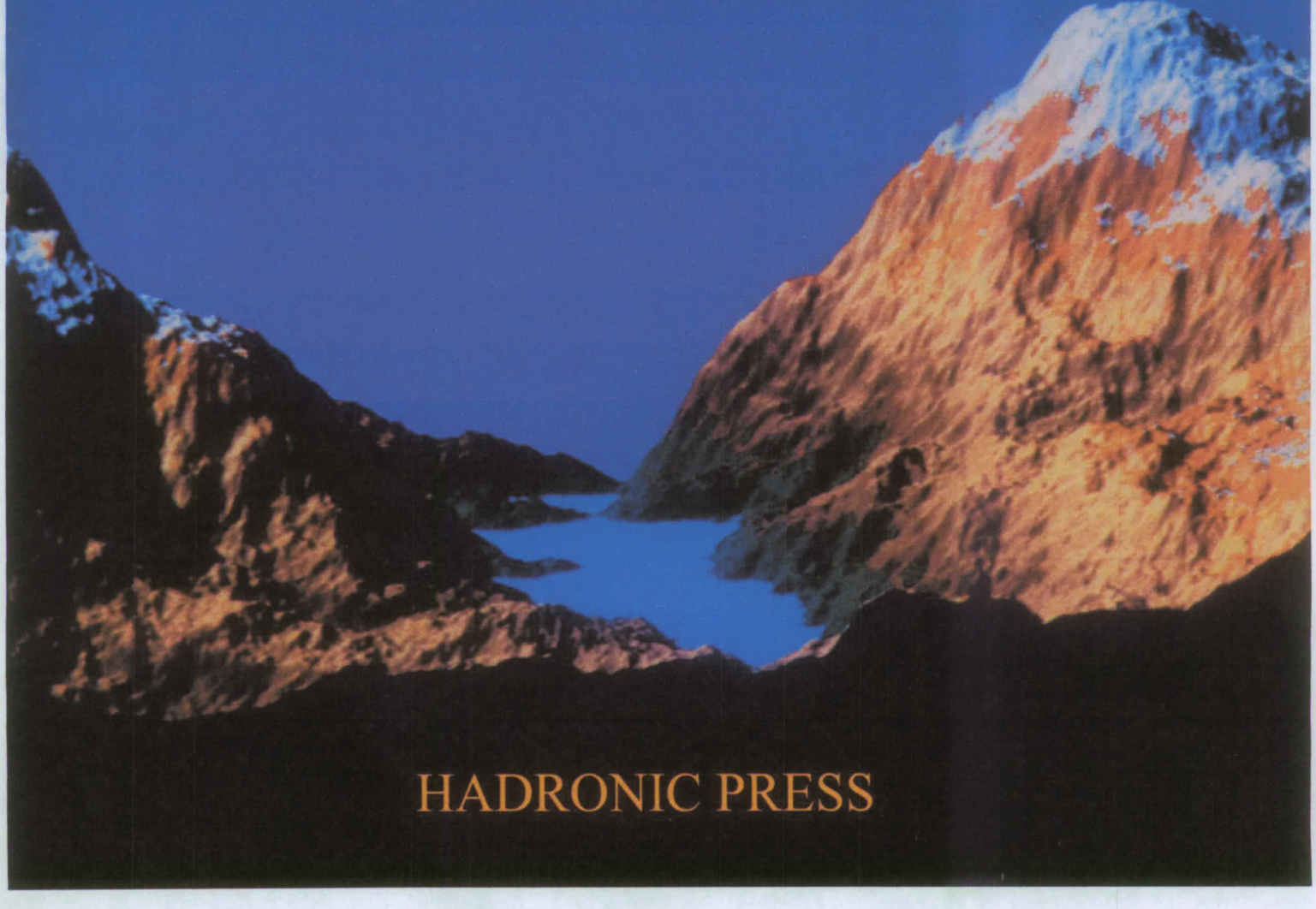
A.A. NASSIKAS

MINIMUM CONTRADICTIONS EVERYTHING

A SPACE-TIME QUANTUM MECHANICS DERIVING FROM THE CLAIM FOR MINIMUM CONTRADICTIONS

Reviewed and Edited by

M.C. DUFFY and C.K. WHITNEY



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MINIMUM CONTRADICTIONS

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to Panayota, Tina and Nefeli

ABOUT THE AUTHOR

Born in Greece in 1947, Dr. Nassikas graduated in Mechanical and Electrical Engineering at the National Technological University of Athens, and the Business Administration Institute of the Economic University of Athens. He co-founded a company to develop technology he co-invented and patented. He received a Ph.D. from Aristotle University of Thessaloniki. He has written articles in various journals, and in 1995 he was elected Professor in the Department of Mechanical Engineering at the Technological Education Institute of Larissa, with subject matter Renewable-New Forms of Energy. He made a device for which there are strong indications that it can create an anti-gravity effect. His biography has been included in Marquis Who is Who.

Dr. Nassikas later wrote a philosophical book entitled **The Claim for Minimum Contradictions**, published by Trohalia in Greek (220 pages, ISBN: 960-7022-64-5). This claim was the basis for the whole of his later work. The core of this work is a theorem through which the contradictory nature of the basic communication system can be proved. On this basis, Minimum Contradiction Physics can be stated, and this is the subject of the present book.

EARLIER FORUMS FOR THIS WORK

Beyond its newly added elements, this monograph is based on articles presented and / or published in:

- "Space Time Gravitation" St. Petersburg Conferences, Russian Academy of Science.
- "Fundamental Problems of Natural Sciences and Engineering" St. Petersburg Conferences, Russia.
- "8th International Conference on Cold Fusion - ICCF8", Societa Italiana di Fisica.
- "9th International Conference on Cold Fusion- ICCF9", Beijing, China.
- "International Conference on Hydrogen Technologies" CH-Weinfelden, Jupiter-Verlag.
- "Vienna Circle International Symposium" Vienna Circle Institute.
- "Physical Interpretations of Relativity Theory – PIRT Conferences", London, British Society for the Philosophy of Science.
- "PIRT 2004 Conference" ISRAMA Conference, Calcutta Mathematical Society.
- "PIRT 2005 Conference" Bauman Moscow State Technical University.
- "Natural Philosophy Alliance" NPA Conferences, USA
- "Infinite Energy Magazine", Cold Fusion Technology, Concord NH.
- "Galilean Electrodynamics", Space Time Analyses, Arlington MA.
- "Journal of New Energy", EEMF, Salt Lake City Utah.
- "New Energy Technologies" Faraday Lab., St. Petersburg, Russia.
- "Hadronic Journal", Hadronic Press, Palm Harbor, Florida.
- "Review Bulletin of Calcutta Mathematical Society - Rev. Bull. Math. Soc.", Calcutta Mathematical Society.

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MINIMUM CONTRADICTIONS EVERYTHING

PREFACE AND ACKNOWLEDGEMENTS

Any Physics theory is stated via the basic communication system, which by the aid of a theorem can be proved as contradictory. Therefore, at best, a 'least contradictory' Physics can be stated, based on a claim for minimum contradictions, which together with the theorem mentioned, constitute the core of this work. This Physics can be regarded as consequence of principles of thought; it is compatible, under certain simplifications, with Newtonian mechanics, relativity theory and QM.

Finally this Physics is a Space-Time Quantum Mechanics that describes **Minimum Contradictions Everything**. On this basis, new explanations for various questions of physics can be given as the gravitation, the second thermodynamic law, the fractal behavior of matter systems and the interaction of the electromagnetic with the gravitational field. According to the spirit of this work, stochastic-quantum space-time appears to be fractal, and matter itself and any matter system behaves as if it had an ability to decide for its evolution. Thus, the basic property of 'Everything' is volition whose however basic dimension is logic; this is the reason why things even though acting under their volition they appear to have a considerable logical behavior. According to this point of view, biological organizations have the ability to decide for their evolution, which is another approach to species evolution in general.

This work originates from various articles, which have been presented at various conferences or published in various journals from 1994 until now. It is derived from purely mental principles in contrast to theories that condense the experience that has been revealed. Thus, in a logically linked way, under certain simplifications, Newton's gravitation law derives from mental principles and not from empirical observations as the falling apple is. The references cited in this work, excluding those that refer to mathematical conclusions, do not constitute source of validity but source of verification.

I would like to thank deeply Prof. Dr. Benoit Mandelbrot for giving me permission to use on my cover one of his excellent fractal geometry landscapes. As Prof. Mandelbrot has showed, the geometry of matter systems appears to be fractal; therefore, it is expected that this fractal geometry can apply to any matter space-time system, as is suggested according to the present work.

PREFACE-ACKNOWLEDGMENTS

I would like to express my very deep thanks to Dr. M.C. Duffy, chairman of the PIRT Conferences, for his warm encouragement for this work to be written, for his valuable suggestions, for informing me on various modern questions, and for giving me forum for various articles to be presented and published. I would like to express my admiration for his efforts in science under conditions so difficult for him.

This work has started with a philosophical book entitled "**The Claim for Minimum Contradictions**". I would like to thank deeply the philosophers Prof. Chr. Giannaras and Prof. C. Zouraris, as well as the philosopher author Th. Ziakas, for their warm support and encouraging related to aspects of this book and physicist and philosopher Prof. G. Grammatikakis for his encouraging comments.

I would also like to thank so much Prof. Dr. I. Antoniou for his crucial question of whether the claim for minimum contradictions has sense since one contradiction implies infinite ones. This led me to try for an answer to a question that I consider as fundamental. The answer is that this claim creates a modification of the basic communication system since it implies a logical 'attractor' through minimum possible contradictions required. Thus, during our communication, *i.e.* after our breaking the silence imposed by the basic communication system, we follow a way of thinking which exceeds the basic communication system itself.

I would like to express my deep honor to the memory of Russian Professor Dr. Pavel Pheodorevitch Parshin, who died during a period of collaboration with me, and whose contribution for the evolution of this work was so valuable. Prof. Parshin came to Larissa in 2000, and he claimed during a lecture that photons have a slight rest mass. Recently Prof. Dr. D. Nanopoulos also came to Larissa, and during his lecture he announced that, on the basis of experimental results of the greatest world research centers, the speed of light is a function of its frequency, which is compatible with Parshin's point of view and with this work as well. According to Prof. Nanopoulos, the background of the Universe at a very early stage was a non-Euclidean space-time foam; this idea could be regarded as compatible to this work.

As participant of St. Petersburg Conferences on Natural Sciences, I would like to express my deep thanks to chairman Prof. A. Smirnov and to co-chairman Dr. J. Klyushin of these conferences, for their valuable help in offering me my first forum and recommending my work to other scientists.

PREFACE-ACKNOWLEDGMENTS

I would like to thank deeply Alexander Frolov editor of "New Energy Technologies", for his warm supporting subjects of this work in various forums and for his proposal for theoretical results of my work to be used in modern technological problems. Frolov's asymmetric capacitors constitute the basic "prior art" of my experimental research, mentioned in this work, related to the interaction of the electromagnetic with the gravitational field.

I would also like to thank very deeply Dr. Cynthia Kolb Whitney editor of the journal Galilean Electrodynamics for her so-helpful care on various articles, for her so interesting discussions and suggestions, and for giving me a publication forum for various articles and aspects, related to this work. I would like to mention that Galilean Electrodynamics has played a key role in encouraging ideas not exclusively relativistic, which was so necessary in the recent past, and has helped me so much to commit this work to writing. As a member of Natural Philosophy Alliance (NPA), I would like to express my deep thanks to all officers beyond Dr Whitney; *i.e.* Mr. N. Munch, Prof. M. Melehy, Prof. D. Spencer, Dr. F. Müller, Prof. U. Shama, as well as Dr. R. Heaston, for their care in presentation of various articles of mine related to this work at the NPA conferences, even *in absentia.*

I would like to thank so much Prof. Dr. Santilli, editor of "Hadronic Journal", Prof. Dr. M. R. Adhikari secretary of the Calcutta Mathematical Society, Prof. Dr. F. Stadler, Director of the "Vienna Circle Institute", Prof. Dr. C.V. Akritidis, chairman of Thessaloniki Fullbrighters Association, Dr. S. Hajra co-chairman of Calcutta PIRT conferences, Prof. V. O. Gladyshev co-chairman of Moscow PIRT conferences, Dr. Hall Fox editor of "Journal of New Energy", Prof. Dr. Grubber President of "Institut für Neue Energie-Technologien", Dr. Schneider director of "Jupiter-Verlag", Dr. Scaramuzzi chairman of the 8th International Conference on Cold Fusion and to honor the memory of Dr. Mallove founder of "Infinite Energy Magazine", for giving me forum to express my ideas related to this work.

