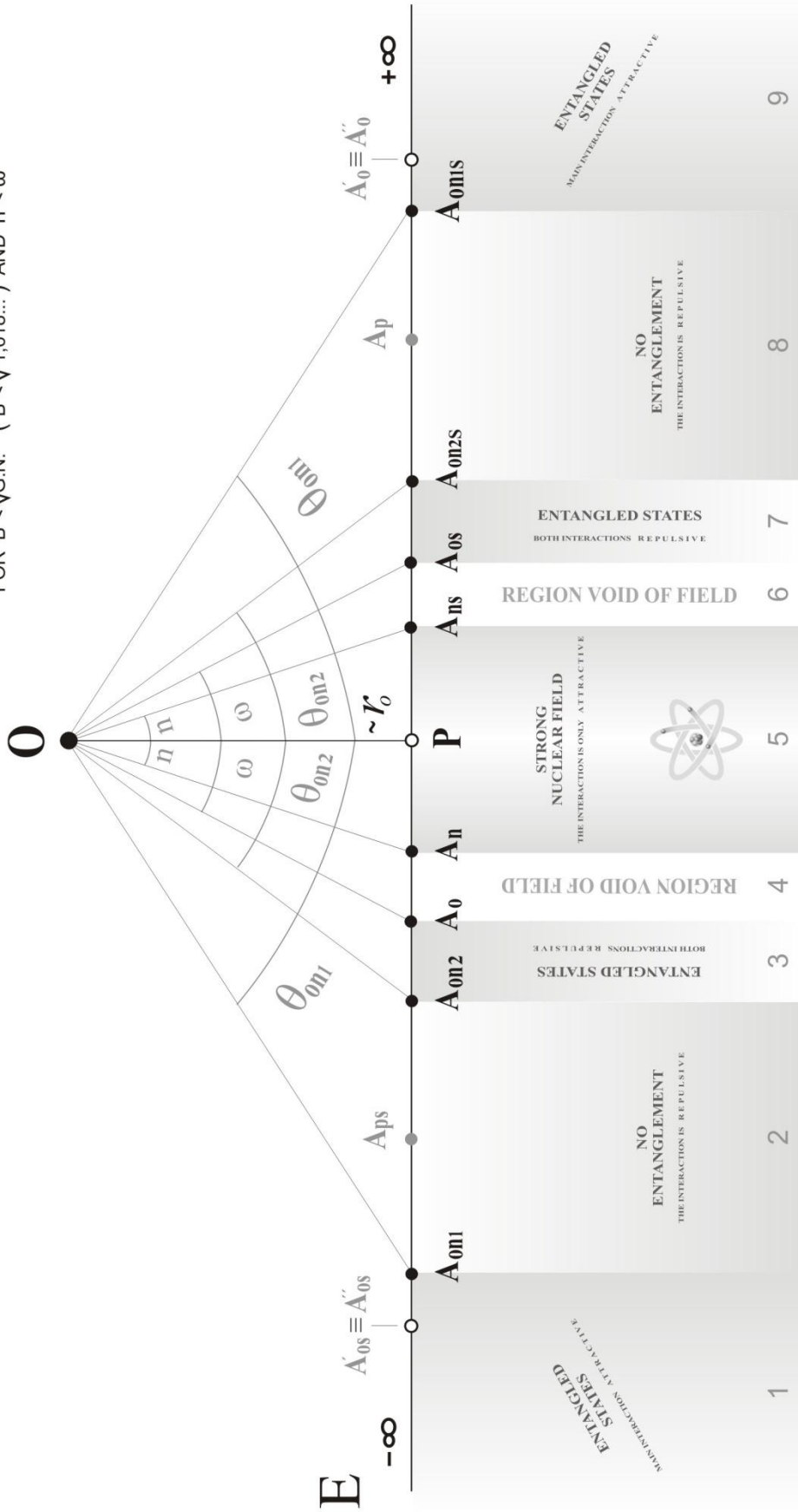


Figure 1.6.6

REGION 2

While the material point travels across the interval $A_{on1} \div A_{on2}$, its first conjugate (A') travels across the interval $A_n \div A_{ns}$ of the Strong Field. Thus, based on the Third Quantum Mechanics Proposition, A' **is neither observable nor does it create an interaction**. The Gravitational interaction corresponds to the second conjugate position A'' and is **repulsive**.

REGION 3

While the material point travels across the interval $A_{on2} \div A_o$, its first conjugate (A') travels across the interval $A_{ns} \div A'_o \equiv A''_o$. Its second conjugate (A''), on the other hand, is approaching the double point $A'_o \equiv A''_o$ while moving in the opposite direction. Then, **both conjugate positions are acceptable, i.e. observable**, and thus there exists an entanglement of the two states, both of which correspond to **repulsive** interactions.

REGION 4

While the material point travels across the interval $A_o \div A_n$, it is located in a Space Void of any Field, i.e. the Apollonian does not have real section points with straight line E. Thus, the material point **is neither visible at O nor does it interact with it**.

REGION 5

While the material point travels across the interval $A_n \div A_{ns}$, it is located within the Strong Field, i.e. in the "Range of Truth". The position coincides with its conjugate, "WHAT IS" coincides with "WHAT APPEARS", the interaction is a pure **Newtonian** one without "deflection" (central), and is **attractive**.

REGION 6

Everything about region 4 applies here too.

REGION 7

Everything about region 3 applies here too.

REGION 8

Everything about region 2 applies here too.

REGION 9

Everything about region 1 applies here too.

This is to be expected since our (Geometrical) Space is Projective and our description **is timeless** i.e. we did not chronologically arrange (pick) the conjugates. Thus, region 9 **cannot differ** from region 1.

Now, at last, the underlying reason for the “**break**” in symmetry, which I mentioned in the previous chapter (fifth), finally emerges:

TIME!

By the way, what IS Time? I am afraid, I have no idea...

I do however hope that the reader will now understand my earlier position on Einstein being, deep down, probably right.

In regions 2, 5 and 8, there is no entanglement of states.

God does not "play dice" there. More specifically, in region 5, it is purely Newtonian Mechanics, i.e. the Physics of Angels, that applies. By contrast, in regions 1, 3, 7 and 9, we have entanglement of states. Here, Nature plays in **two boards at once!**

Furthermore, Regions 4 and 6 are void of Field, i.e. when the material point traverses them, it is neither observed from O nor does it interact with it. Thus, within these Regions matter seems to disappear... (**Dark Matter**)

Of course, it feels ironical that in order to reach the stage where Einstein's philosophy was partly vindicated, we first had to refute his Theory of Special Relativity.

However, what really is at this stage important and what truly fascinates me, is the wisdom of the Great Designer while "drawing up" the Cosmos.

To be more specific:

When the material point is located far away from O, the main interaction is attractive, converting to repulsive as it gets closer to it. To enter region 5 of the Strong Nuclear Field, where the interaction is once again attractive, there are certain energy requirements (such as crossing the potential barrier created by the repulsive interaction).

As a result, the Cosmos is **neither super-dense**, as it would be if Gravity had only the attractive component (form), **nor totally dismantled to its constituent pieces**. The Greek proverbial “*we cannot live together but neither can we live apart*” finds its perfect application in this situation.

In the special case where $n = \omega$, then Regions 4 and 6, void of any Field, are practically non-existent.

I. A. 2. CATEGORY ($B \leq \sqrt{G.N.} = 1,272019649\dots$, $\omega < n \leq \pi/2 - \omega$)

In this category, Regions 4 and 6 (Regions Void of any Field) **do not exist** and Regions 3 and 7 are **compressed**, because as angle n , starting from smaller values increases, angle θ_{on2} decreases. Thus, there exists an angle n where A_n (marginal point of the Strong Field) will coincide with point A_{on2} (marginal of Region 2 of the repulsive interaction). For this, it must be:

$$\tan \theta_{on2} = \tan n \Rightarrow \sin n = \frac{B}{2} \quad (1.6.23)$$

In this case, Regions 3 and 7 **disappear** and the Unified Field takes a simpler form, as shown in the following Figure:

THE FORM OF THE UNIFIED FIELD FOR $B \leq \sqrt{G.N.}$ AND $\sin n = \frac{B}{2}$

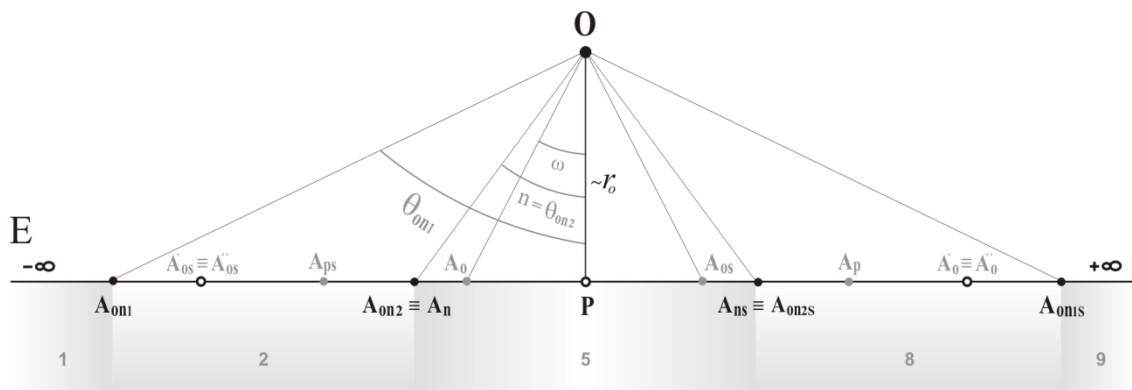


Figure 1.6.7

When the Field takes the above form, the (minimum) time required for Light to travel from A_n to O , equals the time the material point needs to cover the entire Strong Field ($A_n P A_{ns}$)*

* The proof of why this is true is left to the reader.

This proposal has a deeper physical importance, which we will study below. Of course, I note that this time equals the time required to travel Region 2 and, consequently, Region 8. Thus, we have: $A_{on1} A_{on2} = A_n A_{ns} = A_{ns} A_{on1s}$.

Important Mathematical Remark

It is obvious that when angle n increases, angle θ_{on1} , which determines the borderline between Regions 1 and 2, increases as well. Angle θ_{on2} decreases, as long as angle n starts from low values. However, the behavior of angle θ_{on2} is more complicated, as the size of this angle **shuttles between boundary minimum and maximum values** while angle n continues to increase.

Proof:

The first derivative of the function $y = \frac{B - \sin n}{\cos n}$, giving $\tan \theta_{on2}$ is: $y' = \frac{B \cdot \sin n - 1}{\cos^2 n}$.

y' becomes zero when $\sin n = \frac{1}{B}$ (1.6.24). But $\cos \omega = \frac{1}{B}$.

Consequently, the angle n for which angle θ_{on2} will reach its boundary minimum is complementary to ω ($n + \omega = \pi/2$).

In other words when, while angle n increases, point A_n coincides with double point $A'_{os} \equiv A''_{os}$ (which is none other than **the symmetrical** of double point $A'_o \equiv A''_o$), then angle θ_{on2} is **minimized**. The value of this minimal angle is:

$$\tan(\theta_{on2 \min}) = \frac{B - \frac{1}{B}}{\sqrt{B^2 - 1}} = \sqrt{B^2 - 1} = \tan \omega, \text{ therefore: } (\theta_{on2})_{\min} = \omega \quad (1.6.25)$$

In other words, the point that **would delimit*** the borderline between the repulsive electromagnetic Field and its adjacent Field, **coincides with** the boundary point of the Space Void of any Field, when the boundary of the Strong Field is located at the **symmetrical** of the double tangent point of the Apollonian Circumference and line E.

Behold the entangled unity of the Field in its entire splendor!!!

The contorted proposition formulated above, becomes fully understood if one thinks that point A_{on2} has point A_{ns} as its **first** conjugate (by definition), **which however coincides with the double point**, which is the conjugate of A_o . Therefore, A_{on2} **must** coincide with A_o . And this is exactly what happens. While angle n increases beyond $\pi/2 - \omega$, the shuttling angle θ_{on2} starts, **this time for good**, to also increase without ever reaching a new extreme value.

* I say **it would delimit**, as in our case it does not since A_o is located within the Strong Field.

I formulated this Important Mathematical Remark to point out, for the second time, a phenomenon of the **EXCHANGEABILITY OF EXTREMES**, which I consider of **decisive** importance to the New Physics based on Harmonicity; in fact so decisive that in time, I believe, it could advance into becoming a Principle of Physics.

As, however, I do not subscribe to pulling "aces from the sleeve" and "rabbits from the hat" and I am certainly not fond of "administrative measures" (remember those?), I intend to let things take their own natural way. And I do so, confident that, either way, this new Physics Principle will inevitably spring up, sooner or later, on its own*.

When angle n is equal with $\pi/2 - \omega$, i.e. A_n and A_{ns} **coincide** with $A'_{os} \equiv A''_{os}$ and $A'_o \equiv A''_o$ respectively, then the unified Field takes the following form:

THE FORM OF THE UNIFIED FIELD FOR $B \leq \sqrt{G.N.}$ AND $n = \frac{\pi}{2} - \omega$

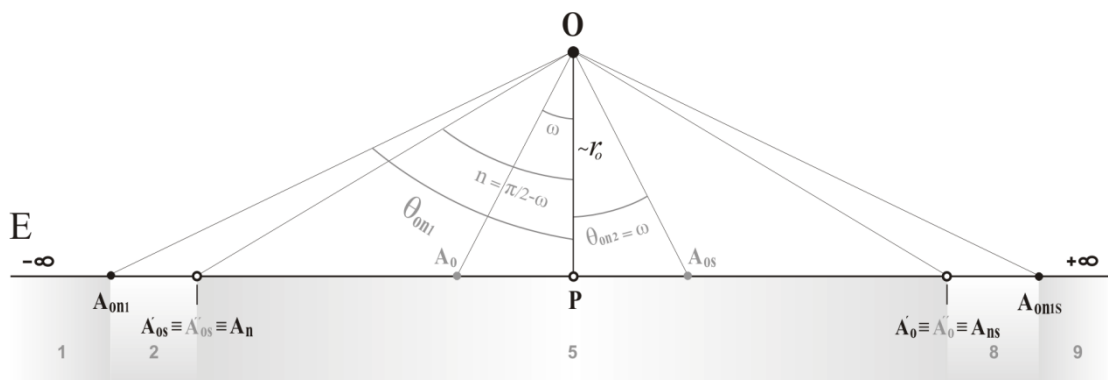


Figure 1.6.8

Where $\tan \theta_{on1} = \frac{B^2+1}{\sqrt{B^2-1}}$ and $\tan \theta_{on2} = \sqrt{B^2-1} = \tan \omega$.

Thus, A_n is the conjugate of both A_{on1} and A_{os} , whereas A_{ns} is the conjugate of both A_{on1s} and A_o^{**} .

* Such a proposition, coming from one of Aristotle's followers, sounds strange to say the least. "Unfortunately" however for us Aristotelians, some of Plato's views appear to still be true [...]

** It is understood that in the Figures, I try to maintain a scale, **wherever this is feasible**. Most of the time, however, positions A_{on1} and A_{on1s} are far removed and consequently way off scale, as in Fig. 1.6.8.

I. A. 3. CATEGORY ($B \leq \sqrt{G.N.} = 1,272019649\dots, \pi/2 - \omega < n$)

Here, our calculations undergo a drastic change.

And this because, whereas the angle given by equation (1.6.19) satisfies our initial equation (1.6.17), the angle given by equation (1.6.20) does not satisfy equation (1.6.17) but **its conjugate***, i.e. it satisfies equation:

$$\cos \theta_{on2} \cdot \left[-\sqrt{1 - B^2 \cdot \cos^2 \theta_{on2}} + B \cdot \sin \theta_{on2} \right] = \cos n \quad (1.6.17a)$$

where now a minus (-) sign appears before the radical.

In other words, from a **Physical** aspect, position A_{ns} is the **second conjugate** of position A_{on2} . Thus, the form of the Unified Field is almost the same as the previous one:

THE FORM OF THE UNIFIED FIELD FOR $B \leq \sqrt{G.N.}$ AND $n > \frac{\pi}{2} - \omega$

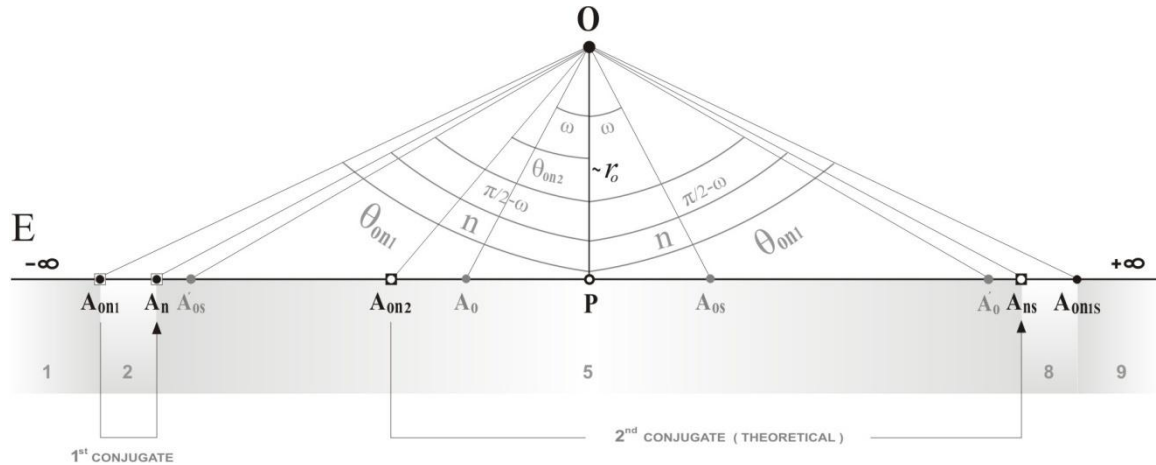


Figure 1.6.9

I. B. 1. CATEGORY ($\sqrt{G.N.} < B \leq \sqrt{2}, n \leq \omega$)

Here, not much changes relative to the initial category **I.A. 1.**

Simply, A_p is driven beyond the double point $A'_0 \equiv A''_0$, and A_{ps} is driven beyond the double point $A'_{0s} \equiv A''_{0s}$. Angle ω remains smaller than $\pi/4$.

* Remember that, to resolve equation (1.6.17), we squared it.

It would be interesting perhaps to examine a **special** sub-case which we did not study in category **I. A. 1**.

The case where the Strong Field **does not appear at all**, i.e. when the distance $OP = r_0$ is normal size or greater and in any case **greater than the minimal measurable**, thus preventing any "**minimal measurable distance threshold**" violations. In this case, points A_{ps} and A_p **gain crucial importance**, as they become boundary, and thus the Field takes the following form:

THE FORM OF THE UNIFIED FIELD IN THE ABSENCE OF STRONG FIELD FOR $\sqrt{G.N.} < B \leq \sqrt{2}$

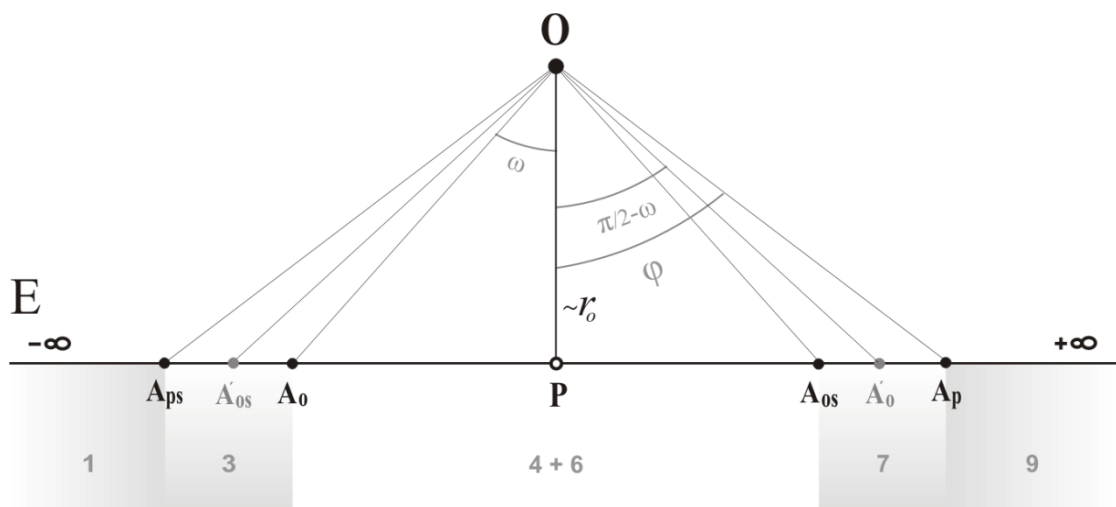


Figure 1.6.10

Here, in the absence of the Strong Field, Regions 4 and 6 are unified. Thus, in these Regions void of any field, entering (common) matter “behaves” like the **Dark Matter** that has been recently divulged by astronomical observations.

If now the Strong Field appears for an angle $n < \omega$, from equations (1.6.19) and (1.6.20) we determine the angles θ_{on1} and θ_{on2} and the form of the Field becomes a lot similar to the form portrayed in Fig. 1.6.6, where **all regions** from 1 through 9 are present.

In the special case where $n = \omega$, regions 4 and 6 simply do not exist.

I. B. 2. CATEGORY ($\sqrt{G.N.} < B \leq \sqrt{2}$, $\omega < n \leq \frac{\pi}{2} - \omega$)

In this category, everything that has been said and is in effect for **I.A. 2** is true.

The general structure and form of the Field does not change.

I. B. 3. CATEGORY ($\sqrt{G.N.} < B \leq \sqrt{2}$, $\frac{\pi}{2} - \omega < n$)

Likewise, everything that has been said in category **I. A. 3** applies also here.
The form of the Field is similar to that of figure 1.6.9.

In the special case where $B = \sqrt{2}$, I distinguish the following sub-cases:

A. For $n \leq \omega$.

Here appear all the Regions from 1 through 9. For $n = \omega$ Regions 1, 2, 5, 8 and 9 appear.

This are understandable as it holds that $n = \omega = \frac{\pi}{2} - \omega$, therefore the boundaries of the Strong Field **coincide** not only with the boundaries of the Region Void of any Field, but also with the double tangent point of the Apollonian Circumference.

B. For $n > \omega$.

Here applies everything said in **I. A. 3.**, whereas the form of the Field is illustrated in Fig. 1.6.9.

I. C. 1. CATEGORY ($\sqrt{2} < B$, $n \leq \frac{\pi}{2} - \omega$)

Here the arrangement of critical points changes, as angle ω exceeds $\frac{\pi}{2} - \omega$.

For $n = 0$, a case where the Strong Field is missing , Spaces 1, 3, 4+6, 7 and 9 appear roughly as in Fig. 1.6.10.

If now the Strong Field appears, then, when angle n increases from 0 to $\frac{\pi}{2} - \omega$, **all**

Regions from 1 through 9 **appear**. In the special case where $n = \frac{\pi}{2} - \omega$, the Field takes the form of Figure 1.6.11.

Let us compare the above case with the special case of categories A.1 and B.1 where $n = \omega$. There, Regions 4 and 6 **disappear**, whereas Regions 3 and 7 **exist**.

Here the **opposite** is true.

THE FORM OF THE UNIFIED FIELD FOR $B > \sqrt{2}$ AND $n = \frac{\pi}{2} - \omega$

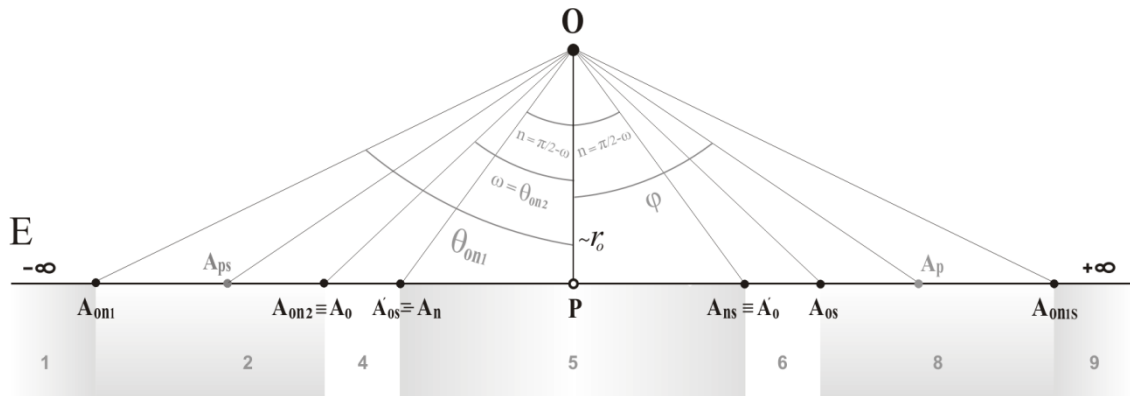


Figure 1.6.11

I. C. 2. CATEGORY ($\sqrt{2} < B$, $\frac{\pi}{2} - \omega < n \leq \omega$)

Here something unusual happens.

As we realized in the previous categories A.3 and B.3, the angle resulting from equation 1.6.20 does not satisfy equation 1.6.17, but its conjugate 1.6.17a. Consequently, point A_{ns} is the **2nd conjugate** of position A_{on2} . Here, however, position A_{on2} is located **outside** the Region void of Field, and thus constitutes a special boundary.

Consequently, while the material point travels along interval $A_{on2} \div A_0$, **both of its conjugates** are located **within the Strong Field**. However, as per the Third Quantum Mechanics Proposition, **these are not observable**.

For this reason Region $A_{on2} \div A_0$ is created where the two conjugates are "potentially conjugates", and hence this Region is Void of Any Field.

Let us designate this Region 4a and 6a, as it essentially belongs to the Region Void of Field. Thus the form of the Unified Field takes the form portrayed in Figure 1.6.12 on the next page.

THE FORM OF THE UNIFIED FIELD FOR $B > \sqrt{2}$ AND $\frac{\pi}{2} - \omega < n \leq \omega$

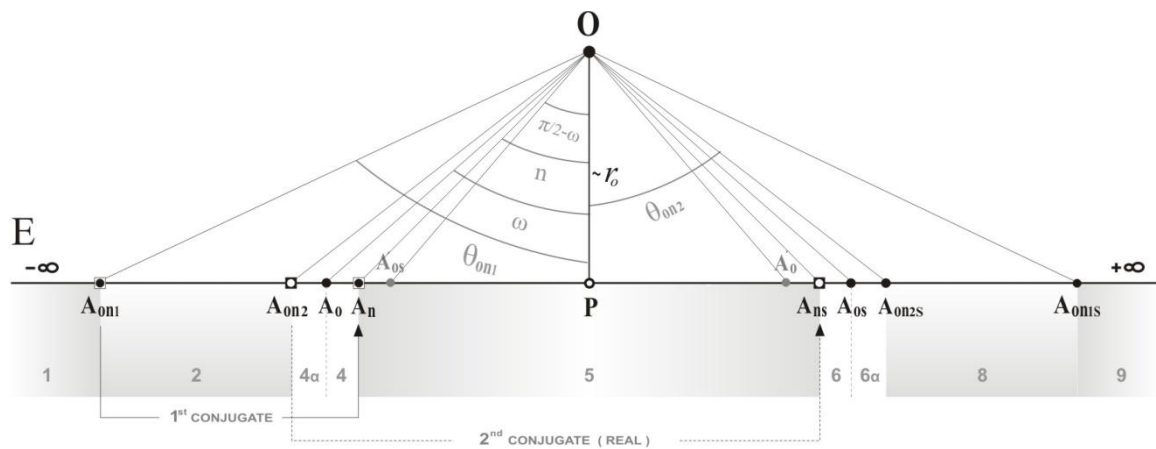


Figure 1.6.12

In the special case where $n = \omega$, then the Regions 1, 2, 4a, 5, 6a, 8 and 9 appear.

I. C. 3. CATEGORY ($\sqrt{2} < B, \omega < n$)

The form of the Field does not change considerably in relation to the previous category; in fact, it resembles the special case where $n = \omega$.

However, it should hold that: $\sin n < \frac{B}{2}$. If $\sin n > \frac{B}{2}$, but in any case $B < 2$, then only the following Regions appear: 1, 2, 5, 8 and 9.

At last!!

We have reached the end. We've examined **nine** categories in total, covering the entire spectrum of the Unified Field.

Time to take a short break, however, and ponder:

What did we really accomplish with the preceding extensive analysis?

We faced a problem of **simultaneous observability of conjugate positions A' and A''** (coexistence of conjugate positions of "WHAT IS") and we converted it to a problem of **observability of straight-line segments**.

In other words, we did not solve the Problem but:

We converted it to its dualistic equivalent.

This is already a great Discovery!

In other words, we converted a problem of **points** into a problem of **straight lines**; and this is its dualistic equivalent, because a straight line is the concept that dualistically corresponds to a point on the Plane*. If I was to explain it in a simpler way (apologizing for the non-scientific expression), I would say that we've somehow "stretched" the points into straight line segments"!!**

But how come we did not solve the Problem?

Simply because, here we don't practice Math, we practice Physics.

* I refer to the Introduction. Specifically, readers not having Projective training are requested to study carefully the founding axioms of the Projective Space and more specifically the **first six positional axioms** and mainly to observe how each one is written opposite to another. The comments will help them comprehend the **Principle of Duality** in Space.

Here, we stumbled upon the Principle of Duality on the Plane, where the concept of the **point** corresponds dually with the concept of the **straight line**. It starts, I hope, to emerge how waves resulted in Physics. Could it be that here, someone might "catch the scent" of the String Theory? Or, in more dimensions, even "(mem)branes"? Here someone like me, who for 30 long years disputes the existence of all types of "-ons", could perhaps see the introduction of these new concepts as some form of redemption.

(Let the "-ons" go away and let anything else take their place). I wonder, however: While doing away with one "demon", have we imported by accident another one through the chimney? Something that has surely happened over and over again in the past...

However, **in Harmonicity**, "demons" of any kind do not have a place.

** In formulating this non-scientific sentence I'm all shaken-up with awe, as I "hear" the poet's words :

"- What is good? What is bad?
- A single point A single point
 and on this you balance and exist
 and beyond this agitation and darkness
 and behind this, the roar of the angels
- A point A point
 and on this you can advance forever
 or else nothing exists anymore
And the Balance which, by stretching my hands, seemed
to weigh the light and the instinct, was

THE COSMOS,
the small and the great!"

Odysseus Elytis

Odysseus Elytis, "Axion Esti", Ikaros Publ., 17th Edition; p. 20 – 21 (in Greek).

We shall return to this ingenious and fascinating poet's conception in part 3 of this Book. For me, this has been an inexhaustible source of inspiration. A source full of **fundamentally pure ideas!**

And in Physics, **all proposals ought to refer to measurable relations only.**

We therefore must investigate if the resulting Region-delimiting straight-line segments are indeed measurable. And to be measurable, they obviously must be observable.

To be observable, however, it must hold that:

The Time required by a material point to travel along them, must be greater than or at least equal to the minimal measurable Time (t_{\min}).

In order, therefore, to consider this particular Problem solved, we must investigate and examine the observability of the discovered Regions.

I n v e s t i g a t i o n

In all cases, the minimal measurable time is:

$$t_{\min} = \frac{A_n O}{c} = \frac{r_0}{c \cdot \cos n} \quad (1.6.26)$$

We established this relation in the previous chapter (1.5.57).

Therefore, as we've already analyzed in the fifth chapter, the observability of the Region of the Strong Nuclear Field requires that:

$$\sin n \geq \frac{B}{2} \quad (1.6.27)$$

And consequently, by restating the conclusion of the fifth chapter, **for speeds greater than twice the speed of light, the Strong Field is not observable.**

For $\sin n = \frac{B}{2}$, the Strong Field is "barely observable".

In other words, the time required by the material point to cross the Field equals t_{\min} . In that case, points A_n and A_{ns} , i.e. those defining the boundaries of the Strong Nuclear Field, **are conjugate to each other.**

Below, I will check the observability of the Regions across all categories. Obviously, in all categories, Regions 1 and 9 (where an entanglement of states occurs with the attractive interaction being dominant), as lacking a boundary are **always** observable.

I. A. 1. CATEGORY ($B \leq \sqrt{G \cdot N} = 1,272019649\dots, n \leq \omega$)

Here it holds that: $\sin(n_{\max}) = \sin \omega = \frac{\sqrt{B^2 - 1}}{B}$, which for every value of B is less than $\frac{B}{2}$. (The equality is true for $B = \sqrt{2}$, which is beyond our consideration).

Thus the Strong Field **is not observable**.

Regions 2 and 8 have a length of $L_{2,8} = r_0 \cdot (\tan \theta_{on1} - \tan \theta_{on2}) = 2r_0 \cdot \tan n = A_n A_{ns} = L_n$ where: L_n is the length of the Strong Field. Thus, Regions 2 and 8 are not observable either. Similarly, Regions 3, 4, 6 and 7 **are also not observable**.

Are we finished?

No, we are not.

We must also check all the **possible combinations of** neighboring Regions!

So here we go:

Regions: 2 + 3 and 7 + 8 **are not** observable.

Regions: 3 + 4 and 6 + 7 **are not** observable.

Regions: 4 + 5 and 5 + 6 **are not** observable.

Regions: 2 + 3 + 4 and 6 + 7 + 8 are **«barely observable»**.

Regions: 3 + 4 + 5 and 5 + 6 + 7 are **«barely observable»**.

It is also $L_{2+3+4} = L_{6+7+8} = L_{3+4+5} = L_{5+6+7} = L$ and $\frac{L}{v} = \frac{r_0}{c \cdot \cos n} = t_{\min}$.

I do not intend to also repeat the above detailed analysis on the remaining categories. The reader, who wishes to obtain a more complete comprehension of the subject at hand, could investigate by himself the observability of the Regions that result from the various combinations.

Here, I shall limit myself to examining the observability of **solitary** Regions **only**.

I. A. 2. CATEGORY ($B \leq \sqrt{G.N}$, $\omega < n \leq \pi/2 - \omega$)

Here if $\sin n < \frac{B}{2}$, what was mentioned before continues being in effect.

For $\sin n = \frac{B}{2}$ (Fig. 1.6.7), both the Strong Field and Regions 2 & 8 are "barely observable".

For $\sin n > \frac{B}{2}$, the Strong Field is "observable".

Time t_2 (and t_8) is equal to t_{\min} . Therefore, Regions 2 and 8 are "barely observable".

These propositions also apply in the special case where $n = \pi/2 - \omega$.

I. A. 3. CATEGORY ($B \leq \sqrt{G.N}$, $\pi/2 - \omega < n$) (Fig. 1.6.9)

Here it holds that:

$$\sin(n_{\min}) = \sin\left(\frac{\pi}{2} - \omega\right) = \cos \omega = \frac{1}{B} > \frac{B}{2} \text{ for every value of } B, \text{ as } \sqrt{1,618...} < \sqrt{2}.$$

Thus the Strong Field is observable.

Regions 2 and 8 are "barely observable".

Also:

For **CATEGORY I. B. 1.** : Exactly what applies for **CATEGORY I. A. 1.**

For **CATEGORY I. B. 2.** : Exactly what applies for **CATEGORY I. A. 2.**

For **CATEGORY I. B. 3.** : Exactly what applies for **CATEGORY I. A. 3.**

In the special case were $B = \sqrt{2}$ then:

A. For $n \leq \omega$.

Only Regions 1 and 9 are observable. For $n = \omega$, when Regions 1, 2, 5, 8 & 9 appear, Regions 2, 5 and 8 are "barely observable".

B. For $n > \omega$.

The Strong Field is observable, whereas Regions 2 and 8 are "barely observable".

I. C. 1. CATEGORY ($\sqrt{2} < B, n \leq \frac{\pi}{2} - \omega$)

Only Regions 1 and 9 are observable.

I. C. 2. CATEGORY ($\sqrt{2} < B, \frac{\pi}{2} - \omega < n \leq \omega$)

Similarly, only Regions 1 and 9 are observable.

I. C. 3. CATEGORY ($\sqrt{2} < B, \omega < n$)

Here, only if $\sin n \geq \frac{B}{2}$, the Strong Field is observable whereas Regions 2 and 8 are "barely observable".

II. THE UNIFIED FIELD OF LIGHT FOR $v = c$

Here things are drastically simplified.

Let us first examine the Field in question, in the **absence of the Strong Field**.

It is obvious that **the critical points** are A_p and A_{ps} , determined by the angle $\varphi = \pi/4$, as that's where the interaction reverses. Therefore, the Unified Field takes the following form:

THE FORM OF THE UNIFIED FIELD, IN THE ABSENCE OF STRONG FIELD, FOR $v = c$

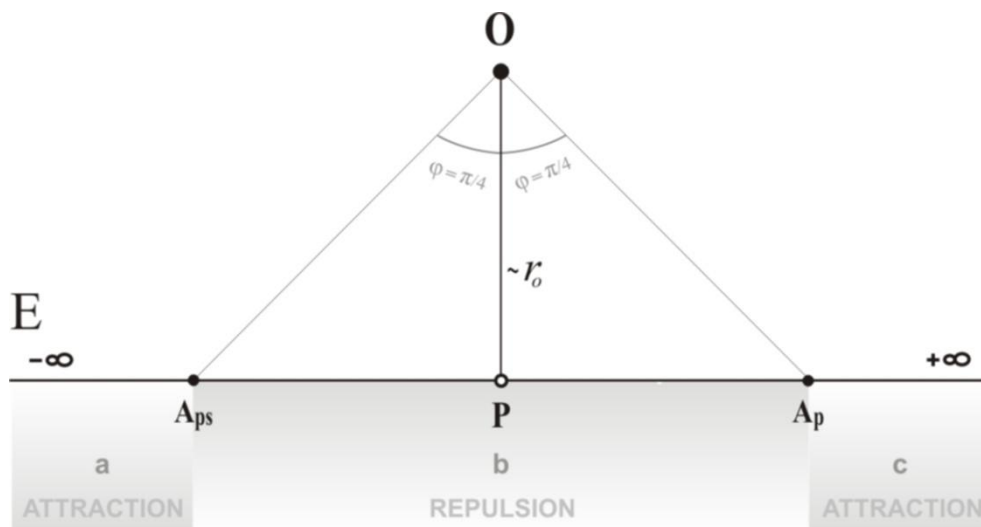


Figure 1.6.13

When the moving material point is located at P, its conjugate is at infinity and the P, O interaction, has line E as a carrier.

When the Strong Field appears, it is defined by angle n which determines its range. Angles θ_{on1} and θ_{on2} can be calculated in various ways.

The easiest way is to substitute $B = 1$ in equations (1.6.19) and (1.6.20) of the superluminal speeds. Thus, for the marginal angles we get:

$$\tan \theta_{on1} = \frac{1 + \sin n}{\cos n} \quad (1.6.28) \quad \text{and} \quad \tan \theta_{on2} = \frac{1 - \sin n}{\cos n} \quad (1.6.29)$$

It is obvious that the boundary point A_{on1} is always located outside the Strong Field; however, in order for A_{on2} to be located outside the Strong Field, it must be:

$$\frac{1 - \sin n}{\cos n} \geq \tan n. \text{ Consequently, it must be: } \sin n \leq \frac{1}{2}.$$

Thus we arrive at the first category to be examined, where $n \leq \frac{\pi}{6}$ (30°).

II. A. CATEGORY: $n \leq \frac{\pi}{6}$

From equations (1.6.28) and (1.6.29), we find the boundary points A_{on1} and A_{on2} as well as their symmetrical relative to P, and draw Fig. 1.6.14.

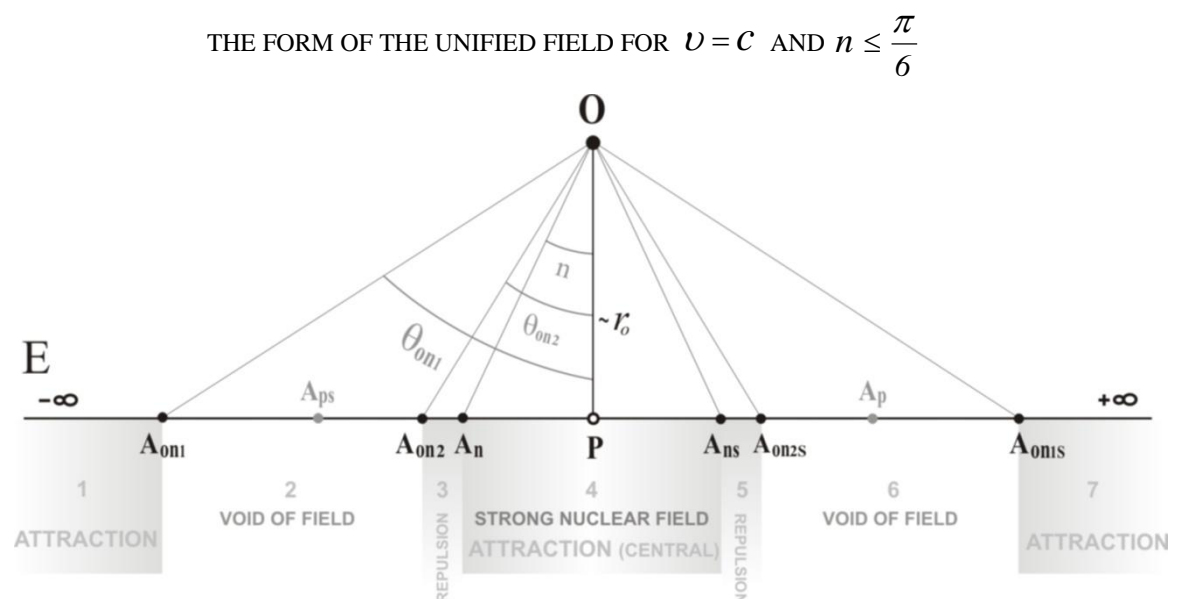


Figure 1.6.14

CAUTION! The numeration of Regions here is **not related** to the numeration of the Regions of superluminal speeds (I).

REGION 1

When the material point moves in the interval $-\infty A_{on1}$, its conjugate is located before A_n and thus is observable. The resulting interaction from it is **attractive**.

REGION 2

When the material point moves in the interval $A_{on1} \div A_{on2}$, then its conjugate travels the interval $A_n \div A_{ns}$ of the Strong Field. Thus, based on the Third Quantum Mechanics Proposition, **it is not observable**, neither does it create any interaction, and thus the region under consideration is **void of Field**.

REGION 3

When the material point travels the interval $A_{on2} \div A_n$ its conjugate travels the interval $A_{ns} \div A_{on2s}$, is located **outside** the Strong Field, and thus the interaction is **repellent**.

REGION 4

When the material point travels the interval $A_n \div A_{ns}$, it is located **inside the Strong Nuclear Field**, i.e. the "Region of Truth". The position **coincides with its conjugate** and the interaction is purely Newtonian **attractive** and central (without "deflection").

REGION 5

Everything about Region 3, applies here too.

REGION 6

Everything about Region 2, applies here too.

REGION 7

Everything about Region 1, applies here too. This is to be expected, **because our Space (Geometric) is Projective** and thus Region 7 cannot possibly differ from Region 1.

I n v e s t i g a t i o n :

As $\sin n < 1/2$, we conclude that **the Strong Field is not observable**.

Also, $L_2 = L_6 = L_n$; consequently Regions 2 and 6 are also not observable. The same applies to Regions 3 and 5. But the combinations of Regions: 2+3, 3+4, 4+5, 5+6 are «**barely observable**». However, in the special case where $n = \pi/6$, Regions 3 and 5 disappear and Regions 2, 4 and 6 become "**barely observable**".

II. B. CATEGORY: $n > \frac{\pi}{6}$

Here Regions 3 and 5 disappear. The Strong Field is observable, whereas Regions 2 and 6 are "barely observable".

III. THE UNIFIED FIELD OF LIGHT FOR SUBLUMINAL SPEEDS

As in the case of superluminal speeds, I formulate the necessary geometrical equations for the Apollonian Circumference.

THE APOLLONIAN CIRCUMFERENCE FOR SUBLUMINAL SPEEDS

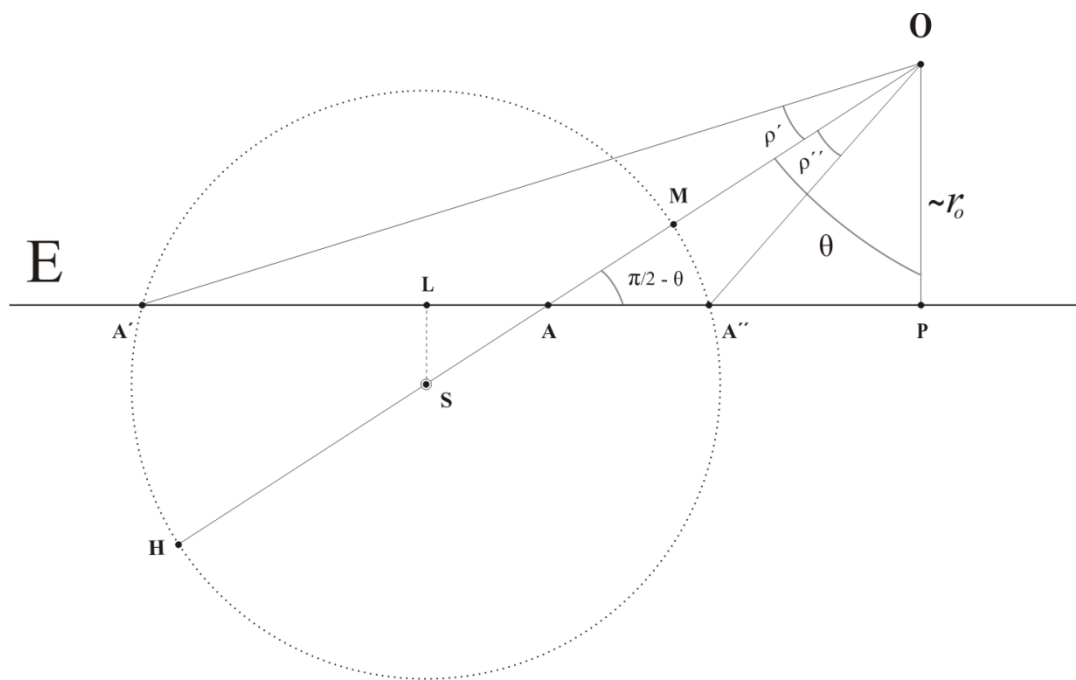


Figure 1.6.15

Applying a similar reasoning as in the case of the superluminal speeds, we are led to the equations:

$$OM = \frac{OA}{1+b} , \quad MA = \frac{b}{1+b} \cdot OA , \quad OH = \frac{OA}{1-b} , \quad AH = \frac{b}{1-b} \cdot OA \quad (1.6.30)$$

where $b = v/c < 1$.

The radius of the Apollonian Circumference is calculated as:

$$R = \frac{b}{1-b^2} \cdot OA \quad (1.6.31)$$

Indeed $R = OA$, when $b = G.S. = 0,618033988\dots$

The constant distance of its center, S, from the straight line E is:

$$SL = \frac{b^2}{1-b^2} \cdot r_0 \quad (1.6.32)$$

Also, we have: $\sin\rho' = \sin\rho'' = b \cdot \cos\theta \quad (1.6.33)$

and $\cos\rho' = \cos\rho'' = \sqrt{1-b^2 \cdot \cos^2\theta} \quad (1.6.34)$

Therefore: $\rho' = \rho'' \quad (1.6.35)$

After a series of calculations, we arrive at:

$$OA' = \frac{OA}{\sqrt{1-b^2 \cdot \cos^2\theta} - b \cdot \sin\theta} \quad (1.6.36)$$

And finally:

$$OA'' = \frac{OA}{\sqrt{1-b^2 \cdot \cos^2\theta} + b \cdot \sin\theta} \quad (1.6.37)$$

Equations (1.6.36) and (1.6.37) were placed in a frame because, as I explained earlier, they are fundamental for Quantum Mechanics. Please note that **the absolute value** of angle θ will be used.

Examining the Unified Field, in the absence of the Strong field, where $\tan \varphi = v/c$, we get:

THE FORM OF THE UNIFIED FIELD, IN THE ABSENCE OF THE STRONG FIELD, FOR $v < c$

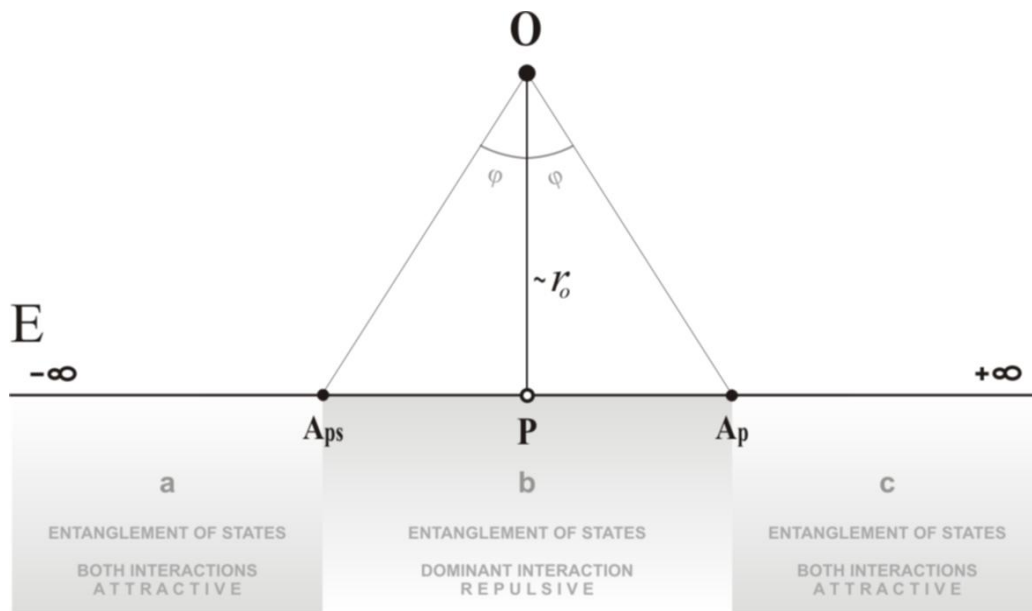


Figure 1.6.16

Thus, in Region b, the interaction from one conjugate **is attractive**, being always **less strong than** the one corresponding to the other conjugate, which **is repulsive**. Only when the position coincides with the PF at P, the two interactions become **equal in measure**.

When the Strong Field appears, defined by angle n , then the various Regions are defined by the two **boundary** angles θ_{on1} and θ_{on2} , which result if we follow the same reasoning we used in the case of superluminal speeds.

Thus, for these two boundary angles we have:

$$\tan \theta_{on1} = \frac{b + \sin n}{\cos n} \quad (1.6.38) \quad \text{and} \quad \tan \theta_{on2} = \frac{b - \sin n}{\cos n} \quad (1.6.39)$$

It is obvious that the boundary point A_{on1} is always located **outside** the Strong Field; however, this is not always true for A_{on2} . In order for A_{on2} to be located outside the

Strong Field, it must be: $\frac{b - \sin n}{\cos n} \geq \tan n \Rightarrow \sin n \leq \frac{b}{2}$

Thus, we are lead to the first category to be examined:

III. A. CATEGORY: $n \leq \arcsin\left(\frac{b}{2}\right)$

Here, the Field takes the following form:

THE FORM OF THE UNIFIED FIELD FOR $v < c$ AND $\sin n \leq \frac{b}{2}$

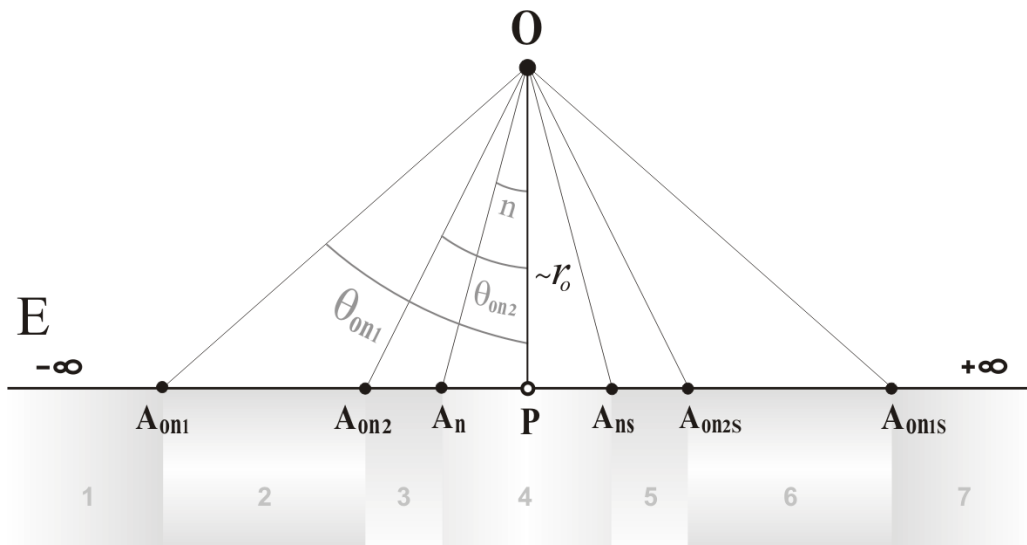


Figure 1.6.17

CAUTION! The numeration of Regions here is **not related** to the numeration of the Regions of the superluminal and luminal speeds (categories I & II).

REGION 1

When the material point travels along interval $-\infty A_{on1}$, **both** its conjugates are observable, located before A_n . Thus an **entanglement of states** occurs and both interactions are **attractive**.

REGION 2

When the material point travels interval $A_{on1} \div A_{on2}$, one of its conjugate positions (A'') has entered the Strong Field. Thus based on the Third Quantum Mechanics Proposition **it is neither observable** nor does it create interaction. The observable conjugate position is A' which is **outside** the Strong Field. Thus, **we do not have entanglement of states** and the only interaction is **attractive**.

REGION 3

When the material point travels interval $A_{on2} \div A_n$, then both its conjugates are located **outside** the Strong Field, hence they are both **observable**. There exists **entanglement of states** and the dominant interaction is **repulsive**.

REGION 4

When the material point travels interval $A_n \div A_{ns}$, it is located **inside the Strong Nuclear Field**, i.e. the "Region of Truth". The position **coincides with its conjugate** and the interaction is purely Newtonian **attractive** and central (without "deflection").

REGION 5

Everything about Region 3 applies here too.

REGION 6

Everything about Region 2 applies here too.

REGION 7

Everything about Region 1 applies here too. This is to be expected, **because our Space (Geometric) is Projective** and thus Region 7 cannot possibly differ from Region 1.

Investigation :

As $\sin n < b/2$, we conclude that **the Strong Field is not observable**.

Also, since $L_2 = L_6 = L_n$, Regions 2 and 6 are also not observable. The same applies to Regions 3 and 5. However the combinations of Regions: 2+3, 3+4, 4+5, 5+6 are **«barely observable»**.

In the special case where $\sin n = b/2$, hence $A_{on2} \equiv A_n$, Regions 3 and 5 disappear and the form of the Field resembles the form shown in the next Category. Here, the Strong Field and Regions 2 and 6 are **"barely observable"**.