I would also like to thank very much the late Prof. J.P. Vigier, editor of "Physics Letters A", for his comments on my work, Ambassador Prof. Dr. Chr. Stremmenos, Prof. Michael Heather, Prof. Ph. Kanarev, Prof. Dr. Evert Post, Dr. I. Anastasiou, Prof. K. Manolikas, Prof. Dr. I. Drigojias, Prof. X. Spiliotis and Prof. C. Hartonas for their so useful discussions and interest on this work, J. Hartikka and D. Reed for their so positive and encouraging comments, and Telemachus Lelentjis for his so important notices on the phi-

losophical consequences of the book **The Claim for Minimum Contradictions**.

I would like to thank very much my colleagues Prof. G. Papapolymerou, Prof. Ph. Lokkas, Prof. A. Noulas, Prof. A. Tzahanis, Prof. Th. Tsirikoglou and Prof. S. Zaoutsos for their useful discussions and interest on this work.

Finally I would like to express my deep thanks to Chr. Kalfopoulos for his substantial help in realizing the main parts of the device related to the experimental part of this work, S. Garbidakis, Dr. E. Gogolidis, Prof. I. Zoubourtikoudis, M. Mastoras and E. Sergis for their so intensive effort for metal deposition on this device, I. Leloudas, M. Michi, and G. Sakerllariou for their so useful help related to this work, Prof. A. Maglaras, Prof. A. Zacharoulis, Assoc.Prof. A. Zachos, K. Kitsakis, P. Dimitriou, E. Charisi, and E. Gani for their constructive collaboration in "Program Archimedes II" related to the experimental part mentioned in this book. In particular I would like to thank deeply Prof. A. Maglaras for his long time cooperation in quick field calculations of various capacitor systems as well as for his patient weight loss measurements in the high voltage lab.

According to this work, it is impossible for a perfect theory of "Everything" to be stated. The only we can do is to describe a Minimum Contradictions Everything. A new way of thinking is proposed through which we can understand things and explain new phenomena. On this basis this book could be rather regarded as a philosophical work but written in form of physics.

The most accepted scientific and philosophical point of view is that space-time itself does not contain any energy which could be used for energy production. This affects the official attitude related to the energy problem solution on the basis of the interaction of the electric with the gravitational field even though there are strong indications for positive results. This shows the significant relation between philosophy, physics and technology, which is taken into account in this work.

I would like to thank deeply once more Prof. Dr. M.C. Duffy, Prof. Dr. C.K. Whitney and Prof. Dr. R.M. Santilli for making me the honor to contribute and for giving me the possibility to close a circle of effort through this book.

Athanassios A. Nassikas

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MINIMUM CONTRADICTIONS EVERYTHING

INTRODUCTION

Every Physics Theory beyond its particular principles is stated based on the language basic communication system [1,2,3,4]. This system obeys the Aristotle logic (Classical Logic) [5,6], the Leibniz Sufficient Reason Principle [7] - according to which, for everything we seek the reason of its power- and a hidden axiom that states "there is anterior-posterior everywhere in communication". In fact, the way in which we communicate is not a simultaneous process but it is characterized by the existence of anterior and posterior; one word is put after another, one phrase after another *etc.* [1,2,3,4].

The belief that a perfect theory can be found originates from the fact that we believe that the basic communication system is perfect. If this system is contradictory, it is meaningless to seek the statement of a perfect theory through a contradictory system.

According to this work the basic system of communication is contradictory. In fact if we call by Λ a logic consisting of the Classical Logic and the Sufficient Reason Principle, the following can be proved [8,9,10]:

Theorem I: " Any system that includes logic Λ and a statement that is not theorem of logic Λ leads to contradiction."

On the basis of Theorem I the following lemma can be stated:

Lemma: "Any system that includes logic Λ and a synthetic sentence leads to contradiction."

The anterior-posterior axiom constitutes a synthetic sentence; however additionally it can be proved that it is not theorem of Λ. Thus, the following is valid:

Statement I: " Any system that includes logic Λ and the anterior-posterior axiom leads to contradiction."

where the anterior – posterior axiom is stated as follows.

Anterior – Posterior Axiom: "There is Anterior-Posterior Everywhere in Communication"

When we try to describe reality through a theory we cannot do it simultaneously but in anterior-posterior terms. Even anterior-posterior, in physical reality, itself is not known but only when it is described. Therefore, this axiom includes every anterior-posterior described; not only the indicating the order of communication elements (words, phrases, *etc.*). It is noted that in the early papers, which this work is based on, the term earlier posterior was

used. However this term applies better to time and not to any countable magnitude. Dr. C.K. Whitney proposed the term anterior-posterior which is more neutral, and can therefore apply beyond time [4].

If we name zero the state before our communication, and 1, 2, 3, ... the sequential states of this communication, we may notice that the anterior-posterior axiom can be related to numbers.

Statement I can also be derived by the aid of Gödel's work and logic Λ [8]. It is noted that Gödel's work, through which his theorems have been stated, cannot be used in the current form of any of his statements; in fact this work is based on an arbitrary hypothesis *i.e.*:

Gödel's Hypothesis: "There is an algorithm that permits the derivation of only true statements"

The arbitrariness of this hypothesis lies on the fact that the algorithm mentioned is not precisely defined, as it has been noticed by H. Putnam, R. Penrose [11,12] and others [13]. By using logic Λ we can reach Statement I through Gödel's work [14] but without Gödel's hypothesis which could be regarded as a part of Λ. This is a verification of Statement I and Theorem I which is required in order that the basic claim of this work can be applied.

Despite of all these, when we communicate in a way that we consider logical, we could say that we try to understand things through minimum possible contradictions since contradictions are never vanished. On this basis we can state:

The Claim for Minimum Contradictions: " What includes the minimum possible contradictions is accepted as valid".

According to this claim we obtain a logical and an illogical dimension. In fact, through this claim we try to approach logic (minimum possible contradictions) but at the same time we expect something illogical since the contradictions cannot be vanished. However, the question is raised of whether this claim has any sense since one contradiction implies infinite contradictions [14]. The answer to this is that the claim for minimum contradictions creates a modification of the basic communication system since it implies a logic "attractor" through minimum possible contradictions required.

Every theory includes at least the principles of the basic communication system. According to theorem I, further axioms beyond the ones of basic communication must be avoided since they can cause further contradictions. Thus the Claim for Minimum Contradictions operates as a Simplicity Princi-

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ple. This is compatible with Ockham's razor [15]; however Ockham's razor does not imply any contradiction.

The systems of axioms we use in Physics include the communication system and, therefore, their contradictions are minimized when they are reduced to the communication system itself. Therefore we can state:

We have minimum contradictions in Physics when it is based only on the basic communication system, i.e. on logic Λ *and on the "anterior-posterior axiom".*

In order that such physics is valid, a unifying principle is required, since everything, *i.e.* matter, field, and space-time, needs to be described in anterior-posterior terms.

At first sight, for a minimum-contradictions physics we can, by means of intermediate statements, make the following statement:

Statement VI: Any matter space-time system can be described in anterior–posterior terms.

Further Statements, *i.e.* II, III, IV, V, appear in Chapters 1 and 2, as necessary for the purposes of this work. It is noted that time implies the existence of anterior and posterior; space does, too. If I say 10cm, I mean the existence of anterior-posterior measuring states corresponding to 1,2,3,....,10 cm. Therefore, the existence of anterior and posterior is the condition for space and time to exist and *vice-versa*. For more details see Chapt. 2, Sect. 1. Thus, because of Statement VI, for a least contradictory physics we can state the following statement:

Statement VII: Any matter system can be described in space-time terms.

Since everywhere there is space-time and not something else, *Space-Time-Everything* can be regarded as *Matter-Ether*. A matter system, in general, has differences within its various areas. This means that a matter system, in general, is characterized by different rates of anterior - posterior (time) within its various points. Since space is also locally affected by the local rate of anterior-posterior, one can expect it to be deformed due to different rates of anterior-posterior. This means that time can be regarded as a 4^{th} dimension which implies Lorentz' transformations and in extension a relativistic theory [16,17,18]. On this basis space-time can be regarded either as geometry or as deformable matter- ether; this is compatible both with Einstein's and Poincaré's point of view [19,20].

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A basic tool of this work is the 'Hypothetical Measuring Field' (HMF). This term was initially proposed as 'image Field', but has been changed in order to correspond exactly to what it signifies, following a proposal by P.F. Parshin [17]. According to M.C. Duffy, this term is compatible to an approach taken by Eddington, and to recent studies on the physical vacuum based on information science, in which material particles, which have a wave particle nature, interact with an 'image-taking field' [21].

The Hypothetical Measuring Field (HMF) is defined as a hypothetical field that consists of a Euclidean reference space-time, at each point A_0 of which exist the real characteristics of the real field at the point A corresponding to A_0 through the transformations of deformity.

In a space-time description we don't know a priori what energy is; we define energy dE of an infinitesimal space-time element its 'ability to exist'. We may notice that an infinitesimal space-time element with energy dE exists on condition that some corresponding 'anterior-posterior' exist too [16,17]. With respect to the HMF a space-time element is observed during a time dt that is different from the time dt_0 of the corresponding reference space-time element. Various space-time elements in the HMF have different dt for the same dt_0. Thus, dt measures the duration *i.e.* the ability of a space-time element to exist (see more details in Chapt. 2, Sect. 2.3); this ability, by definition is energy; when $dt = dt_0$, this ability is dE_0. Thus, we can write:

$$dE \sim dt \quad \text{and} \quad dE / dE_0 = dt / dt_0 \tag{1}$$

which is a relativistic relation and expresses the equivalence of energy and time.

Eq. (1) can be viewed in two ways:

a) When dt_0 is a unit of time, Eq. (1) describes the duration dt, with respect to an observer and, as was mentioned, it leads to the relativity theory.

b) When dt is a constant period of time in the HMF, then Eq. (1) can be written in the form:

$$dE / dE_0 = dt / dt_0 = (f / v) / (f / v_0) = v_0 / v \tag{2}$$

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where ν is the frequency of a periodic phenomenon of comparison and f an arbitrarily constant factor through which we can change the scale of v, v_0. If $v = 1$, v_0 must be different in various points $(\mathbf{r},t)$ of the HMF. If this is the case Eq. (2) can be written in the form:

$$dE / dE_0 = v_0(\mathbf{r},t) \tag{3}$$

Thus, for the same equation we have the following versions:

$$dE / dE_0 = dt / dt_0 \text{ observation (relativity theory)} \tag{4}$$

$$dE / dE_0 = v_0(\boldsymbol{r},t) \text{ action (quantum mechanics)} \tag{5}$$

On this basis, we can reach the basic De Broglie's principle for energy, for $E_0 = h$ (arithmetically) *i.e.* [17,18]:

$$E = hv \tag{6}$$

<u>*At second sight*</u>, because of the claim of the minimum contradictions, we conclude that *Matter-Space-Time-Everything-Aether* can have logical and contradictory behavior at the same time; *this can be valid only if space-time is stochastic.*

According to M.C. Duffy, "The modern ether can be treated as a sea of information, and a generator of dynamic algebras, which is revealed as a discretum rather than a continuum on the smallest scales of space-time." [22] This can be regarded as compatible to stochastic space-time that is not continuum on the smallest scales.

According to A. Pais, Einstein had said: "I consider it quite possible that physics cannot be based on the field concept; i.e., on continuous structures. In that case nothing remains of my entire castle in the air, gravitation theory included, and the rest of modern physics" [23,24].

Despite the fact that space-time may be stochastic, there are basic relativistic relations that continue to be valid; perhaps relativity principle can be stated on the basis of space-time operators, as it will be mentioned.

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At first sight, QM seems to remain unchangeable. However, what it describes, according to this work, is not a particle wave but the stochastic space-time in the Hypothetical Measuring Field (HMF). As was mentioned a De Broglie's basic principle can be regarded as another view of a basic relativistic relation of matter space-time; De Broglie's principles can be proved as valid for stochastic space-time. On this basis, we have the frame in which a unified theory can be stated while the operators of relative length in a given direction and relative time can be defined; by the aid of a Ψ wave function the geometry of stochastic space-time can be described.

With starting point R.M. Santilli's paper: " Lie-Admissible Invariant Origin of Irreversibility for Matter and Antimatter at the Classsical and Operator Levels" [25], we may notice the following:
An operator can be regarded as the basic acting law that causes all phenomena revealed. On this basis, if invariance is valid *in general* at operator level, it means that the basic laws are invariant. This might be close to a new approach of relativity principle. Space-time operators, according to this work, are invariant to Lorentz' transformations (see Chapt. 4, Sect. 6.4); however the final result, *i.e.* real measurable space-time, is non-relativistic; it seems to be fractal (see Chapt. 9, Sects. 7,8).

The stochastic space-time derives from the distribution of the properties of a flat relativistic space-time based on the probability density $P(\mathbf{r},t)$ of Schrödinger's relativistic equation, which is proved as valid [16,18].

The negative values of $P(\mathbf{r},t)$ can correspond to the geometry of the anti-matter. The incomprehensible notion of the negative probability is compatible with the claim for minimum contradictions (since contradictions are always expected). However, the question is raised of whether Schrödinger's relativistic equation or Dirac's equation should be taken into account. As it is known from classical works Dirac's equation is based on the requirement for linear operators correlation. According to the spirit of this work, the linearity that is mentioned constitutes an additional restriction that is not a theorem of logic Λ and therefore because of theorem I causes further contradictions beyond the ones imposed by the stochastic space-time consideration. Schrödinger's relativistic equation, without any potential term, can derive without any further assumption by the aid of Fourier analysis and corresponds to a minimum contradictions description [16,18,20]. P. Rowlands has noticed

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that fermions, which derive from Dirac's equation, do not describe a whole; "the particle and its "environment" can be considered as two "halves" of a more complete whole" [26]. It is noted that fermions have spin 1/2, which according to classical point of view corresponds to real particles. According to the spirit of this work we can have spin 1/2 due to coexisting local equivalent particle fields of gravitational (g) and electromagnetic (em) space-time even though they are described by Schrödinger's relativistic equation.

The electromagnetic (em) space-time is a space-time whose all magnitudes are considered imaginary and behave exactly like the gravitational (g). Electromagnetic (em) space-time is described by means of space-time wave functions such that:

$$\Psi_{em}(\mathbf{r}_{em},t_{em}) = \Psi^{g}_{em}(\mathbf{r},t) \tag{7}$$

where Eq. (7) has meaning due to the coexistence of (g) and (em) space-time under a scale. The way of coexistence and communication of (g) with (em) space-time is shown. On this basis space-time as a whole consists of:

1. real (g) space-time distributed according to a $P_g(\mathbf{r},t)$ function, revealing (g) matter or antimatter via positive or negative values of $P_g(\mathbf{r},t)$.
2. imaginary (em) space-time distributed according to a $P_{em}(\mathbf{r},t)$ function, revealing (em) matter or antimatter via imaginary positive ($+i$) or imaginary negative ($-i$) values of $P_{em}(\mathbf{r},t)$.

At this point we may notice that there are some similarities with P. Rowland's treatment where mass and charge space are independently symbolised and described [27].

The stochastic space-time has the property of self-similarity while, at the same time, it is chaotic (contradictory)- non-deterministic. It is something compatible with fractal geometry, which Mandelbrot has shown is a geometry that occurs in Nature [28,29].

The force of the gravitation is interpreted as a force that is exerted on every infinitesimal element of the stochastic matter space-time in order that it is distributed according to a given probability density function $P(\mathbf{r},t)$. Thus, the following general formula for gravitational acceleration derives:

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$$\mathbf{g}(\mathbf{r},t) = \frac{c^2}{P(\mathbf{r},t)} \nabla P(\mathbf{r},t) \tag{8}$$

Under certain simplifications, this formula is compatible with Newton's law for gravity [17,18].

A basic element of this work is that space-time is statistically interpreted. Most of the conclusions derive on the basis of statistical relations related to various space-time magnitudes. These conclusions and consequences are related to new explanations of various phenomena [18]. The reason why we have enough information to draw these conclusions is the clear statistical interpretation due to the property of Ψ wave functions to be everywhere self-normalized. In fact according to the claim for minimum contradictions the Ψ wave function of a matter system in general, is equivalent to local Ψ_i wave functions that obey Schrödinger's relativistic equation.

Local Ψ_i wave functions describe coexisting equivalent local (g) and (em) particle space-time fields which are regarded as extended to the infinity so that Schrödinger's relativistic equation probability density function $P(\mathbf{r},t)$ can apply. For this probability density function always is valid that:

$$\int P(\mathbf{r},t) dr^3 = 1 \tag{9}$$

Because of the property of Ψ to be self-normalized we have clearly stated statistical relations which permit us to draw conclusions related to forces unification, spin interpretation, matter system quantization, second thermodynamic law derivation, arrow of time and fractal properties interpretation as well as to new explanation of various phenomena. On this basis the possibility to technological applications related to the interaction of the electromagnetic with the gravitational field has been searched; experimental results related to propulsion of asymmetrical capacitors and to excess heat from light water electrolysis could be regarded as positive.

There is no evidence that the statistical relations mentioned are valid in the case of a Dirac treatment; as was mentioned, Dirac's equation cannot describe a whole [26]. The property of self-normalization of the theory proposed constitutes a basic difference in relation to existing current theories or

new proposed ones that use the requirement for re-normalization [30,31]. This requirement derives from the necessity for various magnitudes to be statistically interpreted but through functions that do not by themselves imply a statistical nature. In these cases problems are raised related to various phenomena and mainly to description and interpretation of gravity. The statistical nature of space-time constitutes the basic consequence of the main principle of this work *i.e.* of the claim for minimum contradictions.

On this basis the Equations of Minimum Contradictions Everything are stated; geometry and the force per unit of mass at a point $(\mathbf{r},t)$ of the HMF is defined. These equations describe a *Space-Time Quantum Mechanics.* Taking into account these equations and using numerical analysis (finite differences) we can conclude that a space-time matter system can not be determined on the basis of initial conditions. Thus, any matter space-time system is self-defined and behaves as if it had an ability to decide for its evolution. This might be the basis for a new approach related to the evolution of biological organisms. This approach is based on the existence of volition, which according to this work characterizes "everything" and therefore biological organisms as well. It is noted that according to minimum contradictions point of view the notion of volition is identified with the notion of "free will"(see Chapt. 11, Sects. 4,5,6).

This work derives from purely mental conclusions, in contrast to theories that condense the experience that has been revealed. According to this work a theorist reaches conclusions compatible with the ones of an experimentalist. This has similarities with E.J. Post' point of view where the starting point is the notice that "it is remarkable that Mathematical Theorems can apply so perfectly in Physics" [32]. Thus, in a logically linked way, under certain simplifications, Newton's gravitation law derives from mental principles and not from empirical observations such as the falling apple is.

At the end of this book a short analysis of the basic papers upon which this work is based is given. This might be useful to the reader because the relation of this work to the existing theories can be better understood. This analysis is put at the end, and not in the Introduction, because the objective of this work is to be presented as a result of mental principles. One can see that the main results of this monograph are the same with the ones deriving from

the unification of the physical meanings of the notions that result either from the GRT or from QM (see Chapt. 12, Article A.3) [33].

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MINIMUM CONTRADICTIONS EVERYTHING

CHAPTER 1. LOGIC ANALYSIS

1. GENERAL CONCEPTS

This logic analysis recapitulates the logic analysis developed in Refs. [1-4].

From Aristotle it is known that the way in which we communicate and prove various statements obeys the rules of classical logic; *i.e.*, the propositional and the predicate logic [5,6]. For the purposes of this work, Classical Logic is denoted as Principle I or P_I.

Apart from these rules Aristotle also stated the causality principle according to which for everything a reason-cause is needed. Leibniz expanded the causality principle and claimed more generally that something is valid if it can be logically proved by something else that is valid [7]. So, Leibniz' Sufficient Reason Principle could be written in the following form:

Principle II (P_{II}): *"No statement is valid if it cannot be logically proved through some valid statements different from itself."*

We name as logic Λ the system that includes Principles I and II; *i.e.*;

$$\Lambda \equiv P_I \cdot P_{II}$$

A purpose of this discussion is to prove the following:

Theorem I: *"Any system that includes logic Λ and a statement that is not theorem of logic Λ leads to contradiction."*

On the basis of Theorem I the following lemma can be stated:

Lemma: *"Any system that includes logic Λ and a synthetic sentence leads to contradiction."*

The anterior-posterior axiom constitutes a synthetic sentence; however additionally it can be proved that it is not theorem of Λ. Thus, the following can be proved:

Statement I: *"Any system that includes logic Λ and the anterior-posterior axiom leads to contradiction."*

where the anterior–posterior axiom is stated as follows:

Anterior–Posterior Axiom: "There is anterior-posterior everywhere in communication."

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Our basic communication system includes logic Λ and the anterior-posterior axiom. In fact, the way in which we communicate is not a simultaneous process but it is characterized by the existence of anterior and posterior; one word is put after another, one phrase after another *etc*. At first sight the anterior–posterior axiom relates only to communication, *i.e.*, to any kind of language used in order that any argument or theory to be stated. However, when we try to state a theory we do it through the language. If this theory relates to physics it means that the 'described' can be attributed by the 'describing'. It is obvious that there is not any physical property that can be described through any language simultaneously; *i.e.*, out of the anterior-posterior process. Time for example, is something that gives us the sense of anterior-posterior, but it is described through anterior-posterior elements of the describing language. The same is valid for space, or for any countable physical property. Therefore, the anterior-posterior axiom includes every anterior-posterior described; not only that indicating the order of communication elements (words, phrases, *etc*.).

2. PROOF OF THEOREM I AND OF STATEMENT I

2.1 Symbols

For the purpose of this analysis, we use the symbolic logic not only through the frame of the propositional and predicate logic, but also through the frame of logic Λ. Thus we have:

Principle I (P_I): The symbols of Classical Logic are used.

Principle II (P_{II}): This principle that expresses Leibniz' Sufficient Reason Principle can be stated through the following Statements.

$$P_{IIa}: \sim prov_{\Lambda}(p,p) \tag{1}$$

This Principle states that it is not valid that a statement - or set of statements - p can prove itself on the basis of logic Λ, *i.e.*, on the basis of a system including the classical logic P_I and the Principle P_{II}.

$$P_{IIb}: p \Rightarrow \wp \cdot prov_{\Lambda}(\wp,p) \tag{2}$$

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This Principle states that if p is valid then statement-or set of statements- $\wp$ is valid so that p can be proved by means of $\wp$ through logic Λ. Applying Classical Logic we have the following property of logic Λ.

$$prov_{\Lambda}(p,q)\cdot pov_{\Lambda}(q,r)\Rightarrow prov_{\Lambda}(p,r) \qquad (3)$$

i.e.: if p proves statement - or set of statements - q (through Λ) and p proves statement - or set of statements - r, then p proves r.

Notice: $prov_{\Lambda}(A,B)$ is not a simple logical proof of B through A; it implies that:

$$\sim prov_{\Lambda}(A,A)$$

i.e. A cannot prove itself. Thus Pythagorean Theorem, denoted as P, can be proved by means of Euclidean Geometry Axioms denoted as E; *i.e.*:

$$prov_{\Lambda}(E,P)$$

However, we have: $\sim prov_{\Lambda}(E,E)$

i.e. E cannot be self-proved and therefore is not *a priori* valid.

2.2 Theorem I: *"Any system that includes logic Λ and a statement that is not a theorem of logic Λ leads to contradiction."*

Proof: According to Principle II (P_{II}), Λ must prove its validity. According to Classical Logic (P_I), which is the language of this proof, we have

$$\Lambda\vee\sim\Lambda \qquad (4)$$

which means that either logic Λ is valid or logic Λ is not valid. Therefore, we can consider the following cases:

2.2.1 Logic Λ is non valid.

It is obvious that if a system includes Λ this system is contradictory since it must be valid Λ and ($\sim\Lambda$) at the same time.