III. B. CATEGORY: $\arcsin\left(\frac{b}{2}\right) < n \leq \arcsin(b)$

In this Category, Regions 3 and 5 disappear, the Strong Nuclear Field is **observable** and Regions 2 and 6 are "**barely observable**"

THE FORM OF THE UNIFIED FIELD FOR $v < c$ AND $\frac{b}{2} < \sin n \leq b$

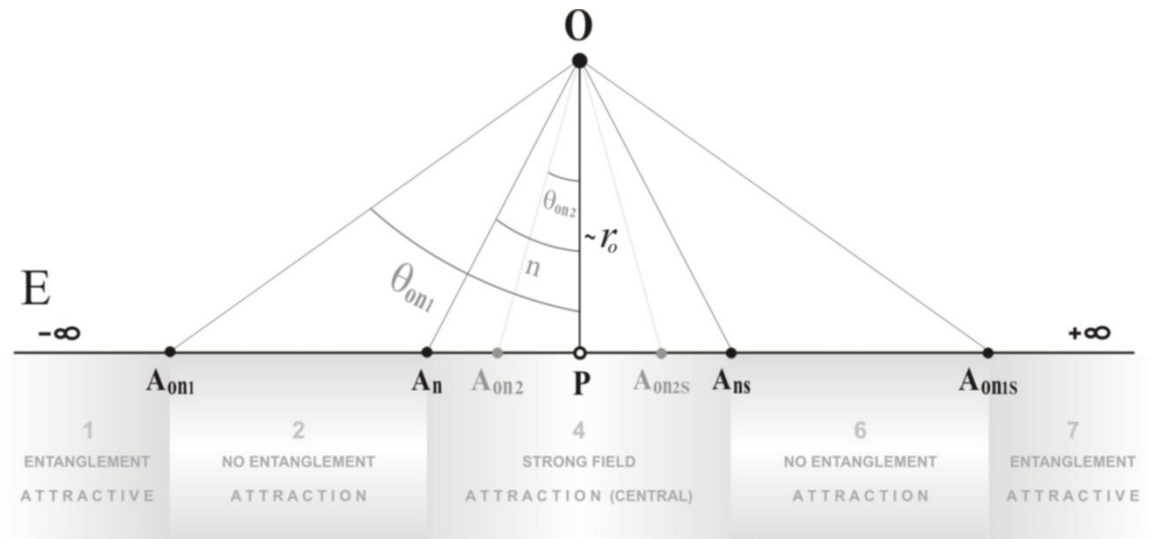


Figure 1.6.18

In the special case where $\sin n = b$, angle θ_{0n2} becomes zero. Of course, this angle does not determine any boundary here.

III. C. CATEGORY: $\arcsin(b) < n$

Here, we encounter an algebraic change as the boundary angles result from the equations:

$$|\tan \theta_{0n1}| = \left| -\frac{\sin n + b}{\cos n} \right| \quad (1.6.40) \quad \text{and} \quad \tan \theta_{0n2} = \frac{\sin n - b}{\cos n} \quad (1.6.41)$$

Apart from that, the Field has the form portrayed in Fig. 1.6.18, the angle θ_{0n2} is **always** less than n , **the strong Field is observable** and Regions 2 & 6 are "**barely observable**".

During our lengthy investigation thus far, we analyzed the form that the Unified Field of Light takes, covering all categories and the whole spectrum of speeds, and isolated the Regions where **entanglement of states** occurs as well as the Regions where **the wave function collapses**, i.e. when either one or both conjugate positions **are located within the Strong Field**.

We also considered, that when the position is located **within** the Strong Nuclear Field, it coincides **now** with its conjugate and, conversely, its conjugate **now is in itself the position**. However, precisely here a vital question arises:

Could it ever be possible for the present to cancel the past?

And to become more specific:

Let us imagine that the moving material point A, has just passed **boundary** point A_n and has just entered the Strong Field. At that precise moment its "image" (and interaction) "**instantaneously**" reaches O. **Simultaneously**, however, the material point's "image" (and interaction) originating from its conjugate(s) **that are located outside the Strong Field also** reaches O, where by conjugate(s) we mean the solution(s) provided by the Apollonian circumference for this particular position A.

Let us designate these conjugate positions A' and A'' , corresponding to a given position A and a given speed U , as "*former conjugate positions of A*", so as to distinguish them from the **present** conjugate position of A, which is A itself.

Thus, **only inside the Strong Nuclear Field**, appears a peculiar entanglement (overlap) of position A with either one or even both of its "former conjugates".

I would like to emphasize that up until now, the investigated entanglement of states was only **between conjugate positions**. This newly appearing entanglement, however, **is between position and its conjugate!**

Here of course, hundreds of philosophical analyses could be written claiming that such an entanglement could not possibly exist, because "**WHAT IS**" **supposedly** always prevails upon "**WHAT APPEARS TO BE**" and thus the image of A **inside** the Strong Field, would **cancel that of its conjugate** ("former conjugate") which originates from the conjugate position **outside** the Strong Field.

However, I am not at all sure...

So, I shall investigate this case also, avoiding taking a position on **what really takes place** here. I will simply refer the issue to experimental Physicists. My own reasoning (and knowledge) is simply not enough to provide a documented answer*.

This investigation I call:

IV. INVESTIGATION OF THE STRONG NUCLEAR FIELD

1. In case where $v < c$

It is obvious that in this case, angle n that defines the range of the Strong Field plays a decisive role. Thus:

1.1 For $\sin n \leq \frac{b}{2}$

Both former conjugates A' and A'' are located **outside** the Strong Field, therefore an entanglement of states exists between position A inside the Strong Field and its former conjugates. Angle θ_{on2} is greater than n and the pertinent figure is as follows:

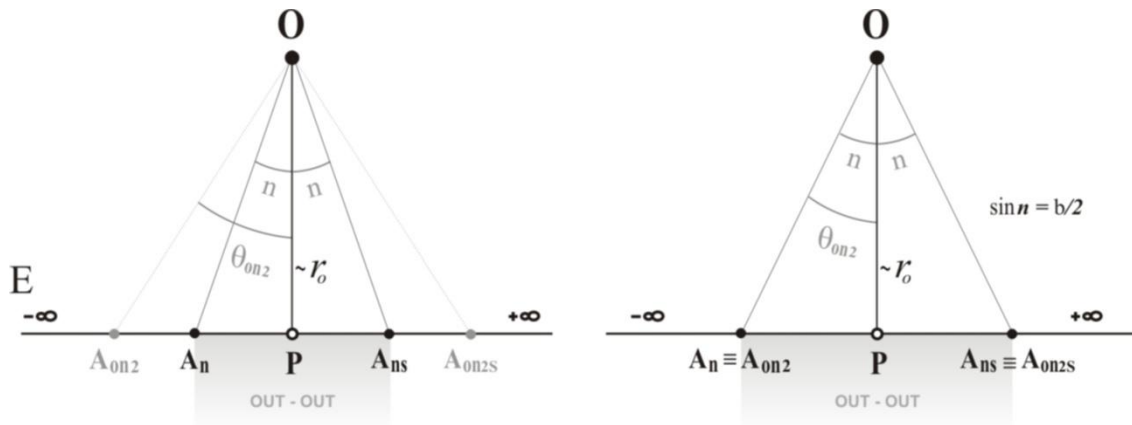


Figure 1.6.19

In the special case were $\sin n = b/2$ then $\theta_{on2} = n$: When in the figure I write OUT-OUT, I imply that both "former conjugates" of a random position located inside the Strong Field, are located **outside** it (hence the entanglement of states).

* Maybe this is the reason Feynman preferred the Babylonian method. No theory can evolve without experience, nor can experience be understood without theory. In conclusion, once more, the common wisdom saying is true: "one hand washes the other, and both of them wash the face".

1.2 For $\frac{b}{2} < \sin n \leq b$

In this case, the following figure applies:

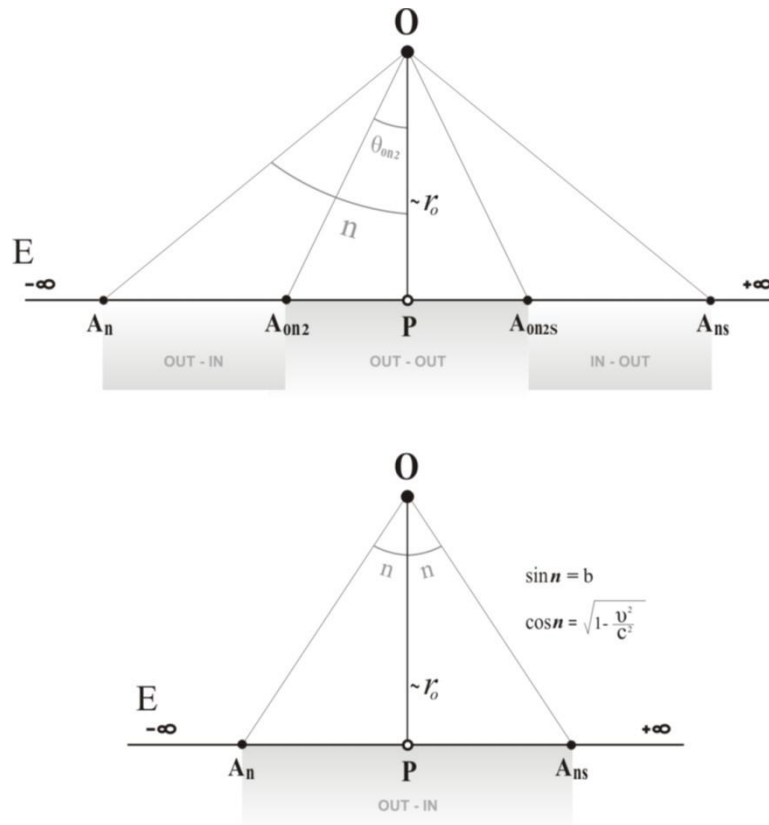


Figure 1.6.20

Here, while the position travels along intervals $A_n \div A_{on2}$ and $A_{on2s} \div A_{ns}$, one of the "former conjugates" is located **outside** the Strong Field and the other **inside** it and thus, an entanglement of states occurs between the position **and one** of its "former conjugate" positions.

In the interval $A_{on2} \div A_{on2s}$, the entanglement of states occurs **between the position and both its "former conjugates"**, because both are located **outside** the Strong Field. In the special case where $\sin n = b$, angle θ_{on2} **becomes zero** and an entanglement of states occurs between the position and one of the "former conjugates".

When the particle is located at the PF, then the two "former conjugates" are located at the limits of the Strong Field. This situation we could call "**entangled coincidence**".

1.3 For $b < \sin n$

Here, angle θ_{on2} is determined by equation (1.6.41) and the figure is as follows:

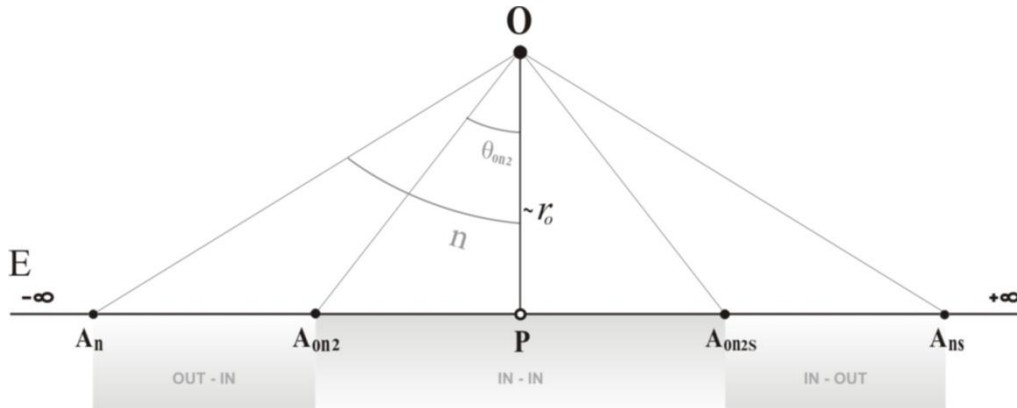


Figure 1.6.21

When the material point is located in the interval $A_{on2}PA_{on2s}$, then **both** of its "former conjugates" are located **inside** the Strong Field (IN - IN); consequently, based on the Third Quantum Mechanics proposition, they are rejected.

Thus in this Region **no entanglement of states** occurs.

Perhaps, it could be also referred to as the Region of the **inner** Strong Nuclear Field or even as the Region of "Absolute (unblemished) Truth".

Could it be that this is the Region that Plato and Paul the Apostle hinted at?

Obviously I cannot provide an answer; however, while observing the "related" Figures 1.6.21 and 1.6.20, where "IN - IN" in one becomes "OUT - OUT" in the other, i.e. where Truth also contains its **previous images** (shadows), there comes to mind the symbol of Yin and Yang which, in its innards, contains also its antithesis!

Well, philosophical reflections are certainly allowed...

Coming back to Physics, let us remember the time that the atomic nucleus was first discovered. Then, we considered it to be compact. Later, we discovered that it had an internal structure. Same thing happened here. First we considered that Region A_nA_{ns} is the Region of Truth. Truth however was "blemished". Finally, we revealed Region $A_{on2} \div A_{on2s}$ of Fig. 1.6.21.

I wonder, is this the final one?

2. In case where $v = c$

2.1 For $\sin n \leq \frac{1}{2}$, $n \leq \frac{\pi}{6}$ (30°) the form of the Strong Field is the following:

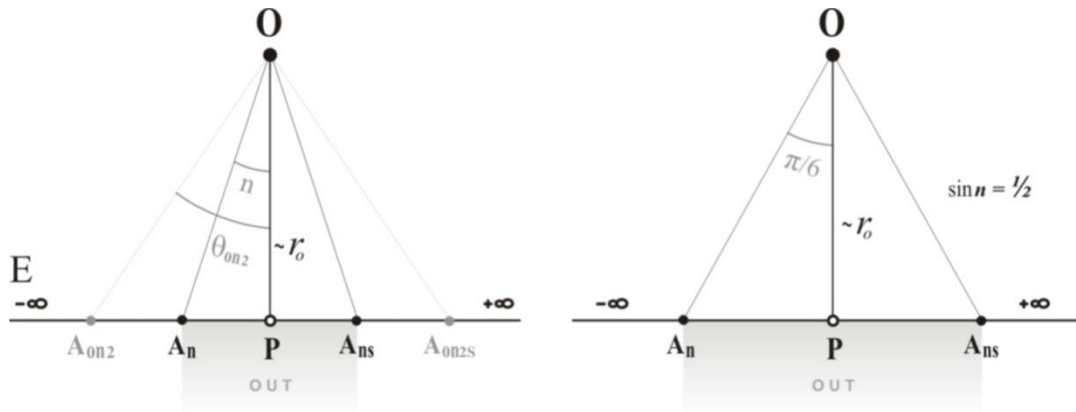


Figure 1.6.22

Here, when the material point is located inside the Strong Field, the "former conjugate" of A' is located **outside** it. Therefore, there is a position-conjugate position entanglement.

2.2 For $\sin n > \frac{1}{2}$

I distinguish two sub-cases:

2.2.1 $\theta \leq \frac{\pi}{4}$

As long as the examined position, located inside the Strong Field, meets the condition above, the form of the Strong Field is:

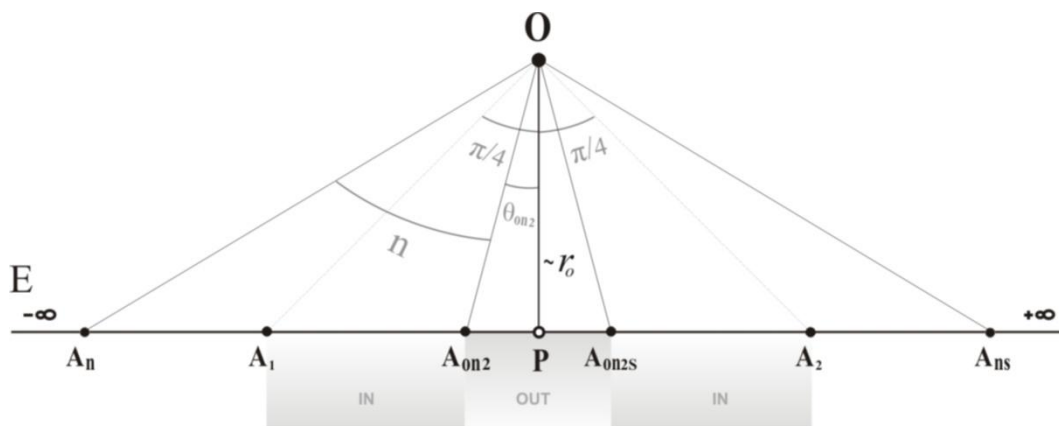


Figure 1.6.23

Where $\tan \theta_{on2} = \frac{1 - \sin n}{\cos n}$.

Thus, when the material point travels intervals A_1A_{on2} and $A_{on2s}A_2$, a "former conjugate" does exist **inside** the Strong Field and, consequently, **no position-conjugate position entanglement** occur.

In contrast, when the material point is within the interval $A_{on2}PA_{on2s}$, there is a "former conjugate" position **outside** the Strong Field and, consequently, a position-conjugate position **entanglement** occurs. The Field **at its center** is influenced by the "former conjugate" position.

The emerging analogy of shape 1.6.23 to the Yin-Yang symbolism is indeed impressive...

2.2.2 $\theta > \frac{\pi}{4}$

Here for **each** position A within the Strong Field (where it must be $n > \pi/4$), the "former conjugate" is located **inside** the Strong Field, and thus no position-conjugate position **entanglement** occurs.

3. In case where $v > c$

At superluminal speeds, the facts are "enriched" by the appearance of the **Region Void of Any Field**, which must be taken into consideration.

Thus, in all the Categories with indicator "1" (A1, B1, C1), where $n \leq \omega$, there is not a position-"former conjugate" **entanglement**, simply because the "former conjugate" position has no real meaning, as the Apollonian Circumference **does not have any real intersection points** with straight line E.

It should be noted that the investigation of the rest of the Categories of superluminal speeds is of no significant interest, and thus is left to those readers wishing to occupy themselves with it...

I apologize once again, as I know that I have exhausted you.

However, Chapter 6 may have been tedious, but it was also fascinating.

We shed some light on the Greatest Mystery of modern Physics, by interpreting both the entangled states of "WHAT IS" and the collapse of the wave function that freely occurs in **Nature**, utilizing the new methods that the Theory of Harmonicity first introduced in Physics. What remains, is to investigate the collapse of the wave function that occurs in a **factitious** way, i.e. the one that we face during experiments.

We shall elaborate on the Principles of this investigation in the following chapter.

However, the legacy of Chapter 6 is not exhausted in this book.

The reader may feel reassured that all those complicated figures were certainly not drawn without a reason. I believe that in the not so distant future, precisely from these figures **a new Physical reality** will emerge, not accessible by established perceptions and all kinds of "doctrines".

For the time being, the only thing I need to stress is that, through the preceding analyses, we've laid down the necessary conditions for the dethronement of all those **"gods" and "demons" of modern Physics** and their replacement with... Geometry.

It seems that Albert Einstein's dream of **"geometrizing"** Physics, starts being realized ...one step at a time.

CHAPTER 7

THE NEW FUNDAMENTAL THEOREMS OF QUANTUM MECHANICS THE CONIC SECTIONS - THE NATURAL INTERPRETATION OF THE INTEGERS IN QUANTUM THEORY

“...μικρόν γ’ ἐλέξας βασιλικού σηκόν τάφου·
διπλάσιος ἔστω, του καλού δε μη σφαλείς
δίπλαζ’ ἕκαστον κώλον εν τάχει τάφου.”

Unknown Ancient Greek Tragic Writer*

I. THE NEW FUNDAMENTAL QUANTUM MECHANICS THEOREMS - CONIC SECTIONS

Consider (fig. 1.6.15) material point A moving on the Projective Straight Line E with speed v , **measured with the LASC**, and lower than the speed of light c $\left(b = \frac{v}{c} < 1\right)$.

For a particular observer at O, a particular position A, and a given measure of speed v , the Apollonian circumference yielding as solutions the conjugate positions A' and A'' is **one and only one and singly-defined**.

* These words, according to the unknown tragic writer, are supposed to be spoken by King Minos of Crete, whom he depicts on the theatre stage instructing an architect to build a cube-shaped grave for his son, Glaukos. When King Minos was told that the edge of the grave would be a hundred feet, he thought it small for a royal tomb and gave the architect the above instruction to double it in size. Moreover, he also indicated to him how to do that: by immediately doubling each edge of the grave. By doing so however, he ended-up with a grave not double, but... eight times the size of the one originally suggested by the architect. Thus here we are presented, for the first time in written history, with the problem of doubling a cube, that is to say constructing a cube double in volume to the one originally given. Later, the Delians were also faced with the same problem in their effort to double the cubic altar of the God of Light Apollo located in the island so that, on the advice of the Holy Oracle, to be delivered from some plague. Since then, this particular Problem was named (and has remained so in history) as the "**Delian Problem**". Many ancient Greek mathematicians and engineers studied it. One of them was Menechmos (375-325 BC), a student at the Plato Academy who, while working on the solution, invented the **conic sections**. Subsequently, the baton was passed to Apollonius of Perga, whose brilliant noetic conceptions, while researching the Conics, brightened the entire Mathematical Science. (See 1. I. Panayiotis Ladopoulos, "Elements of Projective Geometry" Greek Mathematical Library, Second Volume, 2nd Issue, Athens, p. 111 and 2. Evangelos Stamatis "The Conics by Apollonius" Technical Chamber of Greece Publications, Athens, 1975, Introduction).

As $v < c$, it follows that the pair A, ∞ **separates** the pair of the conjugates A' and A'' . Therefore, position A is **always** located "between" points A' and A'' .

Thus, once points O and A are given and for a given measure of speed v , there result two solutions A' & A'' (conjugate positions), at which the observer O **simultaneously sees** the moving material point (First Quantum Mechanics Proposition).

If we now reverse the above statement and consider conjugate positions A' and A'' as well as speed v ($v < c$) as given, I pose the following Question:

Which is the Geometric Locus of the Observer's Positions O , from which a material point moving on the Projective Straight Line E at a given measure of speed v ($v < c$) **appears simultaneously** at two given points A' and A'' of the said Projective Straight Line?

Answer: Suppose A is the Position. This position and the point at infinity of Projective Line E **separate** the conjugate pair. Moreover the following relations are in effect:

$$\frac{A'A}{A'O} = \frac{v}{c} = b \quad (1.7.1) \quad \text{and} \quad \frac{A''A}{A''O} = \frac{v}{c} = b \quad (1.7.2)$$

I consider the intervals at absolute value.

Thus, it is of no consequence whether I write $A'A$ or AA' , etc. Said intervals will be considered as having a sign **only** when placed within parentheses.

From (1.7.1) and (1.7.2) we get:

$$\frac{A'A}{A'O} = \frac{A''A}{A''O} \quad (1.7.3)$$

Therefore:

$$\frac{A'A}{AA''} = \frac{OA'}{OA''} = \lambda_e \quad (1.7.4)$$

thus:

$$\frac{A'A}{AA''} + 1 = \frac{OA'}{OA''} + 1 = \lambda_e + 1 \quad (1.7.5)$$

Therefore:

$$\frac{A'A + AA''}{AA''} = \frac{OA' + OA''}{OA''} = \lambda_e + 1 \quad (1.7.6)$$

I set $A'A + AA'' = A'A'' = 2\gamma =$ given and constant, thus:

$$OA' + OA'' = 2\gamma \cdot \frac{OA''}{AA''} \quad \text{and based on (1.7.2) I conclude:}$$

$$OA' + OA'' = \frac{2\gamma}{b} \quad (1.7.7)$$

Therefore, as the **sum** of the distances of the Observation positions from the given points A' and A'' remains constant, it follows that:

The Position of Observation O "registers" on the Plane an Ellipse having as foci points A' and A'' , i.e. with a focal distance of $A'A'' = 2\gamma$.

Establishing the elements of the ellipse:

If we symbolize the major semi-axis with α and the minor one with β , we have:

$$\alpha^2 = \beta^2 + \gamma^2 \quad (1.7.8)$$

Also, we have: $2\alpha = OA' + OA''$ consequently, based on (1.7.7), $2\alpha = \frac{2\gamma}{b}$, hence

$b = \frac{\gamma}{\alpha}$ But, as the ratio $\frac{\gamma}{\alpha}$ is by definition the eccentricity ε of the ellipse, it follows:

$$\varepsilon = \frac{\gamma}{\alpha} = b = \frac{v}{c} \quad (1.7.9)$$

Based on the above I formulate the:

FIRST NEW FUNDAMENTAL QUANTUM MECHANICS THEOREM

The Geometric Locus of the Observation positions from which a material point moving on the Projective Straight Line E, at subluminal speed v measured by the LASC, appears to be simultaneously at two given points A' and A'' , is on the Plane, an Ellipse, which has A' and A'' as foci and eccentricity $\varepsilon = b = \frac{v}{c}$.

As both the foci and the eccentricity are given, the ellipse is **fully defined**.

Also, as the assumed plane is **random**, it follows:

FIRST COROLLARY

The Geometric Locus of the Observation positions from which a material point moving on the Projective Straight Line E at subluminal speed v measured by the LASC, appears to be simultaneously at two given points A' & A'' is, in 3D-Space, the Ellipsoid surface created by the rotation of the aforementioned Ellipse around its focal axis (Ellipsoid of Revolution).

Drawing this particular Ellipse in the following page (Fig. 1.7.1), I place in parentheses the coordinates of its peaks as well as those of its **foci** A' and A'' , relatively to a Cartesian coordinate system having as beginning its center K.