2.2.2. Logic Λ is valid.

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We consider the system:

$$\Pi \equiv \Lambda \cdot p \cdot q \equiv \Lambda \cdot p' \tag{5}$$

We symbolize as Π_c the system Π when it is complete; that is, when the validity of p,q is due to Π_c itself. According to P_I we have:

$$\Pi_c \vee \sim \Pi_c \tag{6}$$

As long as Π is valid according to P_{IIb} it must be provable. Thus we will have.

$$\Pi_c \vee \Pi_0 \tag{7}$$

that is, either Π is complete (Π_c), or Π is open (Π_0); that is p,q are provable not through Π. Thus we have the following cases:

2.2.2.a. Π_c *(Π is complete).* In this case p,q must be provable through Λ, p, q. Because of Principle P_{IIa}, p,q cannot prove themselves; therefore for the complete system Π_c we will have:

$$p \Rightarrow prov_{\Lambda}(\Lambda, p) \vee prov_{\Lambda}(q, p) \tag{8}$$

$$q \Rightarrow prov_{\Lambda}(\Lambda, q) \vee prov_{\Lambda}(p, q) \tag{9}$$

By hypothesis there is a statement of Π which is not theorem of Λ; let be p this statement. Thus we will have:

$$\sim prov_{\Lambda}(\Lambda, p) \tag{10}$$

Thus, because of Statements (8-10), we obtain:

$$p \cdot q \Rightarrow prov_{\Lambda}(\Lambda, q) \cdot prov_{\Lambda}(q, p) \vee prov_{\Lambda}(q, p) \cdot prov_{\Lambda}(p, q) \tag{11}$$

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Both terms of the right part express impossibility; in fact, applying Statement (3), we have:

$$prov_{\Lambda}(\Lambda,q)\cdot prov_{\Lambda}(q,p)\Rightarrow prov_{\Lambda}(\Lambda,p) \tag{12}$$

i.e. if Λ proves q and q proves p then Λ proves p; this is in contrast with Statement (10). Working in the same way we have that:

$$prov_{\Lambda}(q,p)\cdot prov_{\Lambda}(p,q)\Rightarrow prov_{\Lambda}(q,q) \tag{13}$$

which is in contrast with Principle P_{IIa}. Thus, because of Statements (10-13), and since Λ is by hypothesis valid, we have:

$$\Pi_{c}\equiv\Lambda\cdot p\cdot q\Rightarrow contr. \tag{14}$$

where by the term *contr.* the existence of contradiction is symbolized. Thus because of Statement (14) we can state the following:

Statement II: *"If logic Λ is by hypothesis valid, then any system that includes this logic Λ and a statement that is not a theorem of logic Λ cannot be complete and consistent at the same time."*

2.2.2.b. Π_0 (Π *is open-non complete*)

According to Principle II (P_{II}), Λ and $p\cdot q\equiv p'$ must be provable through some valid statements different from them. As was mentioned, Λ is by hypothesis valid. According to P_{II} we have:

$$p'\Rightarrow\wp'\cdot prov_{\Lambda}(\wp',p') \tag{15}$$

If $\wp'$ is the complete set of statements-reasons for validity of p', the system:

$$\Lambda\cdot\wp'\cdot p' \tag{16}$$

must be complete and consistent so that the complete proof for p' exists; if there were not a complete proof then doubt would exist about p' validity, which is in contrast with the requirement that p' is valid. This system in-

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cludes p' and therefore p; thus according to Statement II, this system leads to contradiction; *i.e.*:

$$\Lambda \cdot \wp' \cdot p' \Rightarrow contr. \tag{17}$$

Taking into account principle P_{II} we obtain:

$$\Pi \equiv \Lambda \bullet p' \Rightarrow \Lambda \bullet \wp' \bullet p' \Rightarrow contr. \tag{18}$$

Therefore, in general, the system Π leads to contradiction regardless of whether it is complete or not; thus taking into account what was mentioned in case 2.1 and Eq. (18), we can state Theorem I since it is valid without any restriction for Λ.

On the basis of Theorem I the following lemma can be stated:

Lemma: "Any system that includes logic Λ and a synthetic sentence leads to contradiction."

The anterior-posterior axiom constitutes a synthetic sentence; however additionally can be proved that it is not theorem of Λ.

2.3 Statement I: *"Any system that includes logic Λ and the anterior-posterior axiom leads to contradiction."*

Proof: If we name zero the state before our communication and 1, 2, 3, ... the sequent states of this communication we may notice that the anterior-posterior axiom can be related to numbers.

The anterior-posterior axiom in terms of arithmetic can be stated as follows:

1. 0 is number. 2. There is the next of any number x. (19)

Statements (1) and (2) coincide with some of the basic Peano's Axioms [8]. The next of 0 is 1. According to the anterior–posterior axiom, 0 corresponds to the non-existence of any communication symbol while 1 to some symbol existence. It is obvious that from the non-existence of something can not derive its existence. Thus, the Anterior–Posterior Axiom is not compatible with Classical Logic (Principle P_I) since it leads to contradiction; in extension this axiom is not compatible with logic Λ, which includes principle P_I. Therefore we can state that *the Anterior–Posterior Axiom is not theorem of* Λ.

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Applying Theorem I for systems including the Anterior–Posterior Axiom we obtain Statement I.

3. GÖDEL'S WORK

Aristotelian - Classical Logic consists of propositional and predicate logic. Gödel's theorem proof is based on Mathematica Principia [9] - which codify a part of Aristotelian logic (propositional logic) - and Peano's Arithmetic (PA) axioms [8]. The fundamental Statement that is the basis for proof of Gödel's Theorems is:

Gödel's Basic Statement: "If Formula G (Gödel's formula) can be proved, then its negation (~G) can be proved as well".

This implies that Peano's Axioms (PA) are inconsistent; the inverse Statement is not always valid, and this implies that (PA) is simply 'ω-non consistent'. However J.B. Rosser proved that if Theory T is an extension of (PA) [that is, T can prove all theorems of (PA)] then there is a formula R_T such that following Statement is valid [10]:

Rosser's Statement: " If formula R_T can be proved, then its negation ($\sim R_T$) can be proved as well, and vice versa".

On the basis of Gödel's Basic Statement and its corresponding inverse Statement, Gödel's Second Theorem can be stated [9]:

Gödel's Second Theorem: *"A consistent system including Peano's arithmetic cannot be complete".*

It is noted that this Theorem was proved on the basis of the following [11]:

Gödel's Hypothesis: *"There is an algorithm that permits the derivation of only true statements".*

Of course this hypothesis is arbitrary. According to Hillary Putnam, Gödel's second incompleteness theorem states that if a system 'S' of formalized mathematics – that is, a set of axioms and rules so precisely described that a computer could be programmed to check proofs in the system for correctness – is strong enough for us to do number theory in it, then a certain well-formed statement of the system, one which implies that the system is consistent, cannot be proved within the system [12]. As Putnam noticed, this Gödel's theorem had been misinterpreted; Gödel's hypothesis has not been proved in spite of efforts made by Church, Schröter, and others [11]. Roger Penrose investigated the 2nd Gödel's Theorem and, taking into account the fact that it is not valid completely in the form stated by Gödel, concluded that [13]:

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Conclusion I: *There is a part of our thinking which cannot be computational; this part could be investigated via laws of physics.*

There are doubts that there exists a possibility for non-computational thinking able to be investigated by the laws of physics [12]; however, Penrose's conclusion completely takes into account what exactly has until now been proved [13].

It is noted that Statement II can be regarded as a generalized case of Gödel's theorem [9]; this theorem requires in order to derive Aristotelian logic (Mathematica Principia) [8,9] and axioms that are not theorems of this logic (Peano's axioms); besides, Statement II requires the Sufficient Reason Principle (P_{II}) which has similarities with Gödel's hypothesis mentioned.

It is also noted that Statement I has similarities with "Gödel's Basic Statement" and J.B. Rosser's Statement; there are similarities between Peano's axioms and the anterior-posterior axiom as it is stated in this work.

4. PROOF OF STATEMENT I BASED ON GÖDEL'S WORK

The Sufficient Reason Principle, for a system including arithmetic, can be stated as follows:

Sufficient Reason Principle:

(a) If something is true then it is provable. (b) Formula G is true.

In fact Statement (a) is immediate consequence of Principle P_{II} and includes Gödel's Hypothesis. Statement (b) can be regarded as Consequence of P_{II} since according to P_{II} nothing can prove itself; note that formula G states that it is not provable by itself. Therefore because of (b) formula G is true which implies, according to (a), that G is provable; thus Statement I states exactly the same with "Basic Gödel's Statement". As was mentioned "Basic Gödel's Statement" is not inversely valid and this leads to ω-inconsistency of (PA). However in the case under study this inverse Statement has no meaning because due to P_{II} formula G is always provable. Therefore it can be stated:

Basic Gödel's Statement, Extension I: *"A system including Mathematica Principia, the Sufficient Reason Principle, and Peano's Axioms leads to contradiction".*

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Mathematica Principia is a part of classical logic (P_I) which is used in the text of any proof; thus, for this proof, have been used both P_I and P_{II}, *i.e* logic Λ. Thus it can be stated:

Basic Gödel's Statement, Extension II: *"A system including logic* Λ *and Peano's Axioms leads to contradiction".*

This Statement coincides with Statement I on condition that natural numbers can correspond to discrete communication symbols, which is in agreement with the anterior-posterior axiom as defined in this work. *This proof constitutes a verification of Statement I, which has been proved through a different way. This is a basic argument for Theorem I validity, which is required in order that the Claim for Minimum Contradictions can be applied in Physics* (see Chapt. 3, Sect. 2.1).

Notice that the question is raised of what is more general: the anterior-posterior axiom as it has been stated in this work or as it has been stated in Peano's Arithmetic? We may notice that Peano's axioms in order to be valid they must be expressed through communication symbols. Numbers 1, 2, 3, ... before any axiomatic definition must be written with some concrete symbols. Therefore arithmetic itself cannot exist without the anterior-posterior axiom. The most pure thinking cannot avoid the experience of communication. On this basis we may notice that according to Statement I arithmetic is not consistent. This of course is in contrast to an obvious arithmetic validity considered. Statement I states that arithmetic in depth is contradictory. It does not state that there is not an internal consistency of an arithmetic based on certain (arbitrary) axioms.

These can be understood through examining of the popular question of circle squaring. According to Euclidean geometry the circumference is:

$$S = 2\pi R \tag{20}$$

According to present knowledge, S cannot be defined on the real number axis. Therefore maybe something non-correct has been taken into account in calculation of S where the Euclidean axiom has been regarded as valid. According to Principle II, the Euclidean axiom cannot prove itself. Therefore, in a more general consideration beyond this axiom we should take into account the sufficient reason principle, and in extension logic Λ. Since we deal with

the real number axis, we should take into account the anterior-posterior axiom in the form of Peano's axiom, or more generally in the present form of this axiom. In both cases, according to Statement I, we have a contradiction. This means that the measuring process for the circumference is not consistent, and this denies the possibility of this length to be defined on the real number axis.

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CHAPTER 2. PERFECT PHYSICS THEORY HYPOTHESIS

Common Roots of Relativity Theory, Newtonian Mechanics and QM

1. GENERAL

As was mentioned in Chapter 1 and in Refs. [1 - 4], our basic communication system consists of the Aristotle logic, the Leibnitz' Sufficient Reason Principle, *i.e.* of logic Λ and the anterior-posterior axiom.

In order that a physics theory is perfect the communication system through which it is stated should be perfect as well. On condition that the Basic Communication System has not contradictions it is possible to state a perfect physics theory hypothesis. Inversely *according to perfect physics theory hypothesis the basic communication system should not include any contradiction.* This is in contrast with Statement I (see Chapt. 3); however in this Chapter we make this hypothesis because through it we can reach the common roots of Relativity Theory, Newton Mechanics and QM.

We consider a physics theory which beyond the basic communication system principles it includes further axioms. If such an axiom is theorem of logic Λ, then this axiom does not add any restriction information beyond what is stated by the basic communication system. If an axiom is not theorem of logic Λ and does not constitute tautology of the anterior-posterior axiom then, according to Theorem I (see Chapt. 1), the system including both this axiom and the basic communication system leads to contradiction.

The systems of axioms we use in Physics include the communication system; therefore, a necessary condition (but not sufficient, as will be shown in Chapt. 3) for the perfect physics theory hypothesis to be valid is that it must be based only on the basic communication system; *i.e.*, on logic Λ and on the 'anterior-posterior axiom'.

In order that such physics will be valid, a unifying principle is needed, since everything, *i.e.* matter, field, space-time, should be described in anterior -posterior terms. On the basis of the above mentioned, we can make the following statement:

Statement III: *Necessary condition for perfect physics theory hypothesis to be valid is that any matter space-time system can be described in anterior –posterior terms.*

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It is noted that time, when described, implies the existence of anterior and of posterior; space does, too. If I say 10 cm, I mean the existence of 1,2,...,9,10; *i.e.*, the existence of anterior and of posterior. Therefore, the existence of anterior and posterior is the condition for space and time to exist. Inversely if anterior – posterior exist, this is not limited to the communication itself, it implies the existence of space and time, both described and measured. (See Chapt. 1, Sect. 1). Thus, because of Statement III, if *perfect physics theory hypothesis* is valid we can state the following:

Statement IV: *Necessary condition for perfect physics theory hypothesis to be valid is that any matter system can be described in space-time terms.*

Since everywhere there is space-time and not something else, space-time can be regarded as matter itself. A matter system, in general, has differences within its various areas. This means that a matter system, in general, is characterised by different rates of anterior – posterior (time) within its various points. Since space is also locally affected by the local rate of anterior-posterior, it is expected to deform due to different rates of anterior -posterior. So the question is raised of whether the "time" anterior – posterior is the same with the "space" anterior – posterior or not; if it was not the same, further axioms – restrictions (not theorems of Λ) should be needed which according to theorem I would cause contradictions. *Thus for a perfect physics theory the anterior – posterior rate must be the same either for space or time.*

According to the *perfect physics theory hypothesis*, as was mentioned, the basic communication system is regarded as not having contradictions (in contrast to what will be mentioned in Chapt. 3) and therefore there is no illogical dimension in the description of reality; thus, space-time, according to this hypothesis, is continuum. However the question is raised of whether space-time has more than four dimensions. Any further dimension requires a further restriction – axiom which, according to theorem I, leads to contradiction. Therefore according to *perfect physics theory hypothesis* space-time has four dimensions.

For the same reason a perfect physics theory hypothesis can not be based on something else which is countable and different from space and time. It is noted that space-time is treated as a "privilege countable" since it is the only one for which we have an immediate experience. This book is based on principles expressing immediate experiences deriving from communication

and reality; not from any arbitrary mental structures. When we want to describe something we ask where it is, what time and for what reason.

On the basis of the above mentioned, we may notice that Theorem I acts as a simplicity principle, which, however, has been derived not arbitrarily but through logic analysis; this principle is not adequate to be applied in physics in general, *i.e.*, out of the *perfect physics theory hypothesis* as it will be shown in Sections 2.2 and 2.3 in Chapt. 3 (see notice II in Chapt. 3).

2. RELATIVISTIC BEHAVIOR

2.1 Lorentz Transformations

As in [4], we note that, *on condition that space-time is considered as a continuum,* the relativity theory can be regarded as a possible consequence of Statement IV. In fact, any infinitesimal area of a space-time continuum can be regarded as an area with constant rate of anterior-posterior, and therefore it has no space-time deformity. Thus, time is independent of space in this infinitesimal area, and, since its rate is different in various points of the field, it can be regarded as a fourth dimension. Thus, in Riemanns's 4-dimentional space with $x_4 = kt$, where k a constant with units of velocity so that x_4 will have units of length, we can write [5,6]:

$$dS^2 = dx'^2 + dy'^2 + dz'^2 + k^2 dt'^2 = dx^2 + dy^2 + dz^2 + k^2 dt^2 \qquad (1)$$

and

$$dS^2 = |\, d\mathbf{r}' \,|^2 + k^2 dt'^2 = |\, d\mathbf{r} \,|^2 + k^2 dt^2 \qquad (2)$$

For $dS = 0$ we obtain:

$$|\, d\mathbf{r}' \,| / dt' = |\, d\mathbf{r} \,| / dt = ik \qquad (3)$$

As we notice, because of Eq(3), there is a velocity that is invariant to the coordinate systems mentioned. This has obvious similarities with Einstein's Special Relativity Theory requirement when $k = -ic$, where c is the speed of light; in this case Eq(1) imply Lorentz transformations. However it is noted that this kind of relativity derives on the basis that space-time is matter itself. Thus Lorentz' transformations relate to the medium (matter space-time -

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ether) deformation which is closed to Poincaré's point of view [7]. *On this basis we may notice that space-time can be regarded either as geometry or as matter. Thus, perfect physics theory hypothesis is compatible both with Einstein's and Poincaré's point of view.*

2.2 Definitions

The following definitions from [8] are useful for the purposes of this work:

i. As reference space-time we define a Euclidean space-time to which, through transformations of deformity, any field can correspond. This reference space-time is not only a geometrical notion because, according to the present hypothesis, it is also matter. Any magnitude of it will be denoted by the subscript 0. A point A_0 of the reference space-time occupies by the action of the field a position $A \neq A_0$

ii. As Hypothetical Measuring Field (HMF) is defined a hypothetical field, which consists of the reference space-time, in which at every point A_0 the real characteristics of the corresponding point A of the real field exist.

iii. In a HMF, we define as relative space-time magnitude sr the ratio of a real infinitesimal space-time magnitude ds to the corresponding infinitesimal magnitude s_0 of the reference space-time: *i.e.* $sr = ds / ds_0$.

This can apply to any magnitude as follows:

a) Relative time: $tr = dt / dt_0$, where dt is an infinitesimal time of comparison at a given position of the HMF.

b) Relative length in a direction **n**: $lr_n = dl_n / dl_{n0}$, where dl_n is an infinitesimal length of comparison in a direction **n** and at a given time of the HMF.

c) Relative volume: $vr = dv / dv_0$, where dv is an infinitesimal volume of comparison at a given time of the HMF.

The relative space-time magnitudes mentioned above are denoted by SR, TR, VR, LR_n when they refer to flat matter space-time field.

Since the physics proposed is based on the notion 'anterior-posterior' and in extension, on the notions of space and time we have not an experience of what energy is on the basis of these notions. We make the following defi-

nition for energy, which is, as it will be shown later, in accordance with what the gained experience has revealed.

iv. *We name energy of an infinitesimal space-time element its ability to exist.*

2.3 Equivalence of Energy and Time [8]

According to Definition iv, the energy of an infinitesimal space-time element with energy dE exists on condition that some corresponding 'anterior-posterior' exist too. With respect to the HMF this space-time element is observed during a time dt, which is different from the corresponding time dt_0. Various space-time elements in the HMF have different dt for the same dt_0. Thus, dt measures the duration, *i.e.* the ability of a space-time element to exist. So we can write:

$$dE \sim dt \tag{4}$$

Relation (4) can be expressed by the following:

Statement V: *The energy of any changing infinitesimal space-time element is equivalent to its internal time.*

Here internal time is the time of a phenomenon of comparison.

2.4 Flat Matter Space-Time [4]

A consequence of Lorentz transformations is that:

$$dt / dt_0 = 1/\sqrt{1 - \upsilon^2 / c^2} = \gamma \tag{5}$$

where $\vec{\upsilon}$ is an equivalent velocity of a space-time element and dt is the time of a phenomenon of comparison. Statement V and Eqs. (4,5) imply:

$$dE / dE_0 = dt / dt_0 = tr = 1 / vr = \gamma \tag{6}$$

For a flat matter space-time it will be valid that:

$$E / E_0 = dE_i / dE_0 = \gamma_i = const. \tag{7}$$

where i indicates a point of the HMF. Because of Eqs. (5-7), we will have:

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$$E^2 = c^2(E/c^2)^2\upsilon^2 + E_0{}^2 \tag{8}$$

Defining the folowing :

$$E/c^2 = m \quad \text{(mass)} \quad , \tag{9}$$

$$E_0 = mc^2 \quad \text{(rest energy)} \quad , \tag{10}$$

$$(E/c^2)\boldsymbol{\upsilon} = m\boldsymbol{\upsilon} = \mathbf{P} \quad \text{(momentum)} \quad , \tag{11}$$

we obtain:

$$E^2 = c^2\mathbf{P}^2 + m_0{}^2c^4 \tag{12}$$

We notice that Eq. (12) has the same form as the one that the gained experience has revealed. Thus, Eq. (12) shows that the SRT energy formula can derive as a possible consequence of the *perfect physics theory hypothesis if it refers to a flat matter space-time.* As it will be shown later (see Chapt. 4, Sect. 2.1) flat matter space-time behavior appears in mean value stochastic space-time geometry.

3. NEWTON MECHANICS BEHAVIOR [9]

Because of Eq. (12), for a motion in a direction $\mathbf{n}$ we obtain:

$$2EdE = 2c^2PdP = 2c^2(E/c^2)\upsilon\, dP = 2E\upsilon\, dP = 2EdP(dx_n/dt) \tag{13}$$

and

$$dE/d\mathbf{x}_n = d\mathbf{P}/dt = \mathbf{F} \tag{14}$$

For $dm/dt = 0$ we obtain:

$$dE/d\mathbf{x}_n = m\, d^2\mathbf{x}_n/dt^2 = \mathbf{F} \tag{15}$$

We notice that Eqs. (14,15) have the same form as the one that the gained experience has revealed. Thus Eqs. (14,15) show that Newton mechanics can derive as a possible consequence of *perfect physics theory hypothesis if it refers to matter flat space-time.* As it will be shown later (see Chapt. 4, Sect.

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2.1) flat matter space-time behavior appears in mean value stochastic space-time geometry.

4. QM BEHAVIOR [4]

Eq. (6) can be viewed in two ways:

a) When dt_0 is a unit of time, Eq. (6) describes the duration dt, with respect to an observer of the reference space-time and this implies a relativistic point of view.

b) When dt is a constant period of time in the Hypothetical Measuring Field (HMF), then Eq. (6) can be written in the form:

$$dE / dE_0 = dt / dt_0 = (f / n) / (f / n_0) = n_0 / n \tag{16}$$

where n is the frequency of a periodical phenomenon of comparison and f is an arbitrarily constant factor through which we can change the scale of n, n_0. If $n = 1$, n_0 must be different for every point $(\mathbf{r},t)$ of the HMF. If this is the case, $n_0(\mathbf{r},t)$ represents the number of ticks of a clock connected with the point $(\mathbf{r},t)$ of the HMF in the unit of time observed. On this basis, Eq. (16) can be written in the form:

$$dE / dE_0 = n_0(\mathbf{r},t) \tag{17}$$

Let us stress the relation:

$$n_0(\mathbf{r},t) \neq n_{0,HMF} \tag{18}$$

which means that $n_{0,HMF}$ is the unique frequency of the HMF and corresponds to the Case (a), while $n_0(\mathbf{r},t)$ is a local frequency corresponding to the Case (b).

Since, according to this work, energy-matter is nothing else than a system with different and changing rate of anterior-posterior, Eq. (18) shows the way through which a field exists and acts at various points. The most general case of a space-time continuum is when it refers to a gravitational wave.

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If this is the case, $n_0(\mathbf{r},t)$ represents the frequency with which a space-time element dU 'acts' at various points of the HMF in the unit of time that an observer, of the reference space-time, spends for the observation of any infinitesimal area of the field. The term 'acts' is used because, by definition, the space-time element dU acts out of the HMF. This is compatible with the QM, which is described through a non-deformable space-time.