Because $(KA'') = \gamma$, $(KB) = \beta$, $(BA'') = \alpha$, it follows that:

$$\sin \omega = \frac{\gamma}{\alpha} = b = \frac{v}{c} = \varepsilon \quad (1.7.10)$$

Therefore: $(KB) = \beta = \sqrt{\alpha^2 - \gamma^2} = \alpha \cdot \sqrt{1 - \frac{\gamma^2}{\alpha^2}} = \alpha \cdot \sqrt{1 - \frac{v^2}{c^2}} \quad (1.7.11)$

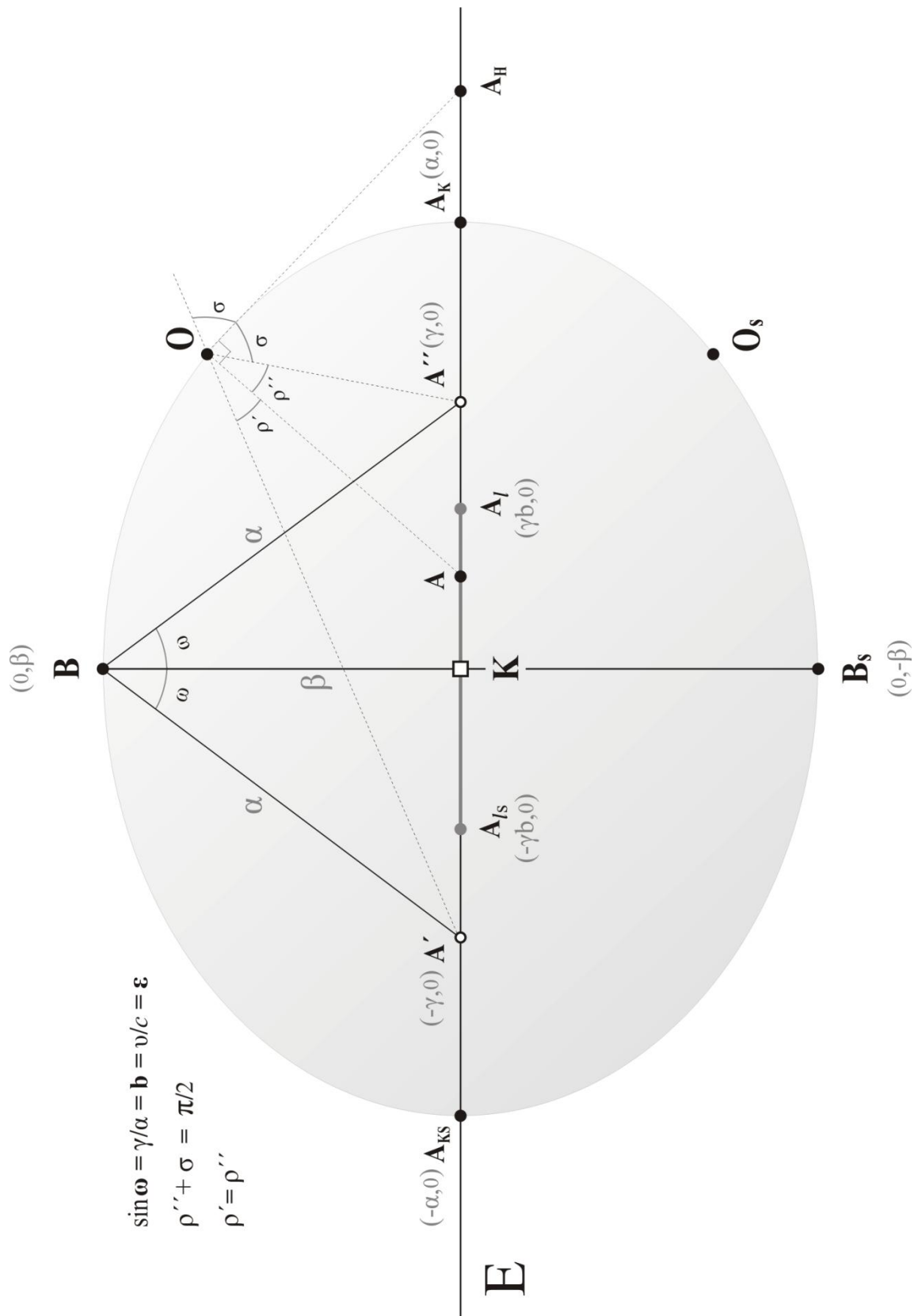


Figure 1.7.1

Thus, it follows:

SECOND COROLLARY

The minor (secondary) axis of the aforementioned ellipse equals its major (primary) axis contracted by the Lorentz Contraction factor.

Let us now follow how the events unfold when the Observer at position O travels along the perimeter of the ellipse:

If we momentarily exclude the peaks of the ellipse A_K and A_{KS} that lie on the primary axis, then for each position O on the ellipse, there is **only one** position A of the material point. Indeed, we observe that position A results by drawing the bisector* of the angle formed by OA' and OA'' , which bisector meets straight line E at **one and only point**, the corresponding position A. If, for example, the observation position O coincides with peak B, then position A of the material point coincides with center K of the ellipse which, **specifically** in this case, is the Foot of the Perpendicular.

Let us thus consider a random observation position O on the conic. I draw the focal radiuses OA' and OA'' and the bisector of the angle they form, OA. The intersection of this with E specifies the corresponding position A. I now draw the tangent to the ellipse at position O. Now suppose that the tangent meets the Projective Straight Line E at a point A_H which obviously lies outside the ellipse. Based on the known property of the conics i.e. that "*The tangent at point M of an ellipse or a hyperbola bisects the angle of the focal radiuses at point M*"⁵⁷, I conclude that the AOA_H angle is a **right angle**. Thus, I formulate the:

THIRD COROLLARY

The tangent of the conic section at any random position of Observation is perpendicular to the corresponding moving ray.

It is noteworthy that the above statement is also true **for both boundary positions** A_K and A_{KS} , which we had temporarily excluded from our consideration.

By applying the Bisector Theorem to the triangle $OA'A''$, we get:

* See Fig. 1.6.15

57. Panayiotis Ladopoulos, "*Elements of Projective Geometry*" Greek Mathematical Library, Second Volume, 2nd Issue, Athens, p. 126.

$$\frac{A'A}{AA''} = \frac{A'A_H}{A''A_H} = \frac{A'O}{A''O} = \lambda_e \quad (1.7.12)$$

Thus, for the **signed** double ratio it follows that:

$$(A_H AA''A') = \frac{(A_H A'')}{(A''A)} : \frac{(A_H A')}{(A'A)} = \frac{(A_H A'')}{(A_H A')} : \frac{(A''A)}{(A'A)} = \frac{1}{-\frac{1}{\lambda_e}} = -1 \quad (1.7.13)$$

This is because the points A_H, A, A'', A' form a harmonic tetrad.

In other words, point A_H is the **conjugate harmonic of A** in relation to A' and A'' , while A is the **conjugate harmonic of A_H** in relation to A' and A'' *.

Thus, I formulate the:

FOURTH COROLLARY

The pairs of position (A) of a moving material point and the intersection of the tangent of the conic, at the corresponding Observation position, with Projective Straight Line E (A_H), lie at Involution.**

* I have selected "H" (**H**armonious) as an indicator, because A_H is the conjugate harmonic of position A in relation to A' και A'' .

** **Involution** is a Transformation. Its definition is the result of another Transformation, which is called **Transformation of Projectivity** or simply **Projectivity**.

During the development of Projective Geometry, there have been many definitions of Projectivity. I only mention the historically oldest definition of Poncelet, which, however, is not fully accepted: "Two geometric formations are called projective, when we can move from one to the other via a finite number of acts of projection and intersection." In order to comprehend our subject the analytical definition of Projectivity between two sets of points in line is sufficient: Suppose two sets of points $\sigma (A, B, C, \dots)$ and $\sigma' (A', B', C', \dots)$. If (X_1, X_2) are the projective coordinates of a random point M of σ and (X'_1, X'_2) the projective coordinates of a random point M' of σ' , the equations $\rho X'_1 = \alpha_{11} X_1 + \alpha_{12} X_2$, $\rho X'_2 = \alpha_{21} X_1 + \alpha_{22} X_2$ (I), where a_{ij} ($i, j = 1, 2$) are real numbers that fulfill the

condition $\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} \neq 0$ and where $\rho \neq 0$, define a one-to-one relation between the points of the two

sets of points in line. This relation or this transformation is called **Projectivity (II)**.

Suppose now two overlapping projective point series in line S and S'. By applying the Projectivity **II** on a random point A_1 of S we move to point A'_1 of S'. Suppose that A'_1 of S' coincides with point A_2 of S. By applying the Projectivity **II** for the second time on A_2 we move to point A'_2 of S'. If $A'_2 \equiv A_1$, then the said Projectivity is called **Cyclical Projectivity of the second order, or, Involution**.

Thus, for Involution it holds that: $\mathbf{II}^2 \equiv 1$ as well as the statement:

"Involution is a Projectivity, not by congruence, coinciding with its reverse". (See Panagiotis Ladopoulos, "Elements of Projective Geometry", Volume I; A. Karavias Publications, Athens, 1966, p. 124, 125, 127 and 172, 173, 174).

We realize that when the Observation position coincides with peaks B or B_S on the secondary ellipse axis, then A_H **coincides** with the point at infinity of Projective Line E. This is to be expected since the corresponding A position coincides with the center K, which is the mid-point of the focal distance A'A'' and, as we know, the conjugate harmonic of the mid-point of a segment in relation to its ends is located at infinity.

We also observe that when the Observation position O, moving on the conic, approaches a peak on the primary axis, e.g. the A_K, the corresponding position of material point A approaches the corresponding focal point A''. However, when the Observation position O lies at "its nearest" to A_K, position A **does not lie at "its nearest" to focal point A''**.

This is because position A, which **always** lies on the bisector of the corresponding angle of the focal radiuses, must satisfy the equation (1.7.12) and therefore at the boundary, that is when position O coincides with A_K, position A lies at a boundary position A_l^{*}, such that:

$$\frac{A'A_l}{A_lA''} = \frac{A'A_K}{A''A_K} = (\lambda_e)_{\max} = \frac{\gamma + \alpha}{\alpha - \gamma} = \frac{1 + \frac{b}{c}}{1 - \frac{b}{c}} = \frac{1+b}{1-b} \quad (1.7.14)$$

So, if X is the Cartesian abscissa of point A_l it should follow that:

$$\frac{\gamma + X}{\gamma - X} = \frac{1+b}{1-b} \Rightarrow X = \gamma \cdot b \quad (1.7.15) \quad \text{or} \quad \boxed{KA_l = \gamma \cdot b} \quad (1.7.16)$$

The same occur, due to symmetry, also when the Observation position coincides with the other peak on the primary axis A_{Ks}. Then, the corresponding **boundary** point of position A is symmetrical to A_l in relation to K, the A_{ls}, and it follows:

$$\frac{A'A_{ls}}{A_{ls}A''} = \frac{A_{Ks}A'}{A_{Ks}A''} = (\lambda_e)_{\min} = \frac{\alpha - \gamma}{\alpha + \gamma} = \frac{1 - \frac{b}{c}}{1 + \frac{b}{c}} = \frac{1-b}{1+b} = \frac{1}{(\lambda_e)_{\max}} \quad (1.7.17)$$

* A_l = A_{limit}

Let us follow the motion of position A, while the Observation position O completes a full rotation on the conic.

Suppose that initially the observation point O lies at peak B on the secondary axis. Then the position of the material point lies at K. Suppose that O moves clockwise, i.e. A moves to the right. When O reaches A_K , A lies at A_I and is "reflected" there. When O reaches B_S , A returns to K. When O lies at A_{KS} , A reaches A_{I_S} and is "reflected". Finally, when O returns to B, A returns to K.

Thus, then when the Observation position O completes a full rotation on the conic, position A registers a **full oscillation** within the interval $A_{I_S}A_I$, i.e., it registers interval $2.(A_{I_S}A_I) = 4.\gamma.b$.

Based on all of above, we reach the following conclusion:

While, to every Observation position O corresponds one and only one position A, to each position A correspond (in general) two Observation positions, symmetrical to the focal axis.

Thus, given position A, in order to find the two corresponding Observation positions, we act as follows:

We locate the conjugate harmonic of A in relation to the focal points, A_H , and with diameter AA_H we draw the **Apollonian Circumference**, hence its two (in general) intersections with the ellipse specify the sought Observation positions O and O_S which are symmetrical to the Projective Straight Line E (focal axis).

In both cases above I noted "in general" because in the special case of the Observation positions O coinciding with the peaks on the primary axis A_K και A_{KS} , there is no intersection but the corresponding Apollonian is **internally tangent** to the conic*.

However, the most important conclusion of the aforementioned analysis, which may have seemed inordinately detailed and tiring, is this:

* *The almost obvious proof of why this is true is left to the reader.*

The position A of the moving material point has **limited freedom of motion** in order for the **simultaneous** Observation at the given points A' & A'' to be valid, i.e., for the **entanglement of the conjugate positions**. Thus, position A may move not within the entire focal interval A'A'', but within the interval A_lsA_l, which equals the focal interval contracted by the factor $b = v/c$.

We are thus led to the:

FIFTH COROLLARY

When the material point lies within the (Euclidean) intervals A'A_ls and A_lA'', it is not possible for it to be simultaneously Observed at the given points A' and A''. In other words, within the above intervals, the wave function collapses.

Finally, we understand that boundaries A_l and A_ls are determined by the transition to the state of a "RoT Observer", as that was defined in Chapter 1, because they were specified by the boundary Observation position when the latter was located on the Projective Straight Line E.

Let me repeat that, even though it may be seen as superfluous:

Point A_l is the position of the moving particle, which appears at points A' και A'' to an Observer (RoT) located at the Observation position A_K.

Indeed:

$$\frac{A'A_l}{A'A_K} = \frac{\gamma + \gamma b}{\gamma + \alpha} = \frac{\gamma(1+b)}{\alpha(b+1)} = \frac{\gamma}{\alpha} = b = \frac{v}{c} \quad \text{q.e.d}$$

and also:

$$\frac{A''A_l}{A''A_K} = \frac{\gamma - \gamma b}{\alpha - \gamma} = \frac{\gamma(1-b)}{\alpha(1-b)} = \frac{\gamma}{\alpha} = b = \frac{v}{c} \quad \text{q.e.d}$$

Please note that the aforementioned proposition is also valid for boundary A_ls and the corresponding (RoT) Observer located at position A_{Ks}.

Let us now follow the motion of point A_H , the conjugate harmonic of A, in relation to the two focal points. It is obvious that A_H moves **in the opposite direction** to A and, furthermore, it appears **on both sides** of the Projective Straight Line E, having first passed from its point at infinity.

Consider X_H the Cartesian abscissa of A_H and X of A, then:

$$\frac{A'A}{AA''} = \frac{A'A_H}{A''A_H} \Rightarrow \frac{X + \gamma}{\gamma - X} = \frac{\gamma + X_H}{X_H - \gamma} \quad \text{therefore:}$$

$$X \cdot X_H = \gamma^2 \quad (1.7.18)$$

It was naturally expected for the above equation to result as simple and symmetrical (it represents an isosceles hyperbola), as A_H and A are connected by **Involution**.

By derivation in relation to time the variable velocity of A_H results as:

$$v_H = -\frac{\gamma^2 \cdot v}{X^2} = -\frac{X_H^2 \cdot v}{\gamma^2} \quad (1.7.19)$$

It is obvious that v_H is **superluminal**. Its **minimum** absolute value results when A coincides with boundary A_l (or A_{l_s}) and then its measure becomes:

$$|v_H|_{min} = \frac{c^2}{v} \quad \text{and } A_H \text{ coincides with } A_K \text{ (or } A_{K_s}).$$

The equations of the directrices* of the ellipse are: $x = \pm \frac{\alpha^2}{\gamma}$.

Thus, when A_H coincides with the intersection between the directrix bearing the $x = \frac{\alpha^2}{\gamma}$ equation and straight line E, it obviously has $X_H = \frac{\alpha^2}{\gamma}$ as the Cartesian abscissa.

* The directrix is the **polar** of the focus. The ellipse is the geometric locus, on the plane, of the points whose ratio of the distance from the focal point and the corresponding directrix is a constant and equal to the eccentricity ($\epsilon < 1$). The ellipse and the hyperbola have two directrices while the parabola has only one.

Then the abscissa of the corresponding position, let us call it A_δ , is:

$$x_\delta = \frac{\gamma^2}{\alpha^2} = \frac{\gamma^3}{\alpha^2} = \frac{b^3 \cdot \alpha^3}{\alpha^2} = b^3 \cdot \alpha^*$$

Let us then observe the consecutive segmentations appearing in our Problem, which strongly remind us of Zenon's consecutive segmentations, the Russian babushkas and fractals: **

1. The primary semi-axis α of the ellipse, contracted by the factor v/c , gives the focal semi-axis γ $\left(\gamma = b \cdot \alpha = \frac{v}{c} \cdot \alpha \right)$

2. The latter, contracted by the same factor v/c gives half the interval of the motion of A, such that it allows for the wave following function:

$$\left[KA_l = b \cdot \gamma = b^2 \cdot \alpha = \left(\frac{v}{c} \right)^2 \cdot \alpha \right].$$

3. The previously mentioned half-interval contracted by the same factor v/c yields the abscissa of point A_δ which is the conjugate harmonic, in relation to the focal points, of A_H when this lies on the directrix of the conic.

$$\left[KA_\delta = b \cdot KA_l = b^2 \cdot \gamma = b^3 \cdot \alpha = \left(\frac{v}{c} \right)^3 \cdot \alpha \right] !!!$$

But, how far could these consecutive segmentations go?

In his own way, this is exactly what the great Zenon of Elea also wondered.

This is the **exact** same question that burdens us also, already from Chapter One.

We observe that the consecutive segmentations are not three but practically "**infinite**", where, by descending the orders one by one, the following occur:

The abscissa of A_H on the directrix of the lower order is the abscissa of the peak A_K of the order immediately higher.

* Also, this statement is valid: When A_H lies on the directrix and hence position A lies at A_δ then the corresponding Observation position O is perpendicularly projected on the corresponding focus (A''). The proof of why this is true is left to the reader.

** Just like the shape structure of cauliflowers or broccoli.

The abscissa of peak A_K of the lower order is the abscissa of focal point A'' of the order immediately higher.

The abscissa of focal point A'' of the lower order is the abscissa of the boundary A_l of the immediately higher order.

The abscissa of the boundary A_l of the lower order is the abscissa of A_δ of the immediately higher order.

Thus, while the ellipses become ever so smaller, they remain **similar**.

And which is the smallest?

Could it constitute a point...?

Let us now consider what happens at superluminal velocities.

Consider (fig. 1.6.2) material point A moving on the Projective Straight Line E with speed v , measured with the LASC, higher than the speed of light c ($B = v/c > 1$).

For a particular Observer at O, a particular position A, and a given measure of the speed v , the Apollonian circumference yielding as solutions the conjugate positions A' and A'' is **one and only one and singly-defined**.

As $v > c$, it follows that the pair $A_{,\infty}$ **does not separate** the pair of the conjugates A' and A'' , **provided that those exist**. And this is so because, especially here, every Apollonian does not really share any true intersection points with the Projective Straight Line E, since it may very well "hang in the air". Thus, in order to have true A' and A'' solutions, it is necessary and sufficient for the angle θ , formed between the moving ray OA and the perpendicular OP, to be **larger (in absolute value)** than the boundary angle ω , where $\cos \omega = \frac{c}{v}$ (See Chapter 5).

Thus, when points O and A are given and for a given measure of speed v , and provided that $\theta > \omega$, the result is two solutions A' και A'' (conjugate positions), at which the Observer O **sees simultaneously** the moving material point. (First Quantum Mechanics Proposition).

If we now reverse the above syllogism and regard the conjugate positions A' and A'' as given and the measure of the material point's speed v also given, (where $v > c$), I pose the following Question:

Which is the Geometric Locus of the Observation Positions O, from which a material point moving on the Projective Straight Line E at a given measure of speed v ($v > c$) **appears simultaneously** at two given points A' and A'' of the said Line?

Answer:

Suppose A is the position. This position and the Projective Line E point at infinity **do not separate** the conjugate pair. Moreover the following relations are in effect:

$$\frac{A'A}{A'O} = \frac{v}{c} = B \quad (1.7.20) \quad \text{and} \quad \frac{A''A}{A''O} = \frac{v}{c} = B \quad (1.7.21)$$

I consider the intervals at absolute value.

Thus, it is of no consequence whether I write A'A or AA', etc.

The intervals will be considered as having signs **only** when located within parentheses.

As of (1.7.20) and (1.7.21) it results:

$$\frac{A'A}{A'O} = \frac{A''A}{A''O} \quad (1.7.22) \quad \text{therefore:} \quad \frac{A''A}{A'A} = \frac{A''O}{A'O} = \lambda_h \quad (1.7.23)$$

$$\text{and so:} \quad \frac{A''A}{A'A} - 1 = \frac{A''O}{A'O} - 1 = \lambda_h - 1 \quad (1.7.24)$$

$$\text{Thus:} \quad \frac{A''A - A'A}{A'A} = \frac{A''O - A'O}{A'O} = \lambda_h - 1 \quad (1.7.25)$$

I pose $A''A - A'A = A''A' = 2\gamma =$ given and constant, so:

$$OA'' - OA' = 2\gamma \cdot \frac{A'O}{A'A} \quad \text{and, based on (1.7.20), I conclude:}$$

$$OA'' - OA' = \frac{2\gamma}{B} \quad (1.7.26)$$

Therefore, as the **difference** of the distances of the Observation positions O from the given points A' and A'' is constant, it follows that:

The Position of Observation O "registers" on the Plane an Hyperbola having as foci the points A' and A'', i.e. with a focal distance of A'A'' = 2γ.

Finding the hyperbola elements:

If we symbolize the primary semi-axis with α and the secondary one with β, we have:

$\gamma^2 = \alpha^2 + \beta^2$ and the hyperbola equation relative to a Cartesian system of coordinate axes having the center K as its beginning and the focal axis as the abscissa x axis, is:

$$\frac{X^2}{\alpha^2} - \frac{y^2}{\beta^2} = 1 \quad (1.7.27)$$

By applying the equation (1.7.26) for one of the hyperbola peaks, it results:

$\alpha + \gamma - (\gamma - \alpha) = \frac{2\gamma}{B} \Rightarrow \frac{\gamma}{\alpha} = B > 1$. But, the ratio $\frac{\gamma}{\alpha}$ is by definition the eccentricity ε of the hyperbola, therefore:

$$\varepsilon = \frac{\gamma}{\alpha} = B = \frac{v}{c} \quad (1.7.28)$$

Based on the above I formulate the:

SECOND NEW FUNDAMENTAL QUANTUM MECHANICS THEOREM

The Geometric Locus of the Observation positions from which a material point moving on the Projective Straight Line E at superluminal velocity v, as measured by the LASC, appears to be simultaneously at the two given points A' and A'', is, on the Plane, an Hyperbola which has A' and A'' as foci and eccentricity

$$\varepsilon = B = \frac{v}{c}.$$

As both the foci and the eccentricity are given, the hyperbola is **fully defined**.

Also, as the assumed plane is **random**, it follows:

SIXTH COROLLARY

The Geometric Locus of the Observation positions from which a material point moving on the Projective Straight Line E at superluminal velocity ν , as measured by the LASC, appears to be simultaneously at two given points A' and A'' , is, in 3D Space, the Hyperboloid surface generated by the rotation of the above Hyperbola around its focal axis (Hyperboloid of Revolution).

For the secondary semi-axis of the hyperbola, it holds that: $\beta^2 = \gamma^2 - \alpha^2 = \alpha^2 \cdot (B^2 - 1)$.

$$\text{Therefore: } \beta = \alpha \cdot \sqrt{B^2 - 1} = \alpha \cdot \sqrt{\frac{\nu^2}{c^2} - 1} \quad (1.7.29)$$

So, if $B = \sqrt{2}$, then the hyperbola is isosceles ($\beta = \alpha$).

The equations of the asymptotes of the hyperbola are:

$$\frac{x}{\alpha} - \frac{y}{\beta} = 0 \quad (1.7.30) \quad \text{and} \quad \frac{x}{\alpha} + \frac{y}{\beta} = 0 \quad (1.7.31)$$

Therefore, the **oblique angle** ω of the asymptotes with the focal axis results from:

$$\tan \omega = \frac{\beta}{\alpha} = \sqrt{B^2 - 1} \Rightarrow \cos \omega = \frac{1}{B} = \frac{c}{\nu} \quad (1.7.32). \quad \text{Thus, I formulate the:}$$

SEVENTH COROLLARY

The oblique angle formed by each of the hyperbola asymptotes with its focal axis equals angle ω , which is formed by the boundary moving ray of point A_0 and the perpendicular, which ray corresponds to the Apollonian Circumference which is tangent to the Projective Straight Line; in other words $\cos \omega = c/\nu$ (Beginning of the Space Void of Any Field).*

Let us now draw the hyperbola.

* See Chapter 5. Angle ω is the angle of the Cerenkov radiation to the direction of the particle motion, which particle is regarded as the cause of the phenomenon. Also, this angle defines the region where Dark Matter exists (Space Void of any Field).

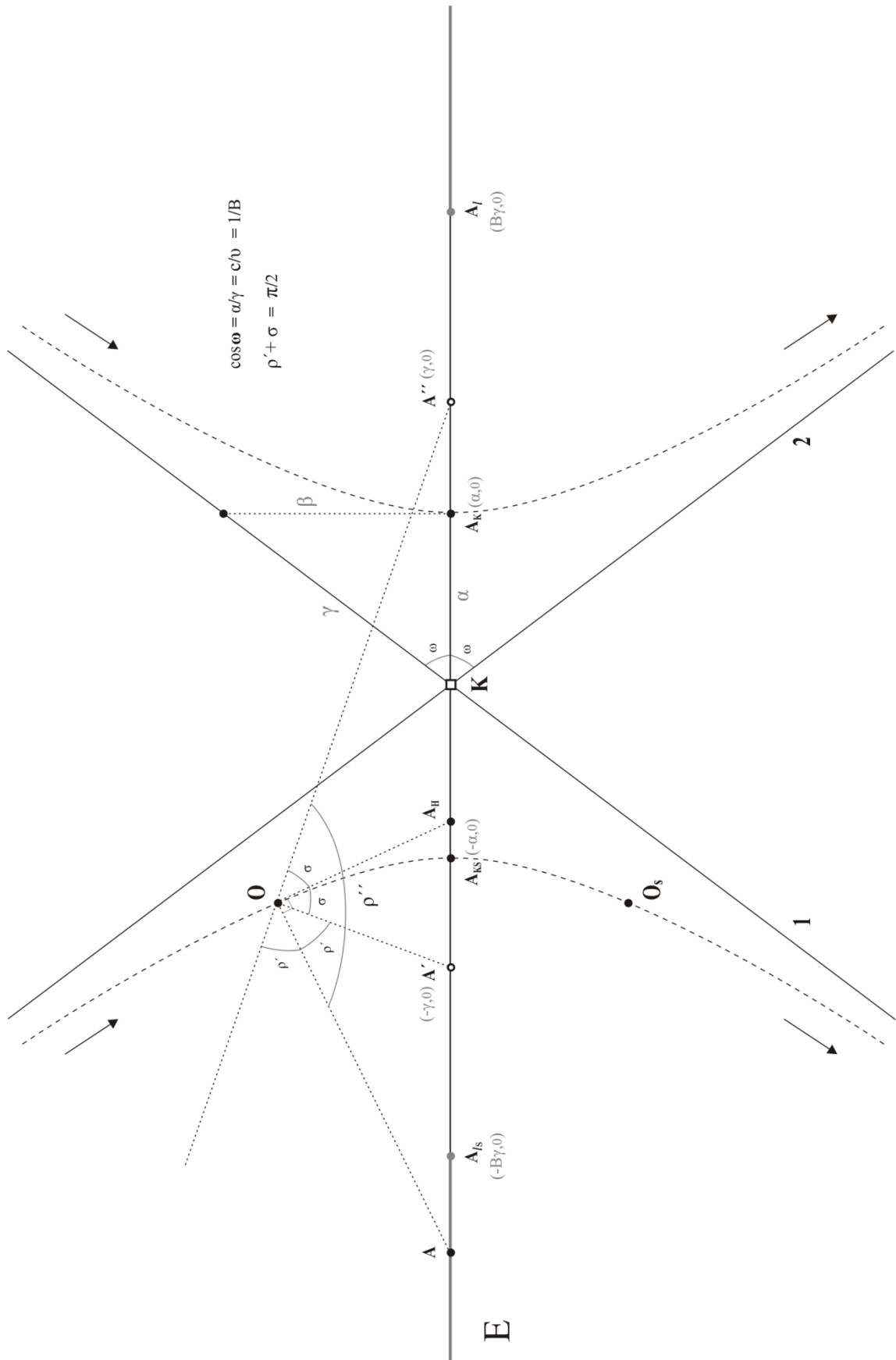


Figure 1.7.2

In Fig. 1.7.2, I put in parentheses the coordinates of the hyperbola peaks and foci, in relation to the previously selected Cartesian coordinate system.

Consider a random observation position O on the conic. I draw the focal radiuses OA' and OA'' . As we realized in the previous chapter, if A is the corresponding position of the moving material point, then $\rho' + \rho'' = \pi$ and therefore OA **bisects** the angle between OA' and the extension of $A''O$. Thus, with the Observation position O given, we locate position A by drawing this bisector. Thus:

To each Observation position O , corresponds one and only one position A .