Thus, for the same equation we have the following correspondences:

$$dE / dE_0 = dt / dt_0 \rightarrow \text{Observation (Relativity Theory)} \qquad (19)$$

$$dE / dE_0 = n_0(\boldsymbol{r},t) \rightarrow \text{Action (Quantum Mechanics)} \qquad (20)$$

For $n_0(\boldsymbol{r},t) = \nu = const.$ in the whole extend of the field, because of Eq(20) we have:

$$E = E_0 \nu \qquad (21)$$

We notice that Eq. (21) for $E_0 = h$ expresses one of the fundamental De Broglie's Principles. According to the above mentioned Eq. (21) is valid if it refers to a field with $n_0(\boldsymbol{r},t) = \nu = const.$ Thus, Eq. (21) is non valid generally. However it shows, that through the *perfect physics theory hypothesis* we can reach to a formula which constitute the root of QM. As will be shown later, Eq. (21) can apply to mean value stochastic space-time geometry (see Chapt. 4, Sect. 4)

5. CONCLUSIONS

From this Chapter we conclude that the *perfect physics theory hypothesis* can lead to conclusions compatible with what the gained experience has revealed. More specifically:

1) On the basis of this hypothesis, Lorentz' transformations derive in a way *compatible both with Einstein's and Poincaré's point of view.*

2) The SRT energy formula derives for flat matter space-time.

3) Newton's Law derives for flat matter space-time.

4) A fundamental De Broglie's Principle derives for a matter space time field with constant frequency in the whole of its extent.

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Thus, we may notice that according to *perfect physics theory hypothesis,* fundamental laws of physics can derive under some restrictions. The restrictions mentioned are valid in the case of mean value stochastic space-time geometry (see Chapt. 4, Sect. 2.1).

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MINIMUM CONTRADICTIONS EVERYTHING

CHAPTER 3. THE CLAIM OF THE MINIMUM CONTRADICTIONS

Basis for a Minimum Contradictions Physics

1. GENERAL

According to what was mentioned in Chaptrers 1 and 2, and in Refs. [1-4], our basic communication system consists of logic Λ and the anterior-posterior axiom. Thus, the basic communication system obeys Statement I (Chapt. 1); however, we notice that Statement I cannot be stated because it is based on the basic communication system which, according to Statement I itself, is contradictory.

Thus, Statement I imposes silence.

When we communicate, the contradictions cannot be vanished, so we use a hidden claim according to which *"what is accepted as valid is what includes the minimum possible contradictions."* According to this hidden claim, which we could name as *"claim of the minimum contradictions"* [5], we obtain a logical and an illogical dimension. In fact, through this axiom we try to approach logic (minimum possible contradictions), but at the same time we expect something illogical since the contradictions cannot be vanished.

According to this claim, Statement I is accepted as valid because contradictions are permitted, but it leads to *silence. Thus, the claim of the minimum contradictions can be regarded only as a necessary condition of communication. Therefore, this claim, and whatever derives from it, includes the arbitrariness deriving from breaking the silence while, at the same time, it constitutes a tendency to logic.*

Notice I:

On the basis of the proposition logic, which is a part of logic Λ, the following statement can be proved [6]:

$$"S \supset (\sim S \supset V)" \tag{1}$$

This means that: *"If statement S is valid then: if statement $\sim S$ is valid then any Theorem V can be proved."*

According to Statement 1, if we have one contradiction, *i.e.* if S and $\sim S$ are valid at the same time, then anything can be proved. If this is the

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case, then any set of statements $(A_1),(\sim A_1),(A_2),(\sim A_2),....,(A_N),(\sim A_N)$ can be proved; *i.e.* any contradiction can be regarded as valid; N can be any number, even infinite.

On this basis, the claim for minimum contradictions would make no sense, since, according to what was mentioned, any contradiction is implied [7]. However the claim for minimum contradictions is *not* a claim within logic Λ. It is a metalogical claim, since it is used despite the fact that our basic communication system appears to be contradictory. Thus, this claim modifies our basic communication system, since it implies a logical 'attractor' through minimum possible contradictions required. Therefore, during our communication, *i.e.* after our breaking the silence imposed by the basic communication system, we follow a way of thinking which exceeds the basic communication system itself. On this basis, if a contradiction $(S)\cdot(\sim S)$ appears, it does not imply that any contradiction is valid; *this gives meaning to the claim for minimum contradictions, which, together with logic* Λ *and the anterior-posterior axiom, creates a new extended communication system.*

2. BASIS OF A MINIMUM CONTRADICTIONS PHYSICS

2.1 General

As was mentioned above, and in Refs. [2-5,8,9], Statement I means our basic communication system is contradictory. We consider a physics theory that, beyond the basic communication system principles, includes further axioms.

If any such axiom is theorem of logic Λ, this axiom does not add any restriction-information beyond what is stated by the basic communication system.

If an axiom is not theorem of logic Λ, and does not constitute tautology of the anterior-posterior axiom then, according to Theorem I (see Chapt. 1, Sect.1), the system that includes this axiom and the basic communication system leads to an additional contradiction.

The systems of axioms we use in physics include the communication system, and therefore, their contradictions are minimized when they are reduced to the communication system itself. *Therefore, we have minimum contradictions in Physics when it is based only on the basic communication system; i.e., on logic* Λ *and on the anterior-posterior axiom.* In order that such

physics will be valid everything, *i.e.* matter, field, space-time, should be described in anterior-posterior terms.

2.2 Space-Time Physics

At first sight, on the basis of the above mentioned, for a minimum contradictions physics we can state the following statement:

Statement VI: *Minimum contradictions physics can be described in anterior –posterior terms.*

It is noted that time implies the existence of anterior and of posterior; space does, too. If I say 10 cm, I mean the existence of 1,2,...,9,10 cm *i.e.* the existence of anterior and of posterior. Therefore, the existence of anterior and posterior is the condition for space and time to exist.

Conversely, if anterior – posterior in communication exists, this is not limited to the communication itself, it implies the existence of space and time that is described and measured (see Chapt. 1, Sect. 1). Thus, because of Statement VI, for a least contradictory physics we can state the following:

Statement VII: *Minimum contradictions physics can be described in space-time terms.*

Since everywhere there is space-time, and not something else, space-time can be regarded as matter itself. A matter system, in general, has differences within its various areas. This means that a matter system, in general, is characterized by different rates of anterior-posterior (time) within its various points. Since space is also locally affected by the local rate of anterior-posterior, it is expected to exhibit deformation due to different rates of anterior-posterior.

However the question is raised of whether space-time has more than four dimensions. Any further dimension requires a further restriction axiom, which, according to Theorem I, leads to additional contradictions. Therefore according to *minimum contradictions physics* space-time has four dimensions. For the same reason a minimum contradictions physics theory hypothesis cannot be based on something else which is countable and different from space and time. Space-time is treated as a 'privilege countable' since it is the only one for which we have an immediate experience. This book is based on principles expressing immediate experiences deriving from communication and

reality; not from any arbitrary mental structures. When we want to describe something we ask where it is, what time and for what reason.

On the basis of the above mentioned we may notice that theorem I acts as a simplicity principle which however has been derived not arbitrarily but through logic analysis; this principle is not adequate so that it can be applied in physics in general *e.g.* in stochastic space-time as will be described in Sect. 2.3 and in Notice II.

2.3 Stochastic Space-Time

At second sight, taking into account the above mentioned and applying the claim of the minimum contradictions, we conclude that matter-space-time has logical and contradictory behavior at the same time; this can be valid when space-time exists and not-exists at the same time (illogical behavior), while it implies the existence of logic. This can be approached by the aid of a hypothetical measuring field HMF as has been defined (see Chapt. 2, Sect. 2.2). If this is the case, we can say that space-time has a probability to exist and to correspond to an infinitesimal area around a point $(\mathbf{r},t)$ of the HMF. When the probability integral equals to 1 the following statement is valid:

"Space-time exists."

This is a non-contradictory statement; *i.e.*, it is a logical statement. Thus we can state the following:

Statement VIII: *Minimum Contradictions Physics can be described by Stochastic Space-Time.*

However physics describes any matter system, *i.e.*, matter, anti-matter, mass and charge. On this basis statement VIII has sense if there are various kinds of space-time corresponding to the various forms of matter. This will be clear in the Chapters following by using signs that declare the kind of stochastic space-time through which matter states are described. Thus we can use signs $+1,-1,+i,-i$ for various states.

This has similarities with Wittgenstein's point of view related to language games. According to Wittgenstein signs $+1,-1,+i,-i$, can correspond to different states of reality. [10] *"From the existence or non-existence of one state of affairs it is impossible to infer the existence or non-existence of another"*. [11]

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It is noted that sign $(+i)$ is incomprehensible with respect to sign $(+1)$; it does not constitute a further contradiction related to the anterior-posterior axiom. The anterior-posterior axiom refers to physical states that can be either states related to (± 1) or states related to $(\pm i)$. Wittgenstein's point of view can be also regarded as compatible with the notion of a contradictory space-time. In fact he had said *"whereof we cannot speak, we must pass over in silence"* [11].

Notice II:

1) According to theorem I further axioms beyond the ones of communication are avoided. Thus the Claim for Minimum Contradictions operates as a Simplicity Principle. This is compatible with Ockham's razor [12]; however Ockham's razor cannot imply the acceptance of any contradiction.

2) Minimum contradictions physics is based on logic, the anterior – posterior axiom and the claim for minimum contradictions; mathematics at the most complete form should be based on the same principles. This may be the reason why physics can be so successfully expressed through mathematics; one can see similarities with Evert Post's point of view [7,13].

3) The contradictions (because of statement I) could imply that the axioms of logic Λ cannot be regarded as correctness rules because in this case we reach to absurd results. This is compatible with Wittgenstein's point of view, which, however, had been stated in an arbitrary way; not through statements derived through correctness rules. According to Wittgenstein we can reach truth without correctness rules since, according to his point of view, truth lies in public view. Of course there are doubts if this point of view can be applied as long as there is not an agreement on what is truth. Thus, we notice that Wittgenstein's conclusions [10,11] are compatible with the present work but through a different starting point. According to Wittgenstein, correctness rules are not treated as mental types-properties that describe reality itself, in contrast to this work. Besides when we express mental types in a symbolic way we don't feel that something prevents us from using them logically; on the contrary we feel that any statement should be in accordance to mental types even though this statement relates to mental types themselves. The point of view according to which correctness-rules-mental-types constitute something different from reality itself, was first stated by Kant [14]. Accord-

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ing to Kant, when logic is applied to reality itself, it leads to contradiction; on the contrary there are *a priori* true sentences when they refer to mental types, *i.e.* to logic and to space and time. It is remarkable that if mental types were regarded as reality itself, then according to Kant methodology they would lead to contradiction too.

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CHAPTER 4. STOCHASTIC SPACE-TIME

1. GENERAL

1.1 Definitions

According to statement VIII (see Chapt. 3, Sect. 2.3 and Refs. [1-3]) we have that minimum contradictions physics can be described in stochastic space-time terms. Working in the same way as in Chapt. 2, Sect. 2, for the purposes of stochastic space-time description, the following definitions are made:

i. As reference space-time we define a Euclidean space-time to which, through transformations of deformity, any field can correspond. This reference space-time is not only a geometrical notion because, according to the present hypothesis, it is also matter. Any magnitude of it will be denoted by the subscript 0. A point A_0 of the reference space-time occupies by the action of the field a position - $A \neq A_0$

ii. As Hypothetical Measuring Field (HMF) is defined a hypothetical field, which consists of the reference space-time, in which at every point A_0 the real characteristics of the corresponding point A of the real field exist.

iii. In an HMF, we define as mean relative space time magnitude $\overline{sr}$ the ratio of the mean real infinitesimal space time magnitude $\overline{ds}$ to the corresponding infinitesimal magnitude ds_0 of the reference space- time; *i.e.* $\overline{sr} = \overline{ds} / ds_0$. This can apply to any magnitude as follows:

a) Mean relative time: $\overline{tr} = \overline{dt} / dt_0$, where dt is an infinitesimal time of comparison at a given position of the HMF.

b) Mean relative length in a direction $\boldsymbol{n}$: $\overline{lr}_n = \overline{dl}_n / dl_{n0}$, where dl_n is an infinitesimal length of comparison in a direction $\boldsymbol{n}$ and at a given time of the HMF.

c) Mean relative volume: $\overline{vr} = \overline{dv} / dv_0$, where dv is an infinitesimal volume of comparison at a given time of the HMF. The relative space-time magnitudes mentioned above are denoted by SR, TR, VR, LR_n when they refer to mean values of a particle space-time field.

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1.2 General properties

Statement V and Eq. (6) in Chapt. 2 can be extended to non-relativistic forms. In fact, for a stochastic space-time because of Eq. (6) in Chapt. 2 we can write:

$$\overline{dE} / dE_0 = \overline{\tau} / \tau_0 = \overline{tr} = \overline{(1/vr)} \neq 1/\overline{vr} \tag{1}$$

where the over bar denotes the local mean value. We notice that $\overline{dE} / dE_0 = \overline{dt} / dt_0$, is compatible with relativity theory, while $\overline{tr} \neq 1/\overline{vr}$ is not compatible with it.

Since Matter-Space-Time is stochastic, we have that its energy, momentum, and geometry are distributed according to a probability density function. In fact the existence of this function reveals the logical structure of a stochastic space-time, while it implies its contradictory nature. If we say that probability density function $P(\mathbf{r},t)$ such that $\int P(\mathbf{r},t)dr^3 = 1$ exists, we accept that something can exist and not exist at the same space and time, at a point $(\mathbf{r},t)$, while we accept that it exists in general within the area in which $P(\mathbf{r},t)$ is defined.

In the HMF, for a relative space-time magnitude $\overline{sr}$ by definition it is valid that:

$$\left\langle \overline{sr} \right\rangle = \frac{1}{V_{0T}} \int \overline{sr}(\mathbf{r},t)dr^3 \tag{2}$$

where V_{0T} is the volume of the reference space-time to which the whole space-time matter system corresponds. According to this work, a flat space-time has energy. Note that if its energy density is not zero, it holds that for a finite energy the volume of the reference space-time cannot be infinite.

Since space-time is matter itself, a space-time magnitude has a probability to exist on condition that there exists energy, *i.e.* matter. In the HMF, by definition, the energy distribution refers to real magnitudes of energy. Therefore, the probability density of a matter field describes the probability density of energy and of any space-time magnitude to exist in the HMF.

For the probability density it is valid that

$$\int P(\boldsymbol{r},t)dr^3 = 1 \tag{3}$$

Thus Eqs. (2) and (3) imply that:

$$\int P(\mathbf{r},t)\left\langle \overline{sr}\right\rangle dr^3 = \frac{1}{V_{0T}}\int \overline{sr}(\mathbf{r},t)dr^3 \quad ,$$

$$\overline{sr}(\mathbf{r},t) = \left\langle \overline{sr}\right\rangle V_{0T}P(\mathbf{r},t) \tag{4}$$

At first sight, the probability density mentioned could be the probability density that derives from the Quantum Mechanics. Therefore, the question is raised which set of statements of Quantum Mechanics is compatible with the claim for minimum contradictions.

2. FLAT MEAN VALUE MATTER SPACE TIME

2.1 General

Eqs. (3) and (4) imply that matter and geometry are distributed by the same function $P(\mathbf{r},t)$. This means that a matter space-time with certain characteristics creates through its distribution the real field. These characteristics are energy E, momentum $\mathbf{P}$ and relative space-time magnitudes SR; *i.e.*, relative time TR relative volume VR and relative length in a direction $\mathbf{n}$ LR_n. These characteristics constitute the mean values of the corresponding local space-time magnitudes. The mean values of all these magnitudes belong to a unique flat matter space-time since through $P(\mathbf{r},t)$ a unique matter space-time is distributed everywhere. Thus the stochastic nature of matter space-time leads to the use of flat matter space-time, which has been described in Chapt. 2, Sect. 2.4.

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2.2 Mean Value of Relative Space-Time Magnitudes

Taking into account what was mentioned in 2.1 for flat mean value space-time, Eqs. (6), (7) in Chapt. 2, and considering that the reference space-time energy is E_{0T}, we have:

for relative time : $$\langle \overline{tr} \rangle = \langle TR \rangle = \langle E \rangle / E_{0T} \tag{5}$$

for relative volume: $$\langle \overline{vr} \rangle = \langle VR \rangle = E_{0T} / \langle E \rangle, \tag{6}$$

for relative length in a direction $\mathbf{n}$:

$$\begin{aligned} \langle \overline{lr}_n \rangle = \langle LR_n \rangle &= \sqrt{1 - \mathfrak{v}_n{}^2 / c^2} \\ &= \sqrt{1 - \mathfrak{v}_n{}^2 \langle E \rangle^2 / c^4 \Big/ c^2 \langle E \rangle^2 / c^4} = \sqrt{1 - c^2 \langle \mathbf{P}_n \rangle^2 \Big/ \langle E \rangle^2} \end{aligned} \tag{7}$$

It is noted that these magnitudes correspond to a reference space-time with energy $E_{0T} = m_{0T}c^2$. If $E_{0T} \neq m_{0T}c^2$, then we have relative magnitudes for the flat matter space-time of energy $m_{0T}c^2$ with respect to the one of energy E_{0T}; since space-time of energy $m_{0T}c^2$ is regarded as stationary and because of symmetry, relative length of this space-time will be the same for any direction. If this is the case, we will have:

$$\langle \overline{tr} \rangle = \langle TR \rangle = \frac{\langle E \rangle}{m_{0T}c^2} \frac{m_{0T}c^2}{E_{0T}} = \frac{\langle E \rangle}{E_{0T}} \tag{8}$$

$$\langle \overline{vr} \rangle = \langle VR \rangle = \frac{E_{0T}}{m_{0T}c^2} \frac{m_{0T}c^2}{\langle E \rangle} = \frac{E_{0T}}{\langle E \rangle} \tag{9}$$

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$$\left\langle \overline{lr}_n \right\rangle = \left\langle LR_n \right\rangle = \sqrt{1-\upsilon_n{}^2/c^2}\,\frac{E_{0T}}{m_{0T}c^2} = \sqrt{1-c^2\left\langle \mathbf{P}_n \right\rangle^2/\left\langle E \right\rangle^2}\,\frac{E_{0T}}{m_{0T}c^2} \qquad (10)$$

Because of Eq. (11) in Chapt. 2, and because mean values correspond to flat matter space-time, we have that:

$$\left\langle E \right\rangle^2 = c^2\left\langle \mathbf{P} \right\rangle^2 + m_{0T}{}^2c^4 \qquad (11)$$

A special case of Eq. (11) is that:

$$E^2 = c^2\mathbf{P}^2 + m_{0T}{}^2c^4 \qquad (12)$$

Eq. (12) is related to a field that corresponds to a unique energy state.

For the purposes of this work the following symbolization and definition are useful:

Symbols: Magnitudes with subscript $0T$ refer to a whole matter system; magnitudes with subscript 0 refer to a particle field.

Definition I: It is defined as basic Hypothetical Measuring Field (HMF), a HMF whose reference space-time energy E_0 equals to h (Planck's constant).

Definition II: It is defined as particle space-time field, a matter space-time field that can be described through the basic HMF.

As will be shown in Section 4 of this Chapter, the energy E_0 is in agreement with what the experience has revealed when $E_0 = h$.

Notice: For a particle field the requirements for Eqs. (13,14,15) in Chapt. 2 validity are fulfilled. However as it will be shown in Chapt. 8, Sect. 2.1, mean energy and momentum take discrete values, which is in contrast with what is implied by the equations mentioned. Thus we may assume that relativity and Newton's mechanics are approached when quantum phenomena are ignored.

3. FOURIER ANALYSIS OF PARTICLE-SPACE-TIME WAVE FUNCTION

A particle field according to this work can be regarded as a space-time formation, which changes in time. Let $\Psi = \Psi(\mathbf{r},t)$ be a function that describes a particle field. For the simple case of one spatial dimension x, this

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function can be decomposed, according to Fourier analysis, into harmonic oscillations.

A space-time wave function $\Psi = \Psi(x,t)$ can be written in the form $\Psi = \Psi(x',t)$ where $x' = x'(x,n,t)$, as will be explained. At a given t, according to Fourier analysis, the space-time function $\Psi(x',t)$ can take the form [4]:

$$\Psi = \sum_n \left[A_n \cos(2\pi n x' / L) + B_n \sin(2\pi n x' / L) \right] \tag{13}$$

where L is a proper interval which will be defined later, and $n = 1,2,3,4,...$

For $n \to \infty$, Eq. (13) describes a function $\Psi = \Psi(x,t)$. The same form is valid for any t but with different $A_1, A_2, ...A_n$, $B_1, B_2, ...B_n$. Thus, in general we may assume that Ψ has the form of Eq. (13) on condition that $A_1, A_2, ...A_n$, $B_1, B_2, ...B_n$ are functions of t. When $A_1, A_2, ...A_n$, $B_1, B_2, ...B_n$ are complex functions, Eq. (13) is extended to complex forms of Ψ.

By using the exponential form of cos and sin, Eq. (13) can be written as follows:

$$\Psi = \sum_n \left[C_{1n} e^{i(2\pi n x'/L)} + C_{2n} e^{-i(2\pi n x'/L)} \right] \tag{14}$$

If $$x' = x - c_{nx} t = x - \lambda_n (\omega_n / 2\pi) t = (\lambda_n / 2\pi)(x(2\pi / \lambda_n) - \omega_n t) \tag{15}$$

where c_{nx}, λ_n, ω_n are the velocity, the wave length, and the angular speed of the n^{th} harmonic wave, then we will have that:

$$2\pi n x' / L = (2\pi n / L)\ (\lambda_n / 2\pi)\ (x(2\pi / \lambda_n) - \omega_n t) \tag{16}$$

On condition that L equals the total length of the interval within which Ψ acts, we will have:

$$\lambda_1 = L \quad \text{and} \quad \lambda_n = L / n \tag{17}$$

Thus Ψ takes the equivalent form:

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$$\Psi = \sum_n \left\{ C_{1n} e^{i[(2\pi/\lambda_n)x - \omega_n t]} + C_{2n} e^{-i[(2\pi/\lambda_n)x - \omega_n t]} \right\} \qquad (18)$$

It is noted that for the same (x,t), the variable x' has different values for $n = 1,2,3,4,...$ if c_{nx} has also different values for various n. In this case Ψ, as a function of variable x', cannot be a continuous function of (x,t); however, in this case, Ψ can be regarded as a complex, statistically interpreted, function for any variable $x' = x'(x,t,c_{nx})$ for any $n = 1,2,3,4,...$

If $c_{nx} = const.$, the space-time function Ψ can be continuous since to the same (x,t) corresponds the same Ψ for $n = 1,2,3,4,....$ Thus, the question is raised whether $c_{nx} = const.$ is valid.

According to the claim for minimum contradictions, the space-time wave function $\Psi(x,t)$ describes a stochastic space-time structure. Thus this space-time function is compatible with this claim on condition that c_{nx} has different values for $n = 1,2,3,4,...$

In the general case of waves that are transmitted to various directions we can write:

$$\Psi = \sum_n \left\{ C_{1n} e^{i[(2\pi/\lambda_n)\mathbf{e}_w \cdot \mathbf{r} - \omega_n t]} + C_{2n} e^{-i[(2\pi/\lambda_n)\mathbf{e}_w \cdot \mathbf{r} - \omega_n t]} \right\} \qquad (19)$$

where $\mathbf{e}_w$ is a unit vector which has the direction of wave velocity.

4. DE BROGLIE'S PRINCIPLES

From Eq. (1) we have:

$$d\bar{E} / dE_0 = d\bar{t} / dt_0 = (f / \bar{n}_{eq}) / (f / n_0) = n_0 / \bar{n}_{eq} \qquad (20)$$

where n is the frequency of a periodical phenomenon of comparison and f an arbitrarily constant factor through which we can change the scale of $\bar{n}_{eq}, n_0$; $\bar{n}_{eq}$ is a frequency which corresponds to $d\bar{t}$. If $\bar{n}_{eq} = 1$, n_0 must be different for every point $(\mathbf{r},t)$ of the HMF. If this is the case, $n_0(\mathbf{r},t)$ repre-

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sents the number of hits of a clock connected with the point $(\mathbf{r},t)$ of the HMF in the unit of *real mean time* corresponding to this point. On this basis Eq. (14) can be written in the form:

$$\overline{dE} / dE_0 = n_0(\mathbf{r},t) \tag{21}$$

Since, according to this analysis, energy-matter is nothing else than a system with different and changing rate of anterior-posterior, Eq. (21) shows the way through which a field exists and acts at various points. The most general case of a space-time continuum is when it refers to a gravitational wave. If this is the case, $n_0(\mathbf{r},t)$ represents the frequency through which a space-time element dU 'acts' at various points of the HMF in the unit of *real mean time* corresponding to this point. The term 'acts' is used because, by definition, the space-time element dU acts out of the HMF. This is compatible with the QM, which is described through a non deformable reference space-time.