It is understood that, for now, we exclude the two peaks A_K and A_{KS}

I now draw the tangent of the conic at the Observation position O and suppose that this intersects the Projective Straight Line at a point A_H . As the tangent bisects the focal radiuses angle, it results that angle AOA_H is a **right angle**.

Thus, in the case of the hyperbola, the already formulated third corollary remains also valid.

This is the reason why when formulating this corollary and the one that follows, I do not specify the kind of conic.

By following a similar thinking to the one applying to the ellipse, we come to realize that points A and A_H are conjugate harmonic in relation to the foci and therefore:

In the case of the hyperbola, the fourth corollary remains also valid.

Therefore, for a given position A , in order to locate the corresponding Observation position O , we first locate A_H (the conjugate harmonic of A in relation to the foci) and using AA_H as diameter we draw the Apollonian Circumference, whose intersections with the **respective branch** of the hyperbola yield the two corresponding Observation positions O and O_s , which are symmetrical in relation to the focal axis. Thus:

For each position A of the moving material point, there are two corresponding Observation positions O , symmetrical relatively to the focal axis.

When the Observation position O approaches peak A_{KS} , position A approaches focal point A' , while the conjugate harmonic position A_H moving in the reverse direction approaches peak A_{KS} .

When the Observation position O is at its nearest to A_{KS} the same is true for position A_H ; however, position A of the moving material point does not approach at its nearest the corresponding focal point A' for the same reason we've shown in the case of an ellipse. Hence there is a **boundary** position A, be it A_{I_s} , such that:

$$\frac{A_{I_s}A''}{A_{I_s}A'} = \frac{A_{KS}A''}{A_{KS}A'} = (\lambda_h)_{\max} = \frac{\alpha + \gamma}{\gamma - \alpha} = \frac{B+1}{B-1} = \frac{\frac{v}{c} + 1}{\frac{v}{c} - 1} \quad (1.7.33)$$

Thus, it follows that the abscissa of point A_{I_s} is $-B \cdot \gamma$.

Exactly the same holds true for the opposite branch:

$$\frac{A_I A''}{A_I A'} = \frac{A_K A''}{A_K A'} = (\lambda_h)_{\min} = \frac{\gamma - \alpha}{\gamma + \alpha} = \frac{B-1}{B+1} = \frac{\frac{v}{c} - 1}{\frac{v}{c} + 1} = \frac{1}{(\lambda_h)_{\max}} \quad (1.7.34)$$

Thus:

$$KA_I = \gamma \cdot B \quad (1.7.35)$$

Freedom of motion of position A is limited in this case too. Thus, although position A can move within the interval $A' \infty A''$, when it is located within the (Euclidean) intervals $A' A_{I_s}$ and $A_I A''$ there is no possibility of **simultaneous** Observation of the material point at the two given points A' and A'' . In other words, within the above intervals, **the wave function collapses**. Thus:

In the case of the hyperbola, the fifth corollary remains also valid.

Here, the ascertainment that the boundaries A_I & A_{I_s} are determined by the transition to the state of the RoT Observer located **on** the Projective Straight Line E, is also valid. Moreover, I remind the reader it also remains valid that positions A_I και A_{I_s} correspond to the positions of the moving material point, that appears **simultaneously** at points A' and A'' to a RoT Observer located at points A_K and A_{KS} respectively.

I kept for the end the motion study of the Observation position along the hyperbola, because this is a case entirely different from the case of the ellipse. The ellipse is a closed curve, hence, when the Observation position completed a full rotation along it, the corresponding position of the material point performed a full oscillation **within the finite** interval $A_I A_{I_s}$, "drawing" the said interval twice.

Let us then consider what happens when Observation position O moves on the hyperbola.

Suppose that the initial position is A_{KS} and that the Observation position moves along the left branch in a **clockwise** direction. (See arrow direction of the left branch). When position O coincides with A_{KS} , it also coincides with A_H , the material point's position being $A_{I,S}$. While O continues to descend along the left branch, position A moves left-wise and A_H moves right-wise, approaching center K.

When position O reaches **the first hyperbola point at infinity, where the asymptote No 1 is tangent***, A is located at the point at infinity of Projective Line E, while A_H is located at K. Subsequently, position O appears on the right branch of the hyperbola descending from the **top** towards peak A_K , position A approaches boundary A_I from the right and A_H continues to move to the right approaching peak A_K

Thus we have an **apparent** reversal of direction, since the right branch arrows move **anti-clockwise**.

Caution, however!!

The rotation has not been fully completed. Therefore we are not facing the phenomenon we considered in chapter 4, where we studied the spin concept.

As the reader himself can also ascertain, Observation position O, after passing from the second hyperbola point at infinity where the asymptote No 2 is tangent, finally **returns** to its original position following the **original** (clockwise) direction.

Thus, when position O performs a full rotation on the conic, the moving position A has covered the **infinite interval** $A_{I,S} \infty A_I$ "drawing" it twice and thus completing a full oscillation, while its conjugate harmonic A_H has completed a full oscillation within the **finite interval** $A_{KS}KA_K$ "drawing" it twice, i.e., covering the distance $4\alpha = 4\gamma/B$.

* *Menaichmos knew the existence of the hyperbola asymptotes. Moreover, Archimedes proved many of their properties. Their essential singularity was understood by Apollonius who formulated and proved statements like: "The asymptotes and the intersection moving ad infinitum closely approach each other and the entire given interval reaches the smallest interval".*

The first who considered the hyperbola asymptotes as tangents to its points at infinity is Gerard Desargues who, in his work "Brouillon project d' une atteinte aux evenements des rencontres d' un cone avec un plan", introduced the point at infinity. However, that required... 18 centuries to pass!! (Note p. 189) (See Panayiotis Ladopoulos "Elements of Projective Geometry" Volume 2, op. cit. p. 138).

Suppose X and X_H are the Cartesian abscissas of points A and A_H respectively. Then, by applying the same reckoning as in the case of the ellipse, we conclude:

$$X \cdot X_H = \gamma^2 \quad (1.7.36)$$

Which is exactly the same as (1.7.18).

The **variable** speed of A_H results from:

$$U_H = -\frac{\gamma^2 \cdot U}{X^2} = -\frac{X_H^2 \cdot U}{\gamma^2} \quad (1.7.37)$$

which is **subluminal**.

Its **maximum** absolute value occurs when A lies at the boundary A_l or A_{ls} and A_H at the corresponding peak of the conic and is $|U_H|_{max} = \frac{c^2}{U}$, which is indeed subluminal.

At this crucial point, I feel compelled to pose a very serious issue, which I also consider of **key importance for the in-depth comprehension of the structure of the World**.

In my previously published works* and already from the 1st chapter of this book, either by calling upon the great noetic conceptions of Zenon or by simply improvising, I have strived persistently and patiently to support the position that:

**As hard as it is for someone "to reach for and touch" infinity,
it is just as hard "to reach for and touch" absolute zero.**

Having gone so far, I believe that now is the time, especially after our more recent considerations, to turn to a tangible example.

* *Dionysios G. Raftopoulos, "Theory of the Harmonicity of the Field - The nuclear interaction and the dual-nature of the World without -ons and without dice" in the Bulletin of the Hellenic Association of Mechanical & Electrical Engineers, issue 122, Dec.1981 and 125 Mar. 1982.*

Let us then follow the motion of point A_H , conjugate harmonic of position A of the moving material point in relation to the foci of the hyperbola.

A_H moves between the peaks of the conic. On peak A_{KS} it "bounces", with a speed of $|v_H|_{max} = \frac{c^2}{v}$ which is subluminal, and moves towards center K, **decelerating**. The moment it reaches K its speed is zero and, after passing it, it **begins to accelerate** again until it eventually reaches the opposite peak A_K having, by that time, acquired a speed of $|v_H|_{max} = \frac{c^2}{v}$.

If we calculate the time taken for this journey, on the basis of the motion equation (1.7.37), we discover to our astonishment that this time is **infinite!!!**

To the following justified question "*what is the reason for the journey time to become infinite?*", I give the following answer with no hesitation:

Zero!

In other words the fact that the speed of A_H , becomes zero at K as required by the specific kinematics equation.

It is almost certain that the reader must be really perplexed by now!

The weirdness of what I have just implied could be best illustrated by the following example: while traveling on a toll-free road, the moment I pass point A_{KS} with subluminal speed c^2/v I begin to gradually decelerate until I reach point K, where my speed becomes zero (and where in time dt I manage to drink a ...very quick cup of coffee), and immediately after I start to accelerate again until I finally reach point A_K , having regained my initial speed of c^2/v , **with the entire traveling experience requiring infinite time!!**

That is to say that we are confronted with the paradox of needing **infinite** time in order to cover a **finite** distance at a **finite** albeit variable speed which, just once, was simply zeroed ...**FOR JUST A SINGLE MOMENT!!!**

The reader shall be further perplexed if I also claim that the time for **half this journey**, i.e., from K to A_K, is also infinite.

Indeed, within this interval the kinematics equation is:

$$v_H = \frac{v \cdot X_H^2}{\gamma^2} \Rightarrow \frac{dX_H}{dt} = \frac{v}{\gamma^2} \cdot X_H^2 \Rightarrow dt = \frac{\gamma^2}{v} \cdot \frac{dX_H}{X_H^2}$$

Therefore, the journey Time was:

$$t_{K-A_K} = \frac{\gamma^2}{v} \cdot \int_{X_H=0}^{X_H=\alpha} \frac{dX_H}{X_H^2} = -\frac{\gamma^2}{v} \cdot \left[\frac{1}{X_H} \right]_{X_H=0}^{X_H=\alpha} = -\frac{\gamma^2}{v} \cdot \left[\frac{1}{\alpha} - \frac{1}{0} \right] = \frac{\gamma^2}{v} \cdot \left[\frac{1}{0} - \frac{1}{\alpha} \right] = \infty$$

q.e.d.

Thus, it seems that we are confronted with a repetition of Zenon's "Arrow Paradox".

As long as, **each and every moment** the moving arrow is motionless, then it shall **always** be motionless. If during my road trip I stop, even for **a single moment**, at point K then I shall **never** reach point A_K!

Surely, there seems to be an error hidden somewhere and a serious one at that.

However, prior to detecting the error, let us first try to comprehend the concept of time tending to infinity, without the use of integrals.

We have shown that points A and A_H are "**Projectively**" correlated and moreover by "**Involution**" (one is the conjugate harmonic of the other in relation to the foci). Thus these 2 points are absolutely entangled **and the motion of one is strictly correlated to the motion of the other.**

Therefore, during the time period in which point A covers the interval A_{I_S}∞A_I, point A_H covers the interval A_{K_S}K_{A_K}. However, the interval A_{I_S}∞A_I is **infinite** and the speed *v* of A is constant and **finite**, albeit superluminal. Thus, the time required for A to cover the interval A_{I_S}∞A_I is infinite. Moreover, as in the **same amount of time**, A_H covers the finite interval A_{K_S}K_{A_K}, it follows that this time is also infinite, *q.e.d.*

So, we have come to discover **an entirely new way** of comprehending Zero induced Infinitude, **without the use of zero.**

It suffices to simply study the behavior of the "entangled" position.

Needless to say the reverse method is also valid whenever it is more convenient to use the Zero concept to evaluate Infinitude

However, the reasonable question rises:

Why do these "mathematical anomalies" (the infinitude of time) not also appear in the case of the ellipse where **also**, while Observation position O completes a full rotation of the ellipse, point A_H **"draws" twice** the infinite interval $A_{K_S} \infty A_I$?

The answer is simple and clear:

Because in this case, when A_H passes through infinity, **it has infinite speed.**

In the case of the ellipse, the finite speed v of position A does not lead to Time infinitude, because there position A covers a **finite** interval $(2A_I, KA_I)$.

If we call the combination of the following events:

- a. the full rotation of Observation position O on the ellipse,
- b. the full oscillation of A within the **finite** interval A_I, KA_I and
- c. the full oscillation of A_H within the **infinite** interval $A_{K_S} \infty A_K$,

"The Process", then the total time for this "Process" in the case of the ellipse is:

$$T_e = \frac{2 \cdot (A_{I_S} KA_I)}{v} = \frac{2 \cdot 2\gamma b}{v} = \frac{4\gamma b}{v} = \frac{4\gamma \cdot \frac{v}{c}}{v} = \frac{4\gamma}{c} \quad !! \quad (1.7.38)$$

Thus I come to formulate the rather odd but extremely important:

EIGHTH COROLLARY

The Time required for a complete "Process" on an Ellipse is independent of speed v of the moving material point and, therefore, independent of the size and shape of the Ellipse and equals the time of a return trip of light between given points A' and A'' (its foci).

Thus, within the above **finite time**, not only does Observation position O complete a full rotation, not only does the moving material point position A cover **twice** the finite journey $A_{Is}KA_t$, but additionally its conjugate harmonic A_H covers **the infinite distance** $A_{KS} \infty A_K$ **twice!**

I believe that the importance of the above corollary to the future development of the New Physics shall become evident with the passage of time.

Let us now return to the initial equation (1.7.26) $OA'' - OA' = \frac{2\gamma}{B} = \frac{2\gamma}{v/c} = \frac{2\gamma \cdot c}{v}$,

based on which we concluded that the sought Geometric Locus was an hyperbola, and let us imagine that the superluminal velocity v of the material point increases without limit. While this happens, the conic **tends to coincide** with its asymptotes which, with angle ω ($\cos \omega = c/v$) also increasing and **tending towards 90°** , **tend to also coincide**, while the difference $OA'' - OA'$ tends to become zero.

Thus, I formulate the:

NINTH COROLLARY

When the superluminal velocity of a material point moving on the Projective Straight Line tends to infinity, the Geometric Locus of the Observation Positions from which it appears to be simultaneously at two given points A' and A'' is:

- 1. On the Plane, the perpendicular line onto the middle of interval $A'A''$.**
- 2. In Space, the perpendicular plane onto the middle of interval $A'A''$.**

In the case of the material point moving at a velocity **equal to the speed of light** c , our data is not sufficient to calculate the Geometric Locus.

This is so because, as I have explained in detail in chapter 4, with position A and Observation position O given, in **finite Space** there is **one and only one real** conjugate position A' , which lies at the intersection of the perpendicular bisector of the moving ray OA (MA' , fig. 1.4.1) and the Projective Straight Line E.

Furthermore, at that point I suggested two possible explanations:

1. Either to consider A' a **double** solution.
2. Or to consider that A'' lies on the Projective Line E 's point at infinity, i.e. the second intersection point of E and MA' , the latter to be regarded as a "degenerated" Apollonian Circumference.

If we accept the second explanation, then the second focal radius OA'' is parallel to the Projective Straight Line E and, thus, the Geometric Locus is a **Parabola** with A' as focal point since, as we know, the Parabola is a conic whose second focal point has moved to infinity.

Nevertheless, the Geometric Locus is not specified since there are an infinite number of parabolas with a given axis and a given focal point A' . We therefore need further information (e.g., the peak of the parabola, the position of its directrix, etc.), in order to accurately specify said Locus.

So, there is an inherent indeterminacy while trying to specify the Geometric Locus in the case of motion at the speed of light, even though we know its form. Obviously, the inherent indeterminacy is due to the fact that A'' lies at infinity, i.e. to the fact that, although we do know **towards which direction** it lays, we are unable to pinpoint its **exact** position.*

Prior to bringing this first section on the conics to an end, I feel I owe an explanation concerning the cause of the "error" in relation to my previously formulated proposition, the one corresponding to the "Arrow Paradox" of Zenon of Elea: *If during my road trip I stop, even for a single moment, at point K then I shall never reach point A_K !*

I am certain that those readers who, already in previous chapters, carefully followed my persistent questioning concerning the ability to divide, ad infinitum, the cosmic elements, must have already located the error source.

The error is entirely due to our notion that a "Moment in Time" (dt) TRULY exists.

Where dt is, in an established fashion, taken to mean as small **as we wish** it to be. Yet, in the **Real World**, **it is simply not possible** to continue dividing Space, Time and Matter **ad infinitum**.

* Here, I remind the reader that although we cannot "see" infinity, we can indeed "look" **towards** the point at infinity of the Straight Line E .

I have already stated it more than once, but I shall not tire of repeating it:

You cannot slice the salami further, once the remaining piece's width is **smaller than the width of the knife blade**.

So, since there is no true "Moment in Time" (dt), I can never really reach **exactly at K**, where my speed ought to "momentarily" be **exactly zero**.

Thus, during my imaginary road-trip, I can never succeed in enjoying a "momentary" coffee break at point K as I will never "arrive" there **exactly**; I will simply "overpass" it and eventually I shall reach my destination at Point A_K .

Achilles, in Zenon's paradox, will **never** really reach the Turtle's position **exactly**. He will simply "overpass" it. This simple "over passing" was elevated to the rank of a grant "Administrative Measure" by modern Physics when it named it:

"Pauli's Exclusion Principle".

But we shall return to this extremely important issue in the future.

For centuries now, humanity has been nursed on the infinitesimal noetic conceptions of Archimedes, Newton and Leibnitz, **all of whom divided the World ad infinitum** at will, and has essentially ignored the SOS signs emitted by Zenon of Elea as well as Leucippus and Democritus with their incomplete, albeit ingenious solution.

Already from the introduction of this book, I pointed out the **fundamental distinction** between the **Geometric Space**, i.e. the purely noetic, and the **Perceptible Space**, i.e. the space of our Experience, the space of Reality.

Once again, I stress that this distinction is **absolutely essential** if we wish not to succumb to contradictions and absurdities.

In the Noetic Space, you **can** keep on dividing ad infinitum.

In the Noetic Space, the mathematical Zero and mathematical Infinity **both exist**.

Yet in the Real, Perceptible Space, no physical dimension can ever be measured to be **exactly zero** or **exactly infinite**.

I trust that the above position is crystal clear. Moreover, I dare suggest that the terms "**practically zero**" and "**practically infinite**", as frequently used by engineers, be also introduced in physics.

Allow me to provide here a tangible example from the engineering world.

It is well known that the satellite antennas are considered parabolic mirrors. This is so because we consider that the received signal (photons) comes from infinity, i.e., it moves in parallel to the focal axis of the parabola, is reflected on its surface and reaches its focal point, where it is picked up by the amplifier. If photons did not move in parallel to the focal axis, the reflection to the focal point would not occur.

Still the photons, all come from a satellite **which does not lie at infinity**, even though the mathematics on which the antenna construction was based “consider” its position at infinity.

So, in order for the concepts to be clear, we should always say that the satellite lies "practically" at infinity.

Perhaps, in order not to get confused in distinguishing the two separate domains, Noetic - Perceptible, we ought to propose that:

All Science or, at the very least, Physics should be limited to the Perceptible World.

However, I fear that such a proposal, **although in total harmony with the object of study** of Physics, would be rather unfortunate, as the **Noetic World** constitutes by far the best "tool" Man has ever invented (or received as a gift from the Creator), in order to comprehend the Perceptible World.

Thus, we are probably destined to exist and function within both Worlds in parallel.

For as long as we do not start to confuse them!

Perhaps it is this destiny of ours that constitutes the quintessence of Human Reason, i.e. the tool exploited in full by the Ancient Greek Thought and helped create the first **Purely Noetic Science, the EUCLIDEAN GEOMETRY.**

Rounding up, I must point out that the wealth of mathematical conceptions concerning the conics is vast. Both the Ancient as well as the more Contemporary Mathematicians have formulated thousands of true propositions on the properties of the conic sections, which are not immediately obvious.

Based on those propositions we can, by applying the two fundamental theorems we have already formulated, reach **corresponding** propositions in Physics, be it Theoretical, Applied, the Physics of the Microcosm or the Physics of the Macrocosm.

I wish a multitude of glorious successes to those Researchers Physicists, Astronomers and Engineers who will seek to return to the research of the conics, and who, inspired by the fundamental theorems formulated here, shall either attempt to formulate true propositions concerning the Perceptible World, or invent new practical applications for the well-being, if at all possible, of Humanity at large.

As for me, I shall continue pursuing the Unknown, "picking at the foundations" and if need be even deeper than that, in my effort to comprehend more than anything else the underlying Principles...

II. THE NATURAL INTERPRETATION OF THE INTEGERS IN QUANTUM THEORY

On December 14, 1900 in Berlin, a real cosmogony took place. The top ranking German Physicist Max Planck, facing the German Physics Society, issued a "Military Order":

WE HEREBY DECIDE AND DECREE!

*"An oscillator with a natural frequency ν can receive or emit energy only at quantities $E = h.\nu$, where h is a new fundamental constant of nature".*⁵⁸

Obviously, Planck did not formulate this proposition randomly, on a momentary whim.

It was imposed on him by the need to explain the Experimental (Babylonian) data concerning black body radiation. Thenceforth, this "Order" became the main trunk of the Quantum Theory. Moreover, Planck himself was not indeed enthusiastic about the aforementioned proposition and thus kept on trying, to the very end, to understand and explain the experimental data, without resorting to a "Military Order".

Unfortunately, he failed...

⁵⁸ Eyvind H.Wichmann "Quantum Physics - Berkeley Physics Course", Volume IV, 1967, 1971; McGraw-Hill, Inc, USA.

Later, in 1913, the top Danish Physicist Niels Bohr, in his effort to explain the non-continuous hydrogen spectrum as well as to restore the compatibility of Rutherford's atomic model with Maxwell's Electromagnetic Theory, composed the homonymous hydrogen model, which however was able to "work" and explain the Experimental (Babylonian) data **only** subject to the issuance of a new "Military Order":

WE HEREBY DECIDE AND DECREE!

*"We shall allow the electron of the hydrogen atom to **only** assume those trajectories in which its angular momentum is an integer multiple of the $h/2\pi$ quantity".*

Years later in 1927, another top German Physicist, Werner Heisenberg, while probing the measuring problem of the Quantum World, after an arduous and comprehensive analysis, realized that there were **limits to the accuracy of the measurements** of the dynamic quantum dimensions; he therefore proceeded in issuing an "Administrative Measure"^{*}, since established as the "*Uncertainty Principle*", which when quantified is expressed with the Uncertainty Relations:

$$\Delta x \cdot \Delta p \geq \frac{h}{4\pi} \quad (1.7.39)$$

that apply to **any** pair of dynamic variables in a quantum system, whose product represents angular momentum. In this case, (1.7.39) it shows the product of the Position Uncertainty times the Momentum Uncertainty.

And of course, the Uncertainty Relations, constitute a purely "Administrative Measure" because:

*"It has to be explicitly understood that no analysis of the measuring procedure in purely classical terms could **ever** lead to the Uncertainty Relation. **The Uncertainty Relations reflect data on nature which were discovered experimentally**".⁵⁹*

And by not forgetting Louis de Broglie's "Military Order" (on the Wave nature of Mater !...) as well as the "Administrative Measure" of W. Pauli's Exclusion Principle,

I believe it is now my turn to voice my frustration:

⁵⁹ E. H. Wichmann, *ibid.* p. 20. The underlining is mine.

^{*}*I remind the reader that the term "Administrative Measures" was first coined by Prof. St. Trachanas, Physics professor in the University of Crete. (See Chapter 4).*

How could we ever allow modern Physics to reach such a state?

On one hand, the Theory of Special Relativity, a theory full of errors and contradictions the sum of which constitutes a grave Insult to Human Reason.

On the other hand, the Quantum Theory which, when it manages not to be a “religion” (complete with gods and demons, i.e. its various elemental particles and antiparticles), resorts to the crutches of "Military Orders" and "Administrative Measures", in order to be able to interpret the Experimental data...

Is this the Science envisioned by its founders, an Aristotle, a Galileo and a Newton?

I am, of course, fully aware of what the great British Mathematician Alfred North Whitehead (1861 - 1947) had once stated:

*A science that is reluctant to forget its founders is condemned.*⁶⁰

With that, however, I could only partially agree!

And I say partially as here we have not just forgotten the founders.

Here, we have trampled on Logic.

Here, we never cease producing "rabbits out of the hat"!

In this day and age, almost every novel Babylonian data requires either the creation of an entirely novel "god" or "demon", or the issuance of a new "Military Order" or, thriftily, the decree of a new "Administrative Measure"!

"Nature loves hiding!", the Ancient Greeks used to say.

I agree! However, this should not be used as an alibi.

I deem it far preferable not to fully understand certain phenomena, than to resort to "cheating"* in order to provide an explanation.

Still, I have to clear up this point also:

⁶⁰ Thomas S. Kuhn, "The Structure of Scientific Revolutions", *ibid*, p. 218.

*By "cheating" I mean operating "beyond the rule of Reason".

Whatever criticism I've voiced so far, in no way does it refer to the Researchers.

I bow with the utmost respect in the presence of **all the Researchers, none excluded**, since I happen to know firsthand the arduous labor, the late nights, the anguish, the voluntary abandonment of many of life's joys, the endless struggle with the "Vague" and the "Elusive", the disappointments, the all-too-frequent rejection and ridicule by the proponents of the "orthodox" view; and all of that in the name of promoting Science.

Whatever they've passed on to us wasn't offered to them as a gift.

They had to conquer it "through iron and fire", and that is the reason **I both respect and honor them**.

My criticism is addressed **solely** to the supporting "Logical Structure".

This is what I don't feel comfortable with.

- Yet, this is the best we have!
- Indeed, but this shouldn't stop us from striving to establish an even better one, i.e. a "Logical Structure" that is both **consistent and fundamentally understandable**.

Let me remind you of Richard Feynman's words:

*"...On the other hand, I can quite safely say,
that no one understands Quantum Mechanics".⁶¹*

This is not a statement made by just anybody; it was made by one of the Greatest Researchers who, as it happens, was also deeply **involved with** the Problem.

It would certainly be extremely naive and would constitute proof of rampant agnosticism if I was to suggest that we do away with "Military Orders" & "Administrative Measures" all at-once. I do, however, have this to suggest:

Let us try to push these propositions **to the limits**. Let us try to transform them into **more general** ones concerning **fundamental** (a priori) concepts. Thus:

- Let us **make them broader and more encompassing**, so that each can incorporate several (at least more than one) "Military Orders" and "Administrative Measures".
- Let us try to **comprehend** them first, because if we do not, broadening them and making them more general, certainly will fail.

⁶¹ Richard Feynman, "The Character of Physical Law", *ibid.* p.111.

In other words, what I suggest is to apply the tested method of the **Ancient Greek Geometricians** (Thales, Pythagoras, et. al.) who, not in the least impressed by the "magic tricks" played with the Geometric Shapes by the Magi* of Babylon and Egypt, attempted, **having first comprehended in depth**, to conceive the Principles and to formulate the General Propositions from which the so called "magical" properties of the Geometric Shapes resulted; they did so, however, **always** confining themselves within the strict boundaries imposed by Logic and Human Reason.

And they were, more or less, successful!

Does anyone wonder how many "Military Orders or Administrative Measures" had to be sidestepped or replaced by Euclid until he formulated that magnificent proposition of his, the fifth Euclidean Postulate?

“Through any given point outside a straight line there passes only one line parallel to it”

- But this is also a "Military Order", some might claim.
- Indeed, the term seems to fit.

However, the concepts contained therein are **fundamental** and therefore it does not constitute a true (partial) "Military Order" but rather a **General Postulate**. "Military Orders" **do not refer to** fundamental concepts. The energy in Planck's proposition and the angular momentum in Bohr's proposition **are not** fundamental (a priori) concepts this being the reason of why I called their propositions "Military Orders".

Furthermore, the Euclidean proposition is fundamental **in its own right** because:

1. For twenty-three consecutive centuries **no one has managed to simplify it**, i.e., to replace it with another, simpler proposition.
2. For twenty-three consecutive centuries **no one has managed to prove it** within the boundaries of the given Logical System. You either accept it or you do not; if you accept it, you open the door and enter the Euclidean World; if you do not, you compose your own Geometry which, however, **is obliged** to explain any "magic trick" by the Magi, **within the boundaries of Human Reason**.

* The term "Magus" (Wizard) did not at that time have the rather derogatory meaning it has today. The three Magi who proffered gifts at Christ's birth, for example, were not some wandering con-men, but rather they were Wise Men, probably Astronomers, of the time.

The Philosophical Line that this research follows is therefore crystal clear. I was inspired not only by both the Ancient and later Geometricians, but also by Albert Einstein himself, in whose work I perceived the anguish concerning the need to "geometricise" Theoretical Physics.

Excluding the introduction of the cosmological constant in the General Relativity Theory (which in fact he withdrew later), Einstein never issued any "Military Orders" or decreed "Administrative Measures" while synthesizing his two Relativity Theories. He set forth his hypotheses and then he "built" on top of them, much the same way Geometry was built. The proposition of the Special Relativity Theory claiming that *"the speed of light is the boundary speed of either matter or energy in Nature"*, does not constitute a "Military Order", but rather a erroneous "conclusion".

In a similar fashion, the remaining contradictory propositions of the above theory are also erroneous, as we have shown in the first and second chapters of this book.

Reasonably then, the question arises:

Which can be considered as **fundamental concepts** in Physics?

In my view, a list of the fundamental concepts in Physics would include:

1. **The Perceptible Space.**
2. **Time**
3. **Light and its Motion**
4. **Matter and its Motion**
5. ?

I deem it is absolutely essential to state once more that the Perceptible Space of the above list, **differs from** the Geometrical (Noetic) Space, as I have stressed several times already in this book. So, one might ask me:

1. Why do I consider the Motion of Light and Matter as fundamental concepts?

Answer: **Because with no Motion Time is meaningless.***

2. Why do I consider Light and Matter as fundamental concepts?

Answer: **Because without Light and Matter, Perceptible Space is meaningless.**

* *"Because it is through motion that we feel time as well". Aristotle.*

The Perceptible Space **is not something that "lives" in our minds** like the Geometric (purely Noetic) Space does. The Perceptible Space is "molded" by Matter and is "conceived" through Light. The Perceptible Space is created by "physical entities", the "Objects" which, however, **need light** in order to become apparent.

If I asked you to show me the Perceptible Space, you would point at **something** in front of you using your finger. Still, in front of you there might a wall, a bicycle, a hill or the sea or a star, or..., or..., therefore:

The Perceptible Space is simply meaningless at the absence of Material Objects.

So, when I asked you to show me the Perceptible Space, you pointed in fact at Objects. I have acquired this perception of Space in Physics while studying Einstein's work⁶² and for this I am grateful to him. Yet, Einstein **did not strictly distinguish** the Perceptible Space from the Geometrical (Noetic) Space which uniquely exists **in its own right** and justifies the development of Geometry as a **self-contained Science**.

A direct consequence of **exactly this** lack of clarity in the distinction between the two Spaces (which, by the way, led Minowski to the conception of the Space-Time monstrosity) was, in my opinion, the "derailment" of theoretical Physics...

The **crucial nature** of the distinction between the Perceptible and the Geometrical (Noetic) Spaces was instilled in me by my professor at the Athens National Technical University, Panayotis Ladopoulos, a brilliant mathematical Mind, who helped me get rid of the inherent in all of us "fear" of "*thinking in the abstract*" and to whom I shall remain eternally grateful*.

⁶² Albert Einstein, "The Princeton Lectures", Korontzis Publishing, Athens.

Ladopoulos performed miracles while teaching Projective Geometry at the blackboard. Magnificent magic tricks unfolded before our eyes, when apparently unrelated points proved to be lying on a straight line and straight lines apparently unrelated to each other ran through the same point; and all of us, extremely impressed, were trying to comprehend how this could be so.

Once a student, representing many of us, dared to ask:

"We have come here to study electrical and mechanical engineering. What is the need for all of this? In what way are the magic tricks of Projective Geometry related to our professional training?"

The wise Teacher then answered with an ironic hint of a smile: "To help you design proper funnels" Many years had to pass so that, through this research project, I would come to understand the irony in his smile and what our Teacher truly meant: "To help you, fools, think in the abstract"...

*By stirring this statement in my mind today I realize the Crime committed and unfortunately still being committed against our children's education, concerning the unwarranted and continuous restrictions in the teaching of Geometry. I think that the inevitable result of this deleterious policy shall be that the school graduates of tomorrow will unfortunately be incapable of "sharing the chaff between two donkeys" without the use of a computer. Young people, some of them scientists, who would not be interested in understanding the **Why**; for whom a superficial description, a ready-to-use "recipe" of **How** would suffice. Young people who, alas, shall not even be capable of noticing, let alone "being disturbed", by the outrage committed on Human Reason [...]*

Finally, one might ask me:

3. Why do I consider the Perceptible Space and Time fundamental concepts?

Answer: **Because without Perceptible Space and Time, the motion of Light and Matter is meaningless, as this motion is actualized only in Space and can only be perceived and measured* through Time.**

Thus with this third answer, **all the concepts that are recorded as fundamental are correlated** to one another and in a way that makes each one essential in providing meaning to the others!

So there appears to be a certain degree of corresponding **similarity** with the first six Axioms (positional axioms) of Projective Space, which **simultaneously** also constitute the **definition** of its fundamental concepts (point, straight line, plane).

You've probably noticed that in the 5th place of my list of the fundamental concepts in Physics, I set a question mark, since I neither know nor can I, for the time being, imagine which this could be, **if indeed it exists.**

Sometime ago, I had considered placing the concept of **interaction** (force) there but I never publicized this view. However, as it has already been emerging from the 3rd chapter of this book and shall be proved explicitly in the 8th chapter, **interaction** (force) **is not a fundamental concept** of Physics, and for that reason I did not include it in the list.

I am almost certain that there shall never be a candidate for 6th position.

I have full confidence in the Intelligence of Man and I hope that he will eventually be able to fully describe the Universe using, at most, five fundamental concepts. After all, he has already managed to describe the Geometric Space with only three ...

Thus, as we set off on the footsteps of the **Ancient Greek Geometricians** in our attempt to transform the various "Military Orders" into Propositions concerning **Fundamental Concepts** of Physics, let us first deal with the "easy" part.

* *"Because this is time, the number which measures the motion before and after" ... Aristotle.*

So let us start with Bohr's proposition, as it is an “easier” introduction to the problem.

From the bibliography I have selected the work of Halliday-Resnick,⁶³ because it offers an easy to understand representation of Bohr's hydrogen atom; thus what I refer to here, originate from that work.

Furthermore, when I use certain equations from that work, apart from the numerical reference of this book, I shall also include their original reference, in parentheses.

Thus, the hydrogen atom according to Bohr, consists of a proton (the core) and an electron, which revolves in a circle around it and is subjected to Coulomb's electrical attraction, i.e.:

$$F = \frac{e^2}{4\pi \cdot \epsilon_0 \cdot r^2} \quad (1.7.40)$$

where e is the elementary electrical charge, ϵ_0 is the dielectric constant in vacuum and r is the radius of the electron circular trajectory. The above electrical force is the accelerating force so, on the basis of Newton's second inertia "law", we have:

$$F = m \cdot \alpha = m \cdot \frac{v^2}{r} \quad (1.7.41)$$

where m the electron mass and v is its speed.*

The combination of (1.7.40) and (1.7.41) leads to the equation:

$$\frac{e^2}{4\pi \cdot \epsilon_0 \cdot r} = m \cdot v^2 \quad (1.7.42)$$

⁶³ David Halliday and Robert Resnick, "Physics Part II", John Wiley & Sons, Inc., New York, 1962.

* We consider the reference system "nailed" on the core. If the reference system is considered "nailed" in the Lab, then the situation changes slightly, because the motion of the core in relation to the Lab has to be taken into account. This change, however, (through the concept of reduction mass) is negligible because the core mass is much larger than the electron mass (1836 times larger).

We thus have an equation with two unknowns r and v , and consequently every trajectory is permissible, as long as the electron adapts its speed in accordance with the above equation.

However at this point the Babylonian (experimental) data **disagree!**

As a consequence of the fact that all trajectories are permissible, all electron rotation frequencies in the atom should also be permissible, the latter regarded as an oscillator. However, the hydrogen atom's (as indeed of all atoms') transmission and absorption spectrum is **non-continuous**. So the experimental data **contradicts** the formulated perception of the electron being free to assume any trajectory.

Moreover, according to Maxwell's Electromagnetic Theory, the accelerating electron should be radiating and, as it constantly loses energy, should eventually fall on the core. Yet, such a collapse of matter is not observed. The atom **is indeed stable!**

So, our perception of the electron being free to assume any distance r from the core is obviously wrong, as it contradicts the experimental data.

Therefore, we seem to be in dire need of an additional Law of Physics, which could negate the contradiction; however, no such Law is immediately apparent.

Still, prior to referring the Problem to the Military Command, let us first see how, on the basis of (1.7.42), some of the atom's natural magnitudes can be expressed in relation to a physical magnitude, which we can freely select as an independent variable.

Let us select radius r as such a magnitude.

Then the remaining physical magnitudes result as:

The speed:
$$v = \sqrt{\frac{e^2}{4\pi \cdot \epsilon_0 \cdot m \cdot r}} \quad (1.7.43) \text{ \& (HR 47-22)}$$

The rotation frequency:
$$\nu = \frac{v}{2\pi \cdot r} = \sqrt{\frac{e^2}{16\pi^3 \cdot \epsilon_0 \cdot m \cdot r^3}} \quad (1.7.44) \text{ \& (HR 47-23)}$$

The momentum:
$$p = m \cdot v = \sqrt{\frac{m \cdot e^2}{4\pi \cdot \epsilon_0 \cdot r}} \quad (1.7.45) \text{ \& (HR 47-24)}$$

The angular momentum:
$$L = p \cdot r = \sqrt{\frac{m \cdot e^2 \cdot r}{4\pi \cdot \epsilon_0}} \quad (1.7.46) \text{ \& (HR 47-25)}$$

The electron's kinetic energy is $K = \frac{1}{2}m \cdot v^2$ while the dynamic energy U of the proton-electron system is $U = V \cdot (-e) = -\frac{e^2}{4\pi \cdot \epsilon_0 \cdot r}$, where V is the Field potential at the electron position.

Thus, the **total energy** of the system is:

$$E = K + U = -\frac{e^2}{8\pi \cdot \epsilon_0 \cdot r} \quad (1.7.47) \text{ \& (HR 47-21)}$$

The negative sign in (1.7.47) appears because the force is attractive, i.e., the electron **yielded** energy to the environment in order to reach distance r from the core (coming from infinity) and, therefore, in order to move away from it, it needs to **obtain** energy from the environment.

Thus, as no Law of Physics is immediately apparent, if we wish our problem solved, now is the time to issue our "Military Order".

Halliday - Resnick wrote:

*"At this stage, Bohr had no rules to follow and so he proceeded (through some indirect justification which we do not present here) with a daring assumption, i.e., that the essential quantization of the trajectory parameters is presented more simply when it is applied to the angular momentum and, especially, that L can have values resulting from: $L = n \cdot \frac{h}{2\pi}$ $n = 1, 2, 3, \dots$ (1.7.48) \& (HR 47-26). Planck's constant again appears in a fundamental way; the integral n is a **quantum number**".⁶⁴*

⁶⁴ Halliday - Resnick, *ibid.* p. 547.

This is precisely the “Military Order” referred to earlier on. However, in this fashion, **the electron is stripped of its freedom** to be able to assume **any trajectory** and thus its permissible trajectories are **only** those that satisfy (1.7.48).

The combination of the equations (1.7.42), which is a consequence of Physical Laws, and (1.7.48), which is a consequence of the “Military Order”, resolves the Problem as follows:

From (1.7.48) and (1.7.43), which is a consequence of (1.7.42), we have:

$$r_n = n^2 \cdot \frac{h^2 \cdot \epsilon_0}{\pi \cdot m \cdot e^2} \quad (1.7.49) \text{ \& (HR 47-27)}$$

So we note that not all trajectories are permissible, but only those whose radiuses in relation to the fundamental ($n=1$) have a ratio of an **integer squared**.

Also, by applying (1.7.49) on (1.7.43), (1.7.44) and (1.7.47) we get:

$$v_n = \frac{1}{n} \cdot \frac{e^2}{2\epsilon_0 \cdot h} \quad (1.7.50) \qquad v_n = \frac{1}{n^3} \cdot \frac{m \cdot e^4}{4\epsilon_0^2 \cdot h^3} \quad (1.7.51)$$

and energy:
$$E_n = -\frac{1}{n^2} \cdot \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^2} \quad (1.7.52) \text{ \& (HR 47-28)}$$

Therefore, the above solutions for the various n integrals represent the static states of the hydrogen atom, in which the atom does not radiate. The radiation results when the electron “**jumps**” from a quantized level (static state) to another one. Furthermore here, by applying Planck’s “Military Order”, we get:

$$h \cdot \nu_{rad} = E_k - E_j \quad (1.7.53) \text{ \& (HR 47-18)}$$

where ν_{rad} is the frequency of the radiated light quantum and E_k , E_j are the energies of the two static atom states between which the electron’s leap took place.

By combining (1.7.52) and (1.7.53) we get:

$$V_{rad} = \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^3} \cdot \left(\frac{1}{j^2} - \frac{1}{k^2} \right), \quad j < k \quad (1.7.54) \text{ \& (HR 47-29)}$$

where j, k are integers corresponding to the lowest and the highest static state.

So when the electron “descends” a level, it yields energy to the environment (the atom radiates). In contrast, when it “climbs” a level the atom absorbs energy.

In this fashion the experimental (Babylonian) data on the hydrogen atom’s spectrum are explained.*

I must point out that there is **no obvious** method to explain the Babylonian data in a classic way. The ideas of the quantization of energy (Planck) and angular momentum (Bohr) are **absolutely essential**.

Yet, Bohr, as worried as Planck was about this revolutionary turn in Physics, tried to maintain contact with the classical ideas and thus dared to pose an ingenious question:

Let us consider that the electron jumps between two consecutive atom static states, that is to say over $k = n$ and $j = n-1$. What conditions should apply for the **Quantum description** to coincide with the **Classical description**?

According to the Quantum description the frequency of the light quantum is given by (1.7.54), which is written as:

$$V_{rad} = \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^3} \cdot \left[\frac{1}{(n-1)^2} - \frac{1}{n^2} \right] = \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^3} \cdot \left[\frac{2n-1}{(n-1)^2 \cdot n^2} \right] \quad (1.7.55) \text{ \& (HR 47-31)}$$

According to the Classical description, the atom radiation frequency is none other than the **trajectory rotation frequency** of the electron in the atom, which is given by (1.7.51) and written as:

* Certainly, modern Quantum Mechanics has gone beyond Bohr’s hydrogen atom model. However, the concordance of this model with the measurements is excellent. Some attribute this to coincidence. Still I, not believing in coincidences, feel that the discovery value of this model is great. The difference from Quantum Mechanics is a phenomenon of a **different order**.

$$V_n = \frac{2}{n^3} \cdot \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^3} \quad (1.7.51a) \text{ \& (HR 47-30)}$$

We note that the two frequencies **coincide when n tends to infinity** and this is so because then:

$$\frac{2n-1}{(n-1)^2 \cdot n^2} = \frac{2 - \frac{1}{n}}{(n-1)^2 \cdot n} \rightarrow \frac{2}{n^3}$$

Conclusion:

For large quantum numbers, the Quantum description coincides with the Classical description.

Bohr called this discovery of his: **“Correspondence Principle”**.

Now I pose a similar question:

Let us consider the electron performing a **very big leap** and starting from the state of an ionized atom (that is an atom without an electron) it reaches the fundamental level ($j=1$), originating from infinity ($k \rightarrow \infty$).

Or, in reverse, the electron, occupying the fundamental level ($j=1$), performs a leap so big that it **disappears*** ($k \rightarrow \infty$), i.e., rendering the atom ionized.

In that case, what should the condition be for the **Quantum description** to coincide with the **Classical description**?

In order to answer, in (1.7.54) we set $j=1$ and ($k \rightarrow \infty$) and we get:

$$V_{rad} = \frac{m \cdot e^4}{8\epsilon_0^2 \cdot h^3} \quad (1.7.56)$$

* I use the verb “disappear” in the way the citizens of a well-governed State would use it, if they were to apply to Administrative Courts and the Council of the State for the annulment of Administrative Acts they consider illegal.

They would write: “I request that the Administrative Act concerned becomes void and **disappears**”.

Note that the verb “disappears” does not refer to an Entity, but to some decision that constitutes an action or activity. This **very specific** meaning of the verb is the one I would request that we do not forget. It shall prove especially useful in the future so that we can finally rid modern Physics of the “gods” and “demons” who have been harassing it for more than a hundred years...

Thus, in order for the v_{rad} of (1.7.56) corresponding to the Quantum Description, to coincide with v_n as given by (1.7.51a), which corresponds to the Classical Description, **it is necessary and sufficient** that: $\frac{2}{n^3} = 1$ or

$$n = \sqrt[3]{2} \quad (1.7.52)$$

Unbelievable! We are back to the Delian Problem!!!

This was precisely (and continues to be...) the famous Delian Problem:
The construction of the cube root of 2.

So then, alongside Bohr's ingenious question, which led us to comprehend **when** the Quantum and the Classical descriptions do coincide, after posing our own question, we are now able to also comprehend **why** they disagree.

Such an integer simply **doesn't exist**. The cause lies with the structure of the Perceptible Space and Time and was first presented to Humanity with the Delian Problem, which also opened for us the door to the magical world of the conic sections.

- *There we go stumbling upon those Greeks again!!...*

Since the aim of this section is different, I do not intend to delve deeper into our discovery for now. In the third part of this book, I have devoted **a whole chapter** to it as well as many references elsewhere. The issue is very difficult and requires further analysis of the **fundamental concepts**. So, for the time being, I bypass it and I proceed with our aim at hand:

The transformation of at least one "Military Order" into a corresponding proposition, based on fundamental concepts of Physics.

Let us consider (fig. 1.7.3) particle A rotating around center K (central body), which constitutes the center of an attraction force obeying a law of inverse square (gravity, Coulomb's electrical attraction).

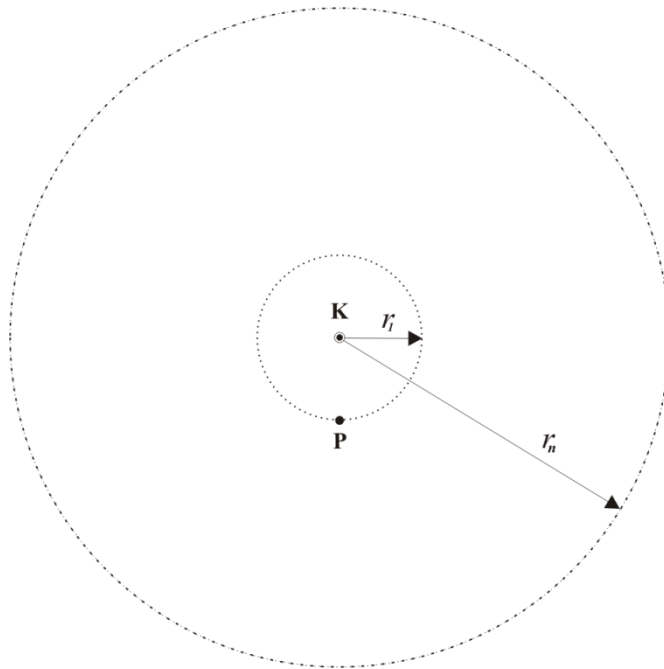


Figure 1.7.3

It is evident* that for the different trajectories of particle A, Kepler's third law applies:
"The period squares are proportional to the radius cubes".

$$\frac{T_n^2}{T_1^2} = \frac{r_n^3}{r_1^3} \quad (1.7.53)$$

All radiuses and, consequently, all periods, are permissible.
 Yet what does "Period" mean? How do we measure it?

Let us then imagine that we have placed a clock "at the closest" to a random point P of the trajectory radius r_1 and that an Observer stands "at the closest" to the clock. When the material point passes by P, the Observer notes the clock reading, t_1 . **The next time** the material point passes by P, the Observer notes the clock reading, t_2 . By definition the period of the moving material point is:

$$T = t_2 - t_1 \quad (1.7.54)$$

* Albeit evident, let me prove it:
 For the gravity field and the electrical field it holds that, (on the basis of the inverse square law and the 2nd Inertia "Law"): $v_i^2 \cdot r_i = \text{constant}$ or $\left(\frac{2\pi \cdot r_i}{T_i}\right)^2 \cdot r_i = \text{constant} \Rightarrow \frac{r_i^3}{r_1^3} = \frac{T_i^2}{T_1^2}$ q.e.d.

That is to say, the period represents a **difference** between two readings of the local clock, readings that correspond to **two consecutive transitions** of the moving material point past the defined as the point of measurements P.

However, in order for the Observer **to be able** to perform his measurements, **he shall have to be able to see** two simultaneous events:

- a. The moving material point passing P
- b. The reading of the clock.*

But, for the Observer to be able to see those events, it is required that:

**Light has to be "Switched to ON" both of the times
that the moving material point passes P.**

- Which Light are we talking about?
- The "Light of the Cosmos".

The Perceptible Space is **revealed to and "conceived" by Man, solely through the "Light of the Cosmos"**, as we have already pointed out a few pages ago, when we defined the fundamental concepts of Physics.

The light bulbs in our house "switch on and off" 100 times per second because the Power Company's frequency is 50Hz. Sunlight, as Newton demonstrated, consists of seven different single-colored "lights", each of which "switches on and off" at its own distinct frequency; sodium vapor lamps emit their familiar yellow "fog light" over highways, which "switches on and off" at the frequency of the sodium atoms...

**The Light of the Cosmos constantly "switches on and off".
There is no such thing as Light that is constantly "on".**

I am not alone in believing this.

It originates in the distant past.

Heraclitus the Ephesian (544-484 BC) writes in his work "On Nature":

* Here I am reminded of Einstein's at first glance naive but in essence very ingenious statement:
"When we say that the train comes at seven o'clock, what we mean is that the arrival of the train and the reading of the station clock at 7 o'clock are simultaneous events."

“Κόσμον τόνδε αὐτὸν ἀπάντων οὐ τις θεῶν, οὔτε ἀνθρώπων ἐποίησεν, ἀλλ’ ἦν αἰεὶ καὶ ἔστι καὶ ἔσται πῦρ αἰεζῶον, ἀπτόμενον μέτρα καὶ ἀποσβενύμενον μέτρα.” (Ἀπόσπασμα 30) *This World here, which is the same for all, was not created by some god or man, but always was, is and shall always be an eternal living fire, **switching on and off**, according to well defined measures”⁶⁵*

!...

So let us define:

T_ϕ = the period at which the "Light of the Cosmos" switches "on and off".

Therefore, the measured period $T = t_2 - t_1$ of the moving material point must be:

An integer multiple of the period of Light T_ϕ .

Because if it wasn't, then, even if Light happened to be "on" during the first pass, **it wouldn't be "on" during the second.** However, in order **to be able to measure** period T of the moving material point, **it is absolutely essential that Light is "on" during both passes,** thus: $T = A_k \cdot T_\phi$, where A_k is an integer.

In other words:

All **measured** time intervals have to be **integer** multiples of the period at which the "Light of the Cosmos" "switches" on and off as, if they weren't, **they would simply become non-measurable!**

And thus the Question arises:

What is the value of T_ϕ ?

I do not know, although I believe there isn't only one.

By referring to our previously conceptualized ideas on the non-existence of such a thing as a "moment in Time" (dt), to which we arrived with the aid of Zenon's of Elea ingenious paradoxes, let us for a moment assume, also in this case, that by carving up time intervals in ever decreasing "pieces", we would end up with:

The absolute **minimum** period at which Light is "switching" on and off, T_l .

Then, it follows that the absolute **minimum** measurable radius at which the material point is able to approach center **K** is r_l , such for the period to equal T_l .

⁶⁵ Great Soviet Encyclopedia, Akademos Publ. S.A., Athens, 1979, Lemma: Heraclitus the Ephesian. The underlining is mine.

Let us now consider that the material point leaves the trajectory (r_l, T_l) , where it had a period equal to the minimum period of Light, and adopts a new trajectory (r_n, T_n) . Since the attraction law is an inverse square law, Kepler's 3rd law applies, and thus:

$$\frac{T_n^2}{T_l^2} = \frac{r_n^3}{r_l^3} \Rightarrow T_n^2 = T_l^2 \cdot \frac{r_n^3}{r_l^3} \quad \text{and finally:} \quad T_n = T_l \cdot \frac{r_n}{r_l} \cdot \sqrt{\frac{r_n}{r_l}} \quad (1.7.55)$$

However, period T_n **has a physical meaning**, i.e. **it is measurable only** if it is an integer multiple of the period at which Light "switches" on and off, which in this case is T_l . But as the radius pair (r_n, r_l) **is random**, in order for the previous requirement to be valid, it is necessary and sufficient that:

The ratio $\frac{r_n}{r_l}$ can "spring out" from under the root for **each and every pair** r_n, r_l , i.e., it has to be: $\frac{r_n}{r_l} = \text{perfect square} = n^2$ (1.7.56) where n **an Integer** 1, 2, 3... q.e.d.!

We note that if (1.7.56) is written as: $r_n = n^2 \cdot r_l$, it agrees with (1.7.49) of Bohr's atom model, where the trajectory radiuses in relation to the fundamental (r_l) share a ratio of **squared integers**.

Also, by applying (1.7.56) on the electron motion equations, **prior to issuing Bohr's "Military Order"**, in other words on equations: (1.7.43), (1.7.44), (1.7.46) and (1.7.47), we receive respectively:

$$U_n = \frac{1}{n} \cdot U_l \quad (1.7.57), \quad V_n = \frac{1}{n^3} \cdot V_l \quad (1.7.58)$$

$$L_n = n \cdot L_l \quad (1.7.60) \quad \text{and} \quad E_n = \frac{1}{n^2} \cdot E_l \quad (1.7.61)$$

all of which agree **in structure** with Bohr's atom equations, as they were adjusted **following the issue of Bohr's "Military Order"**, that is to say with equations: (1.7.50), (1.7.51) and (1.7.48) and (1.7.52) respectively, with (1.7.48) constituting the "Military Order" in question.

Behold, our Problem has been resolved **without issuing a "Military Order"!!**

We managed to replace Bohr's M.O. with a more encompassing **GENERAL POSTULATE**, i.e. a proposal concerning **exclusively** fundamental concepts of Physics:

The "Light of the Cosmos" is indeed "switching on and off, according to well defined measures"

Moreover, by realizing that these "measures" **can never really reach absolute zero** (refutation of Zenon's paradoxes), we are led, for the first time, to the true underlying cause for the natural existence of the "Integers" in Quantum Theory.

This achievement of ours is mostly due to the two great Ancient Greek Philosophers, Heraclitus the Ephesian and Zenon of Elea, whose philosophical conceptions were ironically completely opposite to one another. This of course is not at all peculiar, if we consider that we adhered to Heraclitus viewpoints while essentially **reversing** Zenon's, by following the path laid down by Leucippus and Democritus.

This definitive contribution of the thought of the Ancient Greek Philosophers to the decoding of the Mysteries of the Cosmos has been recognized by all enlightened minds of Humanity. Schrodinger wrote: *"Without speaking in metaphors, I believe that the reason why the Greek philosophy is so intensely attractive for us today is that nowhere in the World, neither before them nor after, has such an advanced, well-structured establishment of knowledge and thought ever been constructed, in the absence of the fatal rupture which has been standing as an obstacle for centuries and has now become overwhelming"*.⁶⁶

However, a reasonable question could be asked by the reader:

What about Planck's Constant?

Please note that I never promised to explain the origins of Planck's Constant, only the origins of the **integers** in the theory Planck founded, and this is exactly what I did.

But if we wish to "dig" a bit further in trying to track down the said constant, let us do the following:

⁶⁶ Erwin Schrödinger, "Nature and the Greeks", Cambridge University Press, 1954.

Note: The "fatal rupture" referred to by the writer is the schism between Science and Religion.

Setting off from equation (1.7.42), which is a result of the Physical Laws of Coulomb - Newton, let us express the atom's natural magnitudes not as a function of radius r but as a function of the **period** of the fundamental trajectory T_1 .

$$\text{Then: } r_1 = \frac{1}{2\pi} \cdot \sqrt[3]{\frac{e^2}{2\varepsilon_0} \cdot \frac{T_1^2}{m}} \quad (1.7.62) \quad v_1 = \sqrt[3]{\frac{e^2}{2\varepsilon_0} \cdot \frac{1}{m \cdot T_1}} \quad (1.7.63)$$

$$L_1 = \frac{1}{2\pi} \cdot \sqrt[3]{\left(\frac{e^2}{2\varepsilon_0}\right)^2 \cdot m \cdot T_1} \quad (1.7.64) \quad \text{and} \quad E_1 = -\frac{1}{2} \cdot \sqrt[3]{\left(\frac{e^2}{2\varepsilon_0}\right)^2 \cdot \frac{m}{T_1}} \quad (1.7.65)$$

We note that:

1. The **square** roots appearing when the independent variable is the **radius** (space), become **cubic** roots when the independent variable is the **period** (time).
2. The fraction $\frac{e^2}{2\varepsilon_0}$ **appears everywhere** and its dimensions are **energy x length** ($J \times m$).

Thus we are in need an "intelligent" replacement, which shall yield "elegant" expressions of the above dimensions.

$$\text{Such an intelligent* replacement is: } h = \frac{e^2}{2\varepsilon_0} \cdot \frac{1}{v_1} \quad (1.7.66)$$

$$\text{So we get: } r_1 = \frac{1}{2\pi} \cdot \sqrt{\frac{h \cdot T_1}{m}} \quad (1.7.67) \quad v_1 = \sqrt{\frac{h}{m \cdot T_1}} \quad (1.7.68)$$

$$L_1 = \frac{h}{2\pi} \quad (1.7.69) \quad \text{and} \quad E_1 = -\frac{1}{2} \cdot \frac{h}{T_1} = -\frac{1}{2} h \cdot v_1 \quad (1.7.70)$$

By observing equation (1.7.66) and recognizing that the reverse speed $1/v$ becomes lower as the radius becomes shorter, I comprehend that in reality:

**Planck's Constant (h) is nothing more than the measure
of the thickness of the "knife's blade"
that "carves" up the World.**

* I do not claim to be so intelligent. Simply, thanks to Bohr, I know the result beforehand.

I hope that the above statement of mine requires no further explanation as I have already, from the very first pages of this book, referred to this serious Problem, which I also believe **constitutes the quintessence** of the Quantum issue.

We also note that the famous product $h \cdot \nu$, which was introduced in Physics via Planck's "Military Order", results effortlessly from (1.7.70).

The $\frac{1}{2}$ in front of it should not make us wonder. Energy E_1 in (1.7.70) does not represent radiation energy but the energy of the **static** state (fundamental) of the proton - electron **system**. If we do not refer to this **total** energy but **only** to the Field energy, $\frac{1}{2}$ disappears. This energy is called **ionization energy** ($-13,6 \text{ eV}$).

To round up, as far as the mathematics is concerned, I also note this:

From (1.7.66) we get:
$$U_1 = \frac{e^2}{2\epsilon_0 \cdot h} \tag{1.7.66a}$$

By dividing both sides of (1.7.66a) with the speed of light C we get:

$$\alpha = \frac{U_1}{C} = \frac{e^2}{2\epsilon_0 \cdot h \cdot C} \tag{1.7.71}$$

The above **non-dimensional** number α which thus resulted is called the **fine-structure constant**, is considered a universal constant and equals (approximately) $1/137$, and it expresses in essence the ratio of the **maximum speed** the electron may acquire relative to the speed of light, when said electron **exists** within the hydrogen atom.

I have written "exists" but probably the correct verb ought to be "**co-exists**".

And I explain:

Let us consider that the electron lies in the hydrogen atom at the fundamental level. Then, the system energy is $-13,6 \text{ eV}$. If we were to add to this atom energy equal to $13,6 \text{ eV}$, then the atom would reach what is called the boundary state of **atomic existence**.

But if we were to add still higher energy, then **the atom simply doesn't exist**.

Then, we say that the atom, in this instance the hydrogen atom, is ionized.

In such a state the electron **doesn't exist*** relative to the proton and the proton **doesn't exist** relative to the electron.

In other words, **there is no interaction** between the two distinct elements of matter such as to allow them to join and constitute an "atomic entity". The accumulation of a multitude of such **independent** elements is considered the beginning of the material state that science has named **plasma**.

In this state (ionization), **there is no quantization**.

The proton - electron system **may have any energy whatsoever** that is above zero.

The system energy is quantized **only when less than zero**.

Therefore, it is of the utmost importance to clarify that the quantization of all physical magnitudes mentioned so far, is **absolutely dependent** on the **co-existence** and the resulting **interaction** of the elements of matter.

In the case of ionization (stoppage of the co-existence of proton-electron), the system energy is **continuous**. The quantization of the physical magnitudes is not **self-existent**; it presupposes an interaction of the elements of matter, that is, the creation of some kind of "**fellowship**" among them through certain "forces".

It is noteworthy that, approaching quantization, we have conceived the phenomenon, **for the first time through time measurements**. Yet, time measurements presuppose co-existence, otherwise position P in fig. 1.7.3 ceases to have a meaning. P (a random position on the A trajectory) "**exists**", **simply because at K "co-exists" the body considered necessary to establish the Field**.

These are clearly the Aristotelian views superficially referred to at the beginning of chapter three. Now, they have to become fully comprehensible as they are essential for the further development of the "Physics for Humans".

To our assistance towards a deeper understanding comes a true Giant of the European Intellect, the top-ranking German Philosopher Immanuel Kant, who first perceived the need for a "**fellowship**" originating from the **co-existence** of the elements of matter within **Time**.

* Remember the specific meaning of the verb "disappear" in the footnote of p. 381.

Because I consider this to be a very serious issue, not just for the comprehension of our present achievement, i.e., the Interpretation of Quantization **through Time**, but mostly for the further development of the New Physics introduced by Harmonicity, I copy a crucial extract from his work: "*Critic of Pure Reason*".

*"Thus, apart from simple existence, there must be something through which A defines its position to B in relation to time and in reverse B to A, because only under such a condition it becomes possible for the substances concerned to be represented empirically **as existing simultaneously**. But if there is something that defines the position of one to the other in relation to time, then this is only the cause of the other or of its definitions. Therefore, every substance (as long as it is a result only in relation to its definitions) must by necessity contain within the causality of some definitions in the other substance and, simultaneously, the effects of the other substance causality, i.e., the substances must by need be in dynamic communication (directly or indirectly), for their synchronicity to be capable of becoming known in any experience possible. But such a character of necessity in relation to the experience objects is enjoyed only by that without which the experience itself of these objects would be impossible [unattainable]. Thus it is necessary for all substances in the field of phenomena, as long as they are simultaneous, to lie in full interdependent communication among them".⁶⁷*

I have not copied such a long passage in vain.

In addition to the understanding it offers concerning our present conceptualizations, Kant's views in this work of his shall point the way to the synthesis, in later chapters, of a **non-tautological** theory of Gravity...

Concluding this chapter, false modesty aside, I believe that our views here constitute a scientific discovery of the first order but, first and foremost, recognizing whence they originated, I consider this Seventh Chapter as Homage to the Ancient Greek Spirit.

⁶⁷ Immanuel Kant, "*The Critique of Pure Reason*"; Vol. II, Papazisis Publ., 1979. A. Giannaras translation, p. 245. Author's underlining.

CHAPTER EIGHT

THE GRAVITATIONAL FIELD OF LIGHT - 1st “CLASSICAL” APPROACH

This then is the message, which we have heard of him, and declare unto you, that God is light, and in him is no darkness at all. If we say that we have fellowship with him, and walk in darkness, we lie, and do not the truth. But if we walk in the light, as he is in the light, we have fellowship one, with another...”

John⁶⁸

“Thus it is necessary for all substances in the field of phenomena, as long as they are simultaneous, to lie in full interdependent communication among them”.

Immanuel Kant⁶⁹

I must admit that I had serious thoughts whether I ought to include this chapter in this first part of the book, where the Theory of the Harmonicity of the field of Light is presented, for the following two reasons:

1. The main idea formulated here is not mine.
2. The approach to the Problem of Gravity attempted here, not only it is not a final solution, but it also opens several new “wounds” the healing of which will require the combined strenuous efforts by many scientists in the future.

In other words, I believe that the presentation of this perception of Gravity, roughly as old as the one by Newton, will shake the very foundations of our cognitive “certainty” with regards to the understanding of the phenomenon, a certainty that stems from the centuries old known interpretations of Newton’s law and, much more, from the almost 100-year old General Theory of Relativity.

⁶⁸ John 1; 5, 6 and 7

⁶⁹ Immanuel Kant, *“The Critique of Pure Reason”*, ibid, p. 245 (Volume B)

Thus, the reader can reasonably ask:

Why then do you occupy yourself with the subject and devote a special chapter to it?

The answer is simple:

Because I believe that, through a **crucial modification** of this old idea on gravity, **imposed** by the Theory of the Harmonicity of the Field of Light, it is possible to open totally new fields in the research towards a deeper understanding of the phenomenon, an understanding that is absolutely necessary for the true Unification of the “forces”.

Having already, through the Theory of Harmonicity, reduced all known interactions to Gravity, I could not consider the Problem solved if a **crucial** question is not answered.

What is gravity?

It is worth the effort, therefore, to briefly follow the story from the beginning.

During Kepler’s era (1571-1630), when the heliocentric system prevailed, an acceptable theory for its inner workings was the following:

The planets moved around the Sun because they were pushed by the Angels !

Feynman wrote: *"The next question was: what makes the planets move around the Sun? At the time of Kepler some would answer this question by saying that there are angels behind the planets flapping their wings and pushing the planets."*⁷⁰

What is interesting with this belief is that the force forcing the planets to move, was not considered to be an **attractive force** originating from the Sun, but instead a **pushing force** exerted by the Angels.

Galileo’s (1564-1642) condemnation by the Church was not irrelevant to this perception. If the planets indeed moved because they were pushed by the Angles we should, at least during nightfall, be able to see them pushing the Earth.

However, as this phenomenon had never been observed by anyone, assuming that our Angel Theory was right, we ought to accept that the Earth was not a planet.

⁷⁰ Richard Feynman, “The Character of Physical Law”, *ibid.* p.111.

Also: Richard Feynman, “Six Easy Pieces” Katoptro Editions, Athens, 1998, p. 137.

Therefore the Church, instead of sacrificing the Angels Theory, chose to "sacrifice" poor Galileo.

Of course this condemnation of Galileo was instigated by the University professors of that era who, unjustifiably and in a totally dishonest manner, got the Church involved (i.e. the secular power) in a purely scientific conflict. The serious mistake on behalf of the Church was that it fell right into the professors' trap.

Stillman Drake wrote:

*"But it was not Galileo who created the split between religion and science. As Galileo expressly states in the **Letter to Christina**, in the beginning of the Copernican battle in 1615, this split had been invented by philosophy professors."* ⁷¹

And elsewhere again:

"The accusation addressed by Galileo to the philosophers was that they used a weakness of human nature betraying their own principles. Only they were responsible for involving the Bible in their conflict with the Galileo, something that he honestly considered an impious act from their part." ⁷²

Therefore it took Newton's (1642 - 1727) ingenious interventions to sort things out.

Newton took two brave decisions:

1. He turned the Angels at a 90° angle (or roughly 90°) and thus forced the Angels to push the planets not along the tangent of their orbit round the Sun, but (roughly) **vertically** to it, that is to say **towards** the Sun.

Perhaps, Newton believed that he could overcome the Problem in this fashion, as he could claim that the Angels could not be seen during the night, because said rotation, placed them on that side of the Earth (and all other planets), where night prevailed...

However Newton, a learned student of the Scriptures which frequently mentioned Angels that could also be seen during the night, prudently avoided giving this rather superficial solution.

⁷¹ Drake Stillman, "*Galileo*", 3rd Edition; 1980, Stillman Drake.

⁷² *ibid.* p. 10.

Living in England, which thanks to Henry VIII had been disengaged from the Vatican, Newton preferred to also take a second brave decision.

2. He simply changed the name of the Angles and called them "**Gravitational Force**", which **originated** from the Sun.

Noting first dear reader, **as emphatically as I can**, that as much as you have seen the Angels, I have seen the Gravitational Force, I must now draw your attention to this indisputable fact:

This Second Decision by Newton changed **the very nature** of Gravity and converted it from a **pushing** into an **attractive** force. Here **exactly** lies the most important change, introduced by him, in the nature of the force that moves the planets and consequently all other material elements.

However Newton was really ingenious.

Thus, he never really claimed that his Theory explained **what Gravity is**.

He fully understood that his Theory described how material bodies move **because of** Gravity, without however describing **Gravity itself**. Thus he never abandoned his effort to discover its true big secret, i.e. its deeper nature.

Richard Westfall wrote:

*"For example, [Newton] adopted the view that gravity is owed to the descent of a faint invisible matter that falls on all bodies and drifts them downwards."*⁷³

And elsewhere the same writer also states:

*"He [Newton] studied the causes of gravity (with its usual meaning) and noted that the "matter" causing the fall of bodies should act on their inner particles, and not only on their surface."*⁷⁴

After noting that the aforementioned concepts belong to the **young** Newton, long before composing *Principia*, I would like to underline the central idea of these reflections:

⁷³ Westfall Richard, *"The Life of Isaac Newton"*, 1993, Cambridge University Press.

⁷⁴ *ibid.* p. 47 – 48.

Something (invisible) strikes the bodies of matter and pushes them.

Consequently, **young Newton** conceived Gravity as a **pushing** force!

However, the perception of Gravity attributed to him that has reached us is different and was conceived **by the mature Newton**. According to this, Gravity is considered an **attractive** force that moves the Planets by drawing them towards the Sun just as it is drawing apples towards the Earth.

Nowadays, those few still supporting this concept do so without possibly realizing that they fall into a **tautological trap**. If you ask one of them “*why do apples fall?*” the answer you get is that the cause is Gravity. And if, being little more curious, you ask “*and what is the cause of Gravity and where does it come from?*” the answer you get is that it **comes from** the Gravitational Field of the Earth!

The very definition of tautology!

After Newton came Einstein (1879-1955) who's Theory of General Relativity introduced an entirely **different** perception of Gravity. Thus today, if I were to ask a supporter of this Theory “*what is Gravity?*” he'd answer:

- Gravity is the **warping of Space*** .

** I hope that a supporter of General Relativity Theory, probably thinking of me as completely clueless, will not rush, in an effort to prove my ignorance, to inform me of the current widely accepted opinion that “Gravity is the warping of **Space-Time**”, as I am not ashamed to admit that I haven't got the faintest idea what **Space-time** is. Even more so, I simply **cannot perceive** what “warped **Space-Time**” could possibly be.*

*Dear readers please do not get impressed by all those who, with such ease, use this incomprehensible albeit “sexy” scientific bubble in their lectures and books. I honestly assure you that **they do not comprehend what they refer to**. And if you ever felt the need to force them to accept that, try asking them a simple but vital question:*

With what instrument do you measure the warped Space-Time?

*And should anyone dare to claim that it is not necessary for **every** concept of Theoretical Physics to refer to measurable relations, you can answer, without hesitation, **that concepts not referring to measurable relations of the elements of Perceptible Space, are not considered legitimate in Physics**. Perhaps they belong to the Philosophical sphere. Let us be reminded of the great Dutch Physicist and pioneer Researcher Heike Kamerlingh - Onnes (1853-1926, liquefaction of helium, discovery of superconductivity), who never got tired repeating to his students: “Door meten tot weten” (through measurement to knowledge). Moreover, I wish to remind, that Science broke the fetters of Philosophy from the moment Galileo systematically introduced **measurement**. This is why he is rightly considered the father of Science **and that was the reason** Professors of Philosophy fought him so bitterly.*

The above answer, at first sight, appears reasonable and thus acceptable.

However, in my curiosity to deeply comprehend the mechanism of Space warping, I move on to a second question:

- What **causes** the warping of Space?

Then the supporter of the Theory of General Relativity would answer:

- The **concentration of matter** (or energy).

- Ok, the answer again appears reasonable and thus acceptable.

However, still more curious, I also try to comprehend **the mechanism** and perhaps **the reason for** the concentration of matter. Thus I formulate a third question:

- What **causes** the concentration of matter?

Then the supporter of said Theory can only give the following answer:

- Gravity...of course.

Once more the very definition of tautology!

Thus, in essence, description-wise the perception of Gravity according to Einstein can be considered as superior to that of Newton's, **only** insofar it can bear but a single extra level of "probing" prior to also ending in a tautological impasse. Consequently, it is time to admit that, as far as **the nature of Gravity** is concerned, modern Science swims in very murky waters indeed.

There exists, however, a ray of hope!

As the subject of our study here is truly fundamental and thus exceptionally serious, I include the following passage verbatim, with no abridgements, apologizing for its length.

Feynman wrote:

*".... You would want, perhaps, to understand more, and many they tried to achieve it. From the first moment, Newton himself had been asked for his theory: "Finally what does it mean? What is its deeper meaning;" And he himself answered: "It says **how** a body moves itself. This should be enough. I have told you how it moves and not why it moves the way it does." However people often do not get satisfied without a mechanism. I will describe you, therefore, one of the theories of type that you would perhaps like. This theory suggests that the phenomenon is the result of a big number of effects and explains why mathematics is needed for its description.*

Let's suppose that everywhere the world is full of particles moving among us with very high speed. They come in equal numbers from all the directions, and from time to time they strike us as if bombarding us. Both the Sun and we are practically transparent for the particles (practically, but not completely), and thus they cause us a slight effect. So look at what would happen (Figure 8).

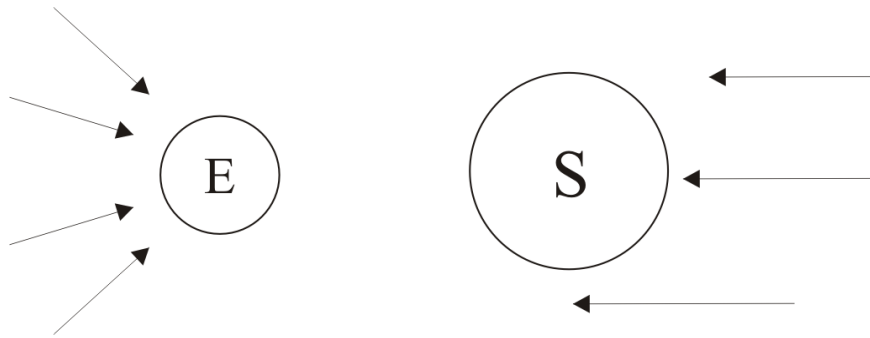


Figure 8

S is the Sun and E the Earth. If the Sun was not in this place, particles would continuously strike – tic toc, tic toc – the Earth from all sides. And this would not of course push the Earth to a certain direction, because the particles fall from in equal numbers from all the sides.

Because, however, the Sun exists, the particles that come from this direction are partly absorbed by it, because some strike it but do not penetrate it. Consequently, the particles that come from the side of the Sun are less than the ones coming from the other sides, precisely because the Sun prevents them. It is easy for someone to see that the further the Sun lies, the smaller percentage of particles is removed.

*In this case, the Sun appears smaller – actually inversely proportional to the square of the distance. Therefore there will be a small movement of the Earth towards the Sun that changes inversely proportionally to the square distance. And that will be the result of a big number of very simple activities, simple successive beats from all directions. (This theory was formulated in 1782 by the Swiss C. Le Sage and is written in the book *Lucrece Newtonien Memoires de l'Academie des Sciences (Berlin 1782)*, p. 404 - 432 (editor's note.)). Therefore, the mystery covering the mathematical relation is solved to a large extent, because the main operation is much simpler than the calculation of the inverse square of the distance. The mathematic relation in question is the result of particles' activity striking the bodies.*

*However, this interpretation is wrong for other reasons. Each theory devised by someone, should be investigated concerning **all** its possible consequences, in order to confirm anything it predicts. And this theory predicts the following: if the Earth moves it should be hit by particles mostly on the front than from behind. (When someone runs in the rain, the rain strikes mostly his face than the back of his head). So, if the Earth moves, "it rushes" towards the particles coming to it, while it goes away from the others that chase it from behind. This means that it is hit by more particles on the front than from behind. So, there is a force opposing to each movement. This force should have slowed down the speed of the Earth and surely its movement would not have lasted three or four billions of years (at least so many years the Earth moves around the Sun). So this is the end of this theory. You say however: "It does not matter- it was a good theory that freed us a bit from mathematics. Perhaps we can find a better one".*

*Perhaps, since no one knows the end. However, until today, since Newton's era, nobody formulated any other certain theoretical description of a mechanism behind this law, which does not say the same thing or does not make mathematics even more difficult or does not suggest certain mistaken phenomena. Therefore, there is no model for the theory of gravity other than this mathematical expression."*⁷⁵

Noting first that the mathematical expression meant here by Feynman is Newton's law of Reverse Square,

$$F = G \cdot \frac{m \cdot m'}{r^2} \tag{1.8.1}$$

where G is the so-called world constant of Gravity, m and m' are the drawn masses, and r is the distance between them, I'd also like to express my sorrow for the rejection of Le Sage's theory. Perhaps it was an important step towards the comprehension of gravity, which unfortunately went down the drain...

I am afraid however that we were a bit overhasty in rejecting Le Sage's Theory.

Its basic premise was that material bodies, simply by blocking (one from the other) a small part of all the particles striking them from all sides, create among them a "deficit" of such particles which results to the birth of an inter-"attraction", on account of the impetus said bodies acquire from them. Thus, there always exists a kind of "**deficit**" (**void**) of particles **in-between** the material bodies, which deficit also constitutes the underlying reason for the phenomenon of Gravity.

⁷⁵ Richard Feynman, "The character of Physical Law", 1985; Princeton University Press, Princeton, New Jersey.

Democritus had declared:

“Only atoms and void exist. All the rest are simply opinions”.

This statement of Democritus had irritated Aristotle, who answered back:

*“Ὡς οὐτ’ ἀποκεκριμένον κενόν ἐστίν, οὐθ’ ἀπλῶς, οὐτ’ ἐν τῷ μανῶ, οὔτε δυνάμει, εἰ μὴ τις βούλεται πάντως καλεῖν κενόν τὸ αἴτιον τοῦ φέρεσθαι”.*⁷⁶ Aristotle partly rejects Democritus’ statement, not accepting **the existence of void** in any case, save for the case where the term "void" can be used to refer to **the cause of motion!!!**

Noting first the impressive coincidence of the views of Le Sage and Aristotle, regarding the equivalence of «**ὡσεὶ κενόν**» (virtual void) with the «**αἴτιο τοῦ φέρεσθαι**» (cause of motion), I will try to approach mature Newton’s way of thinking.

In 1713 old Newton, already 71 years old, in the second edition of his legendary work *“Philosophiae Naturalis Principia Mathematica”*, having already solidly forged his natural philosophy by first overcoming all the reactionary objections by the scientific community of his time, wrote:

*“This beautiful system of the Sun, the planets and comets could result only from the guidance and the sovereignty of a brilliant and powerful Being... This Being governs all the things, not as the soul of the world, but as the Lord of Everything. And because of his sovereignty he is usually called **Lord God**, **“Παντοκράτωρ”** or **Governor of the Universe** because **God** is a word with many definitions and has to do with believers. And **Deity** is the sovereignty of God not over his own body, like the ones who believe that God is the soul of world imagine, but over the believers.”*⁷⁷

Further down, Newton, referring to God, continues:

*“He is present everywhere not only as **sovereign**, but also as **essence**; because the sovereign cannot exist without the essence. He contains and everything moves within Him; however, the one does not affect the other: God is not affected by the movement of the bodies· the bodies do not meet resistance by God’s ubiquitous presence.”*⁷⁸

⁷⁶ Aristotle, “Physica” Δ217b, 21. Underlining is mine.

⁷⁷ Reported by Richard Westfall, *ibid.* 479.

⁷⁸ Reported by Richard Westfall, *ibid.* 479 - 480.

I bow, before this brilliant concept indeed!

Even if, in years to come, all of Newton's work becomes totally obsolete, this single extract from "*Principia*" is enough, in my opinion, to place him, next to Aristotle and Galileo, at the very top of Nature's Researchers Hall of Fame.

I underline the crucial points of this magnificent concept:

1. **God is present anywhere and everywhere, as an essence.**
2. **Everything is contained and moves within him.**
3. **Bodies do not meet resistance from God's ubiquitous presence.**

The Third proposal is especially shocking!

How did Newton conceive it?

How is it possible, for the Founder of Mechanics, to formulate such a proposition?

We all know that fish and submarines moving in water face resistance. When we run, we always face the air's resistance.

So how come material bodies moving within the "essence" of God do not face some form of resistance? Could it be that Newton was wrong?

No, Newton was not wrong!

It is obvious that we have reached the critical question:

Which is the "essence of God"?

However, John the Apostle has probably already given the answer to this question in the subtitle of this chapter:

"God is Light".

Hence, let us proceed and try to compose the **physical data** based precisely on Newton's proposition. Let us investigate what would apply in the case that the "essence of God", invoked by him, was indeed Light itself.

Thus, let us modify a bit Le Sage's Theory, as described by Feynman, and let us suppose that material bodies are bombarded, not by some random particles, **but by photons**. Let us imagine for a moment that all material bodies “swim” in a vast "sea of photons", that continuously strike at them **evenly** and in a **uniform fashion** from **all directions**.

It is obvious that what Feynman described could also apply in the case of photons. Thus, a net thrust on a material body is created by the striking photons when **another** material body **coexists** with it.

That is to say, on account of **their coexistence**, material bodies are pushed towards one another by Light **and this is Gravity**.

In the case of the Le Sage Theory, it was rejected for reasons presented and thoroughly analyzed by Feynman. However, let us examine what happens in our case, where the “missiles” are not just any particle, **but photons**.

According to the First Postulate of the Theory of Harmonicity of the Field of Light, the luminous interactions of matter move in the Geometrical Space with stable speed, independent of the relative speed of the interacting elements of matter and equal to the speed of light that I measure in the Perceptible Space where I stand.

Thus, the speed with which the photons strike the material bodies is always the same, **regardless of whether the material bodies collide with the photons “head-on” or from “behind”**. And this applies for **any** reference system, including the system of the material body undergoing the “bombardment”. In other words, if I stand on the Earth and the Earth “swims” in the "sea of photons", the photon speed that I **measure** with reference to the Earth is the same, whether the moving Earth meets them head-on or from the back.*

Thus, **when the particles are photons**, the following statement by Feynman is not valid:

“So, if the Earth moves, "it rushes" towards the particles coming to it, while it moves away from the others that trail behind it.

* *Let us remember here the statement that we formulated in the 1st Chapter, where we showed the error source of Special Relativity: “But who, in God’s Name, gives us the right to add and subtract speeds arithmetically as if they were...potatoes?”; (p. 86)*

For photons, therefore, collision with a material body, whether "head-on" or "from behind", **is one and the same!**

**Consequently, in the case of photons,
a decelerating (resisting) force doesn't exist.**

This is, **precisely**, how Newton's revolutionary conception is justified:
"The bodies do not meet resistance from God's ubiquitous presence."

A significant experimental support to the above is provided by the negative result of the historic Michelson-Morley experiment, which failed to detect Earth's "absolute" motion while trying to detect any difference to the speed of light coming from the "front" compared to that of light coming from "behind".

A direct consequence of this result was the Second Postulate formulated by Einstein while composing the Theory of Special Relativity (see p.45). In turn, the First Postulate of the Theory of Harmonicity constitutes a modified and more general version of it, following however **the clear and fundamental distinction between Perceptible and Geometrical Spaces**.

Thus I arrive to the:

Fundamental Conclusion:

If the particles which, according to Le Sage's Theory, strike the material bodies from all sides are just photons then, based on the First Postulate of the Theory of the Harmonicity of the Field of Light, the basis for the rejection of Le Sage's Theory is invalid.

In other words, Le Sage's Gravitational Theory could very well be correct, provided the random particles-missiles were replaced with photons.

This perception of Gravity, however, goes even further.

Thus let me remind the reader of the following points of this research, which at a first glance may seem irrelevant:

1. The **synchronization, via the light**, method of Einstein's clocks.
2. The agonizing question formulated at the end of the third chapter:
*"Could it be that the so-called "Force of Gravity" is nothing more but the consequence of some "motion" occurring **along the "Path of Light"?"**"*
3. The conclusion to which we were led in the previous chapter, according to which the **quantization** of physical magnitudes is a direct consequence of the **co-existence** and the **interaction of** the elements of matter, in other words a direct consequence of the absolutely essential "**fellowship**" among them, which was first conceived by Kant, and refers to **syn-chronous** entities.

And who is responsible for all this?

There can only be one answer:

LIGHT !

Thus it is neither strange nor coincidental that John the Apostle and Kant both refer to a "fellowship". Kant simply was the first to comprehend the Problem, the solution of which was well hidden in the "**Light**" mentioned in the Bible.

Light **mediates** by establishing the interaction and the "fellowship" in syn-chronous entities. There is no such thing as a Universal magical "Attraction". There is no need for an inexplicable "Narcissistic Love" of Matter towards itself.

There is **only** the Universal **Impulsion** that Matter everywhere receives **from Light**, on account of the syn-chronous co-existence of the "Other".

We won't have to resort to Mathematics. The explanation Feynman gave us is enough. This impulsion is **inversely proportional to the square of the distance between the two elements of matter** because, very simply, the apparent size of bodies varies also according to this law.

Here, however, is where the Theory of Harmonicity actively intervenes.

Said law applies **only** when the two elements of matter are relatively motionless or their relative speed is low in comparison to the speed of light ($v/c \rightarrow 0$). If, however, the ratio v/c is considerable, then the distance that enters into the denominator of the law of the inverse square is not the actual, but the **apparent** one that corresponds to the conjugate position (see Chapter 3).

That, as far as **the denominator of** Newton's Gravity Law (1.8.1) is concerned.

But what can be said about the numerator?

Unfortunately not very much, as to fully comprehend the numerator would require the writing of a whole new book. The comprehension of the numerator would require the composition of a **Quantum Theory of Gravity** and, for sure, modern Science does not have as yet such a theory...

That is exactly what I meant by the "opening of new wounds" that I mentioned at the beginning. The formulation of such a Theory would definitely require the abolition of many of our biases and the wounds that would open would be quite painful...

But we shouldn't lose heart.

Taking into consideration that today some of Humanity's best brains work, night and day, to formulate such a theory, the elusive Quantum Theory of Gravity will sooner or later either be discovered or, in some unexpected fashion, be Re-vealed to us...

So, let us be patient...

To summarize:

1. Gravity is the Impulsion that Matter receives from Light due to the **syn-chronous co-existence** of the Other element of Matter.

(Le Sage's Theory modified with "particles" replaced by photons).

2. This Impulsion is **not** directed towards where the Other element of matter **actually is right now**, but rather towards where it **appears to be right now**.

(Theory of the Harmonicity of the Field of Light).

The aforementioned concept of Gravity does not lead to any tautology.

CHAPTER NINE

AS AN EPILOGUE TO PART ONE AND A PROLOGUE TO PART TWO

PHILOSOPHICAL AND THEOLOGICAL PROBING CAUSED BY THE PHYSICAL PROBLEM – THE FUTURE PROSPECTS OF THE THEORY

*“...and lo and behold, I am with thee all the days
to the end of days.”*

Matthew 28:20

This is the point, dear reader, where I believe I should take a break.

Any further development of the Theory of Harmonicity of the Field of Light as well as any deeper probing into areas which, as I have already stated, will certainly “scratch” many open wounds, require the formulation of its **Second Fundamental Hypothesis**, which shall take place in Part 2 (The Thesis).

The Theory of Harmonicity, as presented so far, not only pays tribute to the great Ancient Greek Thinkers, whose foresight and clarity of thought enabled us to view the phenomena of the Physical World under a new “light”, but it also constitutes a Hymn to both **Light** and the **Human Reason**.

However, today at the dawn of the 21st century, what is Science’s perception of Light?

The relatively recent history of light is indeed slightly confused. Newton thought light consists of **particles**. Later, at the beginning of 19th century, Thomas Young claimed through a series of arguments that light consists of waves. In fact, towards the end of that century, Maxwell and Hertz proved, the former in theory and the latter experimentally, that light is an **electromagnetic wave**. Finally at the beginning of the 20th century, Einstein, while interpreting the photoelectric effect, again converted light into particles and indeed he called the light quantum a **photon**.

In today's Physics, it is widely accepted that light is **both!**
Particle **and** wave!

And to be more accurate:

Light is considered to be **sometimes** a wave and **other times** a particle depending, per case, on what suits us best!!

How did we ever reach this totally “hermaphroditic” concept?

It is known that the Quantum Theory, as it came to be defined following M. Planck's “First Military Order” in 1900 and later N. Bohr's “Second Military Order” in 1913, continued developing without many objections for a couple of decades. However later, with the emergence of the first problems, many serious scientists started to formulate documented objections against it and this is how we ended up today calling it the “**Old Quantum Theory**”.

Professor Stefanos Trachanas has brought together a representative collection of such objections, some of which I also copy⁷⁹ here so that we can approach more easily the spirit of the scientists of that age.

[“W. Pauli: This whole issue is like a fairy tale. If indeed such a thing as the electron trajectory exists, then the electron must obviously periodically rotate at a specific speed. However, as we know from Electrodynamics, an electrical charge in periodic motion must radiate light at a characteristic frequency. Yet this supposedly is not the case with the electron. Instead, we claim that the frequency of the emitted light, lies somewhere between the trajectory frequency prior to the mysterious leap and the trajectory frequency following the mysterious leap. All this is pure insanity.

W. Heisenberg: Still, although insanity, it does have a method inside.”

“If these damned quantum leaps are indeed to stay in Physics, then I regret ever having got involved in Quantum Theory.”

*E. SCHRÖDINGER
(In conversation with Bohr)*

⁷⁹ Stefanos Trachanas, “Quantum Mechanics I”, Crete University Pub., Heraklion, 1991 (5th Edition), p. 80.

“Quantum Theory provokes feelings in me similar to yours. One should truly be ashamed about such achievements obtained through the use of the Jesuit rule: “Your left hand should not be aware of what your right hand is doing”

A. EINSTEIN
(Letter to M. Born, 1919)]

Objections such as above, entirely reasonable, with the exception of Einstein’s*, and supported by the experimental weaknesses of the Old Quantum Theory, eventually led to the abolition of the latter.

The responsibility was now taken over by the “Physics Higher Military Command” which in 1923, through Louis de Broglie’s lips, issued a brand new “General Military Order”.

WE HEREBY DECIDE AND DECREE!

“The principle of the wave-particle dualism

*The wave-particle dualism is a global characteristic of matter in all its forms.
The relations associating wave with particle characteristics are:*

$$E = \hbar \cdot \omega \quad p = \hbar \cdot k$$

and are the same both for photons and for mass particles”⁸⁰

where $\hbar = \frac{h}{2\pi}$, $k = \frac{2\pi}{\lambda}$ (the wave number), $\omega = 2\pi\nu$, and λ is the wavelength.

The second leads to the familiar relation of the wave definition according to de Broglie:
 $\lambda = h/p$, where p is the particle momentum.

* Let us not forget that it was the **Old Quantum Theory that Einstein did use** (Planck’s “1st Military Order”) to interpret the photoelectric effect, an interpretation for which he was awarded the Nobel Prize [...]

⁸⁰ Stefanos Trachanas: *ibid.* p. 84.

So then, with the issue of the above totally arbitrary “General Military Order”, the **wave-particle dualism** of Light and Matter was first established, through which the “hermaphroditic” concept was introduced in Science.

Without it, some thought, the “magic tricks” (Physics experiments) would never be explained...

However, as by claiming that matter and light are **both particles and waves** there was a very strong possibility that eventually they would have to face a “scientific mutiny”, scientists were a bit later forced to convert “material” waves into “**probability waves**”.

Thus, by issuing “Military Orders” of lesser importance (Schrödinger’s wave function, its differential equation, Heisenberg’s matrix mechanics), the “**New Quantum Theory**” slowly emerged and finally ended up being summarized in the Logical System we call today **Quantum Mechanics**.

Now, finally, we could all be satisfied!

Unfortunately, however, this did not happen!

And that’s because, even if we ignore Einstein’s well known objections, some people such as Richard Feynman* claim that: “... *no one understands Quantum Mechanics*”.

What did the great researcher mean?

In my opinion, he meant the following:

Quantum Mechanics, as it stands today, swamped with various “Military Orders” and “Administrative Measures”, is entirely **incompatible** with Human Reason, **as it does not formulate a clear ontological definition of its subject**.

* *Richard Feynman, a free, consistent and penetrating spirit, has never insulted Reason; furthermore, he also detested real military orders. Participating in the Manhattan Project scientific team at the Los Alamos base, as a young physicist back then, he enjoyed disobeying military orders and organizing various pranks, irritating all military personnel. However, Feynman’s true scientific rigor has been proverbial. He preferred to honestly state “I do not understand” rather than present or even adopt incompatible and “hermaphroditic” explanations about the cosmic phenomena.*

Many other American Scientists, along with Feynman, have been honored with the Nobel Prize. Indeed in 1986 the U.S.A. could boast of the most top-ranking physicists who had been awarded this prize. However, President Reagan and the American Government selected to assign Feynman as the scientist in charge of the Committee investigating the causes of the Challenger space shuttle disaster.

*And by remaining **faithful to Reason** to the end he, alone, finally unraveled the mystery...*

Thus, I shall never tire of emphasizing that modern Physics:

1. Insults Human Reason with the Special Theory of Relativity.
2. Is incompatible with Human Reason with Quantum Mechanics.

But it was not just Einstein and Feynman who were not happy.

Around 1947-48, another pioneering researcher, Erwin Schrödinger, after the above Theory had already taken its final form, based **also** on his own crucial contribution (wave mechanics), writes:

*“Quantum Theory has of course reached a point of a heavily promising prospect but not a point of full comprehensibility, notwithstanding how useful and successful the theory has proved to be in the most differing areas, even in Genetics and Biology in general”.*⁸¹

And elsewhere he also warns:

*“Quantum Theory expanded Atomism to the limit, while at the same time hurled it into a crisis which is much more serious than most of us would wish to admit. In total, the crisis plaguing the current basic sciences points to the necessity for a review of their foundations to probe as deep as possible”.*⁸²

Yet, perhaps some physicists may still regard that Einstein’s objections, Feynman’s opinion and Schrödinger’s a posteriori doubts as well as the position formulated by this author herein, on the incompatibility of Quantum Mechanics with Human Reason, are all rather exaggerated as long as Quantum Mechanics “works”.

My answer to that is, that Quantum Mechanics may very well “work”, but so does Nature which has chosen to throw at our face the two kinds of mystery-experiments X and Z, as Penrose^{*} calls them, which unfortunately cannot be explained either by Quantum Mechanics or, for that matter, by any other known Theory, no matter how many “hermaphroditic” proposals we formulate or how many interpretations we attempt to assign to waves (be it probability waves or ...the waves of Danube).

⁸¹ Erwin Schrödinger, *"Nature and the Greeks"*, 1954; Cambridge University Press.

⁸² *ibid.* p. 24.

^{*} *See chapter 6 p. 291.*

Nature, with these two kinds of mystery-experiments ridiculed many of the issued “Military Orders” and crushed our certainties.

An interpretation of these Mysteries that is compatible with Reason requires a brand new understanding of the nature of human experience as well as a brand new concept regarding the nature and description of Space: The one proposed by the Theory of the Harmonicity of the Field of Light which, right after the formulation of its Second Fundamental Hypothesis, shall proceed to their clarification.

As for now, let us not forget that Schrödinger himself invented the paradox with the cat that was named after him, in a unique moment of honest and rather ironic critique of **his very own wave function!**

Let us understand that **Feynman was absolutely right**, even if his famous statement that “...no one understands *Quantum Mechanics*”, demystifies and dethrones from the (so conveniently distant...) heights of omniscience various “big names” who, of course, took care to place themselves up there...

Certainly some may claim that, although we may not yet comprehend the Penrose mysteries still, by controlling them, we could very well utilize them so that:

- a. Through Mystery-X (experiment of the two holes, etc.) we could construct very fast **quantum computers** which, since the particle lies **simultaneously** at two positions, could offer us incredibly rapid manipulation of information, etc.
- b. Through Mystery-Z, (the ones resulting from the Einstein-Podolsky-Rosen (EPR)* paradox), we could at last achieve 100% unbreakable cryptography, etc.

I do not dispute these.

However, I believe that Technological progress can in no way become an alibi for the lack of comprehensibility, thoroughness and correctness of Science.

Here we are dealing with two totally different issues.

My claim is that current Physics does not allow us **to fully comprehend** the Cosmos.

* *The first experimental "slap on the face", resulting from the EPR paradox, was painfully felt as early as 1982 in Paris (Alain Aspect, et. al.)*

Technological progress without comprehending the fundamentals is not an all-together unfamiliar phenomenon and has repeatedly taken place in the past. Let me remind you that people "plowed" the seas, constructing great ships with the use of an increasingly higher shipbuilding technology, a lot earlier than the time Archimedes formulated his famous Principle.

To such Technological progress, usually a result of the collective effort of Humanity often motivated by daily needs or economic profit, any sharp mechanic, anywhere in the world, could very well contribute. Besides, let us not forget that the screw and the rivet were not invented by Scientists but by mechanics and that without them we may never have had metallic airplanes...

In this first part of the book, we have questioned and rejected a lot.

We have questioned and rejected not only the strictly scientific Theory of Special Relativity, which in my opinion, constitutes an enormous and certainly unprecedented in the annals of Science insult against Human Reason, but also the resulting "mythology" imposed by the "scientific obscurantism" that was largely based on their interpretation of said theory and on Einstein's work in its entirety.

Not comprehending Einstein's philosophy which respected the Principle of Causality and hiding behind the back of the creator of Relativity, some, considering themselves to be his sanctioned authoritative spokesmen, ended up publishing nonsensical and entirely mythological proposals in "scientific" articles such as the one whose extract I refer to here in order to prove my point:

*"If we manage to construct wormholes or Space-time distortion engines, we may render time travel feasible. The flow of time is relative. It depends on the observer's speed. If one leaves the Earth on a spaceship moving at a speed approaching light speed and then returns, he shall not be as old as one who stays back on Earth. If the traveler manages to overtake a light ray, perhaps using a shortcut through a wormhole or a distortion bubble, he may return before he leaves."*⁸³

Are you still standing on your feet...?

⁸³ Lawrence H. Ford and Thomas A. Roman, "Negative Energy, Wormholes and Space-Time Distortion Engines", Scientific American, Greek Edition, February 2000 – Volume 2 – issue 13, p. 49.

If yes, you can weep for the misery of science!!!

The authors signing this article are professors of Physics at American universities!

I shall not press on any further.

I hope that in this first part of the book, "Obscurantism" has received an appropriate response; I shall only remind you of the Words of the Apostle of Nations:

"For there will be a time when they will not endure wholesome teaching, but itching ears, they will, according to their own lusts, heap up to themselves teachers. And from the truth indeed they will turn away their ears, and be turned asight to fables." ⁸⁴

Different times, different audience, yet he is still so current...

However, beyond our scientific objections we've also cast doubts more philosophical in nature.

Thus, we have questioned the prevailing approach for understanding the Cosmos, a sample of which is Eugenio Scalfari's* position which follows.

"The Fathers of the Church, although they assign to Holy Grace a definitive role for the salvation of the soul, never deny to go along, albeit implicitly, the path which prompts man to know and recognize transcendental God only through the assistance of reason. For a whole millennium this effort held on the position of the «Causa Prima» (First Cause) of «Primo Motore» (first move). Later though more refined minds realized that such a position had now lost all persuasive power while science gradually deposed man and his creator along with him. At the same time necessity and chance were replacing coincidence, the justification of returning via reason from the end result to the First Cause was becoming unsupportable and indeed no mature mind now ever resorts to such thinking." ⁸⁵

⁸⁴ Apostle Paul, "The Second to Timothy", ch. 4:3,4.

* *Journalist, director of the Italian newspaper "La Repubblica".*

⁸⁵ Eugenio Scalfari. From his intervention to the dialogue between Umberto Eco and Cardinal Carlo Maria Martini, published in the Italian magazine Liberal and republished in the book: Umberto Eco - Carlo Maria Martini "What does the non believer believe in?", Greek Letters Pub., Athens, 1988, p. 116, 117. (Cardinal Carlo Maria Martini, the Archbishop of Milan, was a few years back a strong favorite to succeed the Pope. Professor Eco needs no introduction, as he is known worldwide).

It is exactly this, the philosophy of the "refined" minds that we have questioned, which originates from contemporary Science's erroneous dethronement of Man and his Creator from the description of the World.

This modern practice by contemporary Science and its consequences are convincingly criticized by Professor Christos Giannaras in his article under the title "Fertile reading differences":

Modernity was founded on the generalized certainty that the comprehension of the signifier is identified with the knowledge of the signified. The warrantor for the soundness of such identification was the authority of the "method", that is to say an objectified coded version of the "correct logic" (ratio recta). The belief in the conceptualized "scientifism" is crushed (literally) through the language used by meta-Newtonian Physics and Freudian, but especially meta-Freudian (Lacan) psychology. In both cases, a way of expression is shaped which requires us to waive the representational or simply imaging ability of our mind, the constants of the "ontological" version of the existent and the real. Often the language of modern physics and psychology gives the impression that it touches the limits of the poetic freedom in the use of conceptual contradictions or the misuse of the signifiers so that reality is stated as a dynamic becoming instead of as a describable constant. Neither the physicists nor the psychologists having shaped this language aspired to or even ever contemplated to extrapolate its consequences on the field of ontological questioning (the wonder about existence, its "meaning": its causal principle and purpose)."⁸⁶

But it is not only philosophers who doubt the structure of modern Physics, accusing it for the non existence of ontological questioning and the inconsistency of its "Discourse".

There are also physicists and pioneering ones at that; Schrödinger writes:

"The cause of this state of intellectual awkwardness is exactly that, with a view to shaping a comprehensible image of the external World, we allowed for the oversimplification of excluding our own self, of getting rid of it, one might say. Indeed, our self was lost, disappeared into thin air, seems redundant.

⁸⁶ Christos Giannaras, "Fertile Reading Differences" Column in the Kathimerini newspaper of Sunday, 15.12.2002.

Limits of the scientific view of the world

More specifically – and this is most important – this is the cause for the scientific view of the world in itself containing none of the moral and aesthetic values, nor a word about our destination itself, our ultimate life goal and, if I may say so, God. "I know not where I come from; I know not where I go..."⁸⁷

It is this rather intelligent and delicate irony of Schrödinger's ("*...if I may say so*") that I borrow in order to take my turn in sounding the alarm for those wise men who insist on teaching our children at Universities that there is no God,... and yet nuclear force is caused and carried by the gluons...!

I fear a lot that modern Physics, with the so-called *Physics of the Elementary Particles*, has degraded into some kind of religious travesty! In other words, it has declined into a childish religion!

Augustinos Zenakos writes in an important article of his:

"Geertz, a professor of Social Sciences at Princeton University, in his essay 'Religion as a Cultural System' in 1966, without disregarding his debt to his predecessors, Fraser, Durkheim, Weber and Malinowski, offers a particularly convincing "structural" definition of religion: 'Religion is a symbolic system acting so that it establishes powerful, global and long term dispositions and motivations for people, forming perceptions about the general structure of existence and investing such perceptions with a halo of objectivity in such a way that dispositions and motivations appear uniquely realistic'".⁸⁸

I suggest, dear reader, that in Geertz's definition of religion above you substitute the word "religion" with the words "Elementary Particle Physics" and thus you can arrive at the latter's current "convincing structural definition".

At long last! Enough is enough !!

We reject the Physics of "Angels".

⁸⁷ Erwin Schrödinger, "Nature and the Greeks", *ibid*, p. 105.

⁸⁸ Augustinos Zenakos, "Why are you searching the living among the dead?", "To Vima on Sunday" newspaper, Easter Sunday, 5.5.2002.

We reject trying to describe the Cosmos at the absence of a (common Man) Observer, that is to say a realistic Man, in whose absence said description is **deterministically** led to contradictions, dead ends and a religious type of mythology.

Finally, the time has come to place Man **back in the center** so that we can synthesize a **logical** natural description, which does not "swallow-up its tail" while degenerating into tautologies.

It is time we believed that the search for the First Cause and the First Motion (and the consequent "feeling" of the Creator and His Purpose), **solely via observable events**, is not immature thinking.

I am in deep fear that this approach/description of the Cosmos by modern Physics without "ontological questioning", risks leading us to utopia, some to a mental hospital (as insulters of Reason, albeit unintentional) and some others, consistent to reason but psychologically sensitive as Ludwig Boltzmann and Paul Ehrenfest were, to suicide...

I am afraid that we must **return** to Plato, for intellect, and to Aristotle, for perception.

In 1979, in the epilogue of my work titled "*On the Harmonicity of the Field*", I put forth the warning that, in years to come, Nature keeps in store for us and our science numerous and quite painful "conceptual slaps".

I do not think there was anyone who believed me then.

However, only three years later, specifically in 1982 in Paris, we received the first of them, experimental in fact. Since then many others have followed.

Today, after the thirty years that I spent questioning and researching, with this book that you now hold in your hand, you have the opportunity of enumerate yourselves the slaps that are theoretical in nature, evaluating their cause and importance and to appraise "with your own eyes" how many of the "certainties" of science are lying in ruin.

As for myself, I shall repeat the warning:

The "conceptual slaps" yet to come, are going to be a lot stronger!

And this is so because I believe that Theoretical Physics is ailing, seriously ailing, to a degree that (at least at certain key-points) it cannot even stand up to serious criticism Reason-wise, resembling proverbial “...stones, bricks & tiles piled-up in disorder”.

In a nutshell:

Modern Theoretical Physics lacks Logical Consistency.

Modern Theoretical Physics lacks Self-Consistency.

Modern Theoretical Physics lacks the Strictness of Mathematics.

Baseless exaggerations?

Whoever believes I am exaggerating only has to read on...

We are currently preparing, Americans, Chinese, Europeans, Hindus, Japanese and Russians (mentioned in alphabetical order) to go back to the Moon. This time however not just to collect rocks, raise flags and shoot photographs but to truly get busy by building way-stations for interplanetary travel, mining rare minerals, constructing power plants, etc.

One thing that is certain is that this time around we shall perform serious experiments and execute elaborate and detailed measurements **while on the Moon**.

And that is exactly where I believe we are going to receive the first of the impending painful "conceptual slaps".

There is a simple reason for this:

We claim that we accept the General Relativity Theory and therefore the following proposal **which constitutes its quintessence**, as well as the quintessence of Albert Einstein's entire philosophy:

"All reference systems are absolutely equivalent for the application of all laws of Nature".

In other words, in Nature there are no privileged reference systems, for which the natural laws are valid and some others, of inferior rank, for which they are not.

In Nature absolute isonomy prevails.

All reference systems, as far **all** laws of Nature are concerned, are absolutely equal.

Not to be misunderstood, I note that not only do I accept this Einstein's position, but I also regard it as one of the most glorious achievements of the Human intellect.

Therefore I ask this:

By applying the laws of Nature **relative to the "Moon" reference system**, I would like someone to explain to me why is it that the Earth does not "fall" onto the Moon, since apples, spanners, wrenches, the Eagle lunar module and all other debris have, without any exception, all "fallen" there.

We have all watched on television the astronaut (I think David Scott) standing on the Moon's surface, holding a hammer and a feather and dropping them simultaneously thus enacting an elementary, but ideal, due to the lack of atmosphere, Pisa type experiment. And we all have seen the two objects falling and reaching the surface of the Moon simultaneously.

It is certain that the two objects have not taken-off into space to come and fall onto the Earth "attracted" by the "Earth-Moon" center of gravity, which is known to lie within the Earth's mass.

Both, the hammer and the feather, fell onto the Moon.

Newton, by applying the laws of Nature in relation to the reference system "Earth", explains to us **in a most satisfying manner** why the Moon does not fall onto the Earth.

All I'm asking here is for modern Physics to **explain** the exact opposite.

After all, *"the Earth from the Moon looks just like a moon itself"*, as goes the familiar Greek song ...

... Any answers?

I therefore emphatically claim that the modern scientific community is incapable of giving a proper answer to this naive, high school level question of mine, using modern Theoretical Physics as a tool; and when I say proper I mean **compatible with the Theories it professes and teaches**, in this case the General Relativity Theory, without being forced, whistling to the wind, to resort to the **privileged** reference system of the "Earth-Moon" center of gravity.

We thus face the unacceptable phenomenon of, on the one hand, worshiping the General Relativity Theory on a daily basis in Universities and Scientific Conferences, ...while on the other not being able to apply it in Practice!

Still, not wishing to conclude Part I of this book in a negative and pessimistic way, let me articulate, by way of an epilogue, the essence of all our considerations so far which also constitutes an **optimistic** message:

**Light is the true Lord of Forces
and exists "with & within us" in the Cosmos.**

This statement is not meta-physical.
It is **purely and solely** Physical!

**Light establishes the so called interaction by setting up the
"Fellowship of others", whose necessity of existence was first conceived by Kant.**

The fascinating revolution of Quantum Mechanics, and specifically the Copenhagen interpretation, may be described simply as that:

Quantum Mechanics moved the spectator from the theatre box to center stage and turned him into an actor, eliminating the Cartesian dualism (*res cogitans* - *res extensa*).

This revolution of Quantum Mechanics was not only respected by the Theory of the Harmonicity of the Field of Light but also promoted via the foundation of the Physics of Humans, that is to say by introducing the Observer as an integral part of each and every one of its descriptions; this Observer is not an immaterial spirit but a material being occupying a specific position in the Perceptible Space at each given moment and interacting **via Light** with the observed.

Furthermore, it was also extended by it:

The Theory of the Harmonicity of the Field of Light, not only did not "*get rid*" of Man but, additionally, introduced God to "center stage".

It introduced God, the true God, **LIGHT**, as the deus-ex-machina of the ancient Greek Tragedy, onto **the stage** of the theatre where the "drama" of the physical happening is being enacted and in which we are all henceforth participating.

With Light present there, new and exciting prospects open up for Science and Man:

Perhaps now, idols shall be toppled and shadows shall be dispersed.

Perhaps now, the resolution and final “catharsis of the Tragedy” can be anticipated.

Perhaps now, our long yearning for "**the Unification of everything**" shall be realized...



END OF PART ONE
AND
PRAISE THE LORD (LIGHT!)

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