Thus from Eq. (6) in Chapt. 2,with Eqs. (1, 20 & 21), we have the following correspondences:

$$dE / dE_0 = dt / dt_0 \rightarrow \text{ observation (Relativity Theory)} \tag{22}$$

$$\overline{dE} / dE_0 = n_0(\mathbf{r},t) \rightarrow \text{ action (Quantum Mechanics)} \tag{23}$$

For $n_0(\mathbf{r},t) = \nu = const.$ in the whole extend of the field, because of Eq. (23) we have:

$$\overline{E} = E_0 \nu \tag{24}$$

We notice that Eq. (24) for $E_0 = h$ expresses one of the fundamental De Broglie's Principles.

Eq. (24) is valid either for mean energy values or for discrete energy states. The ν is the mean frequency of a space-time oscillation in the HMF. Since Eq. (24) is valid for space-time oscillations in general, it is valid also for harmonic oscillations. In the case of a photon, which is described by Eq. (12) for $m_0 = 0$ and simulated by harmonic oscillations, we will have:

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$$E = \sqrt{c^2 P^2} = cP \tag{25}$$

$$E = h\nu = cP \quad , \quad \nu\lambda = c \quad , \quad \omega = 2\pi\nu \quad , \text{ and } \quad \lambda = h / P \tag{26}$$

In the case of a particle in general, from Eq. (12) we obtain:

$$E_{eq} = \sqrt{E^2 - {m_0}^2 c^4} = cP \tag{27}$$

where E_{eq} is the energy of an equivalent photon. Eq. (25) refers to an oscillating matter space-time field that has no energy when the oscillation stops. Eq. (27) refers to an oscillating matter space-time field with energy $m_0 c^2$ when the oscillation stops. Therefore, we may notice that the equivalent energy E_{eq} characterizes the creation of space-time waves. Thus, we can write:

$$E_{eq} = h\nu_{eq} = hc / \lambda_{eq} = cP \quad \text{and} \quad \lambda_{eq} = h / P \tag{28}$$

For energy the general formula of Eq. (24) is valid, and therefore:

$$E = h\nu \, , \; \omega = 2\pi\nu \quad , \quad \nu = c_w / \lambda_{eq} \neq c / \lambda_{eq} = \nu_{eq} \tag{29}$$

where c_w is different for various n as corresponding to different energy states (see Section 5). As was mentioned in Section 3 Ψ is a complex statistically interpreted wave function and this implies that the velocities c_{nx}, mentioned in this Section, are different for various values of n. On this basis, Eqs. (27,29) imply that Ψ is complex and statistically interpreted when $m_0 \neq 0$.

For a particle field in general, Eqs. (28) and (29) mean that we have relations that are compatible with De Broglie's principles. The notion of wavelength has sense since it refers to something that vibrates and this is space-time itself.

Since E and ν of Eqs. (28) and (29) are mean values, it holds that ω and λ_{eq} are mean values too, regarded as being the same in the whole extent

of a particle field. Thus Eqs. (28,29) can apply to Eq. (19) and therefore we can write:

$$\Psi = \sum_n \left\{ C_{1n} e^{i[(2\pi/\lambda_{eqn})\mathbf{e}_w \cdot \mathbf{r} - \omega_n t]} + C_{2n} e^{-i[(2\pi/\lambda_{eqn})\mathbf{e}_w \cdot \mathbf{r} - \omega_n t]} \right\} \qquad (30)$$

5. PARTICLE SPACE-TIME WAVE

Taking into account Eqs. (28,29,30) and that $\mathbf{P}$ and $\mathbf{e}_w$ have the same direction, we have:

$$\Psi = \sum_n C_{1n} e^{i(\mathbf{P}_n \cdot \mathbf{r} - E_n t)/\hbar} + C_{2n} e^{-i(\mathbf{P}_n \cdot \mathbf{r} - E_n t)/\hbar} \qquad (31)$$

Since Eq. (12) is valid both for $\pm E$ and $\pm \mathbf{P}$, Eq. (31) can take the form:

$$\Psi = \sum_n A_n e^{i(\mathbf{P}_n \cdot \mathbf{r} - E_n t)/\hbar} \qquad (32)$$

In fact because of Eq. (12) energy and momentum take values of the form $\pm E$ and $\pm \mathbf{P}$ respectively; therefore in Eq. (32) appear both terms:

$$e^{i(\mathbf{P} \cdot \mathbf{r} - Et)/\hbar} \quad \text{and} \quad e^{-i(\mathbf{P} \cdot \mathbf{r} - Et)/\hbar}$$

Due to the statistical interpretation of Ψ for an energy level E we have:

$$\Psi_E = e^{i(\mathbf{P} \cdot \mathbf{r} - Et)/\hbar} \qquad (33)$$

From this equation we obtain:

$$\hat{E} = i\hbar \partial / \partial t \quad \text{and} \quad \hat{\mathbf{P}}_n = -i\, \hat{\mathbf{n}} \hbar \partial / \partial x_n \qquad (34)$$

i.e. the known, from the QM, operators for energy and momentum in a direction $\mathbf{n}$ [5,6].

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Taking into account Eq. (12) and operators (34) we obtain Schrödinger's relativistic equation; *i.e.*:

$$-\hbar^2\partial^2\Psi/\partial t^2 = -\hbar^2 c^2\nabla^2\Psi + m_0{}^2c^4\Psi \tag{35}$$

6. THE MEANING OF Ψ

This wave function is valid on condition that space-time has no deformation. When the vibrating medium is space-time itself, we may assume that this wave function describes the HMF in which, by definition, there exist only hypothetical local deformations. Thus, Ψ describes the changes of anterior-posterior rates of at various points $(\mathbf{r},t)$ of the HMF (see definitions ii,iii).

According to Eq. (35) space-time magnitudes are distributed through the same probability density function $P(\mathbf{r},t)$; this function as it will be shown in Chapt. 5, Sect. 2.1, is function of Ψ of its complex conjugate and their time derivatives. The Ψ describes a complex geometry statistically interpreted. This geometry is also described, by the aid of HMF through its relative space-time magnitudes Sr. Thus we may state that:

$$Sr = C_{sr}\Psi \tag{36}$$

where Sr is any complex space-time relative magnitude, *i.e.* complex relative time or complex relative volume or complex relative length in a direction $\mathbf{n}$. According to Eq. (36) any complex space-time relative magnitude leads to measurable magnitudes on the basis of Ψ wave interpretation. More specifically we can have the following correspondences:

$$\Psi \rightarrow P(\mathbf{r},t), \tag{37}$$

$$Sr \rightarrow \overline{sr} \tag{38}$$

Because of Eq. (4) and relations (37,38) we will have:

$$\overline{sr}(\mathbf{r},t) = \left\langle \overline{sr} \right\rangle V_0 P(\mathbf{r},t) = C_{sr}P(\mathbf{r},t) \tag{39}$$

Therefore we have:

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$$Sr = C_{sr}\Psi = \left(\overline{sr}\right)V_0\Psi \tag{40}$$

Eq. (40) reveals the physical meaning of Ψ as being connected to the notion of relative space-time magnitude.

7. CONCLUSIONS

According to the spirit of this work a theorist by the aid of the HMF without any experiment reaches:

1) to De Broglie's principles

2) to a space-time wave function Ψ which obeys the Schrödinger's relativistic equation; this function has physical meaning only as complex statistically, interpreted function and it is equivalent to any complex space–time relative magnitude.

3) to the fact that the well known from the QM form of Ψ at energy state E *i.e.* the expression $\Psi_E = e^{i(\mathbf{P}\cdot\mathbf{r}-Et)/\hbar}$ is valid only on condition that energy and momentum take values of the form $\pm E$ and $\pm P$ respectively.

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CHAPTER 5. MINIMUM CONTRADICTIONS PARTICLE-SPACE-TIME GEOMETRY

1. ABSENCE OF POTENTIAL IN MATTER SPACE-TIME SYSTEMS

Because of Eq. (35) in Chapter 4, we can write in general:

$$\hbar^2\partial^2\Psi / \partial t^2 - \hbar^2 c^2 \nabla^2\Psi + m_0{}^2 c^4\Psi + F_V = 0 \tag{1}$$

where F_V is a term which describes the influence of a potential V. In order to avoid any further contradictions, a matter space-time system in general should be described through the same principles as a particle space-time field is. This can be valid when a matter space-time field locally behaves as a particle space-time field. Since stochastic space-time is matter itself, we have that: *There does not exist a potential which acts at a distance, but an action of matter-space-time itself in the whole extent of a matter system.* Therefore we have that:

$$F_V = 0 \tag{2}$$

Thus, for a matter space-time field we have in general that:

$$\hbar^2\partial^2\Psi / \partial t^2 - \hbar^2 c^2 \nabla^2\Psi + m_0{}^2 c^4\Psi = 0 \tag{3}$$

Eq. (3) is valid locally and m_0 is constant only in an infinitesimal neighborhood of any point $(\mathbf{r},t)$ of the HMF; for a particle field m_0 is the same everywhere. These are mentioned in [1,2].

2. PROBABILITY DENSITY

2.1 Schrödinger's Relativistic Equation

For a space-time particle field on the basis of Eq. (3), we can find a function $P(\mathbf{r},t)$ for which it is valid:

$$\frac{d}{dt}\int P(\mathbf{r},t)dr^3 = 0 \tag{4}$$

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and $$\int P(\mathbf{r},t)dr^3 = 1 \qquad (5)$$

If this is the case, then $P(\mathbf{r},t)$ can be regarded as probability density of Schrödinger's relativistic equation, which according to classical works is [3]:

$$P(\mathbf{r},t) = (i\hbar / 2m_0c^2)\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right) \qquad (6)$$

Eq. (6) is valid on condition that the space-time particle described is extended to infinity [3]. According to what until now has been accepted, this function cannot be interpreted as probability density because it is not always positive. Because of Eq. (4) in Chapt. 4, a negative $P(\mathbf{r},t)$ would imply, negative values of geometrical magnitudes, and negative values of local energy density as well. This is at first sight incomprehensible.

According to the claim for minimum contradictions, we try to apply logic but we have to expect contradictory behaviors; thus, negative values of geometrical magnitudes can be interpreted as contradictory-incomprehensible entities that appear because of our inadequate basic communication system. Of course, it would be constructive to investigate if these incomprehensible magnitudes appear as reactions to our communication system and constitute a reality that our basic communication system cannot approach. According to experience gained up-to-now, these negative magnitudes can be regarded as characterizing the anti-matter. As was mentioned in Chapt. 3, Sect. 2.3, we can use signs $(+1)$, (-1) for various states. This has similarities with Wittgenstein's point of view related to language games. According to Wittgenstein [4], signs $(+1)$ and (-1) can correspond to different states of reality. "From the existence or non-existence of one state of affairs it is impossible to infer the existence or non-existence of another." [5].

3. SPACE-TIME OPERATORS

We consider a flat space-time with energy E, momentum $\mathbf{P}$ and rest energy m_0c^2. With respect to reference space-time of energy E_0 according to Eqs. (8,9,10) of Chapt. 4, we have the following:

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for relative time : $$\left\langle \overline{tr} \right\rangle = TR = E / E_0 \tag{7}$$

for relative volume: $$\left\langle \overline{vr} \right\rangle = VR = E_0 / E\,, \tag{8}$$

for relative length in a direction $\mathbf{n}$:

$$\left\langle \overline{lr_n} \right\rangle = LR_n = \sqrt{1 - c^2 \mathbf{P}_n^{\,2} / E^2}\left(E_0 / m_0 c^2 \right) \tag{9}$$

According to what was mentioned in Section 2.1 of Chapt. 4, these magnitudes are distributed with the aid of $P(\mathbf{r},t)$ function of Eq. (6). Since these magnitudes are functions of energy and momentum, they have operators defined as follows:

$$\hat{TR} = \frac{i\hbar}{E_0}\frac{\partial}{\partial t}, \tag{10}$$

$$\hat{VR} = \frac{-iE_0}{\hbar}\frac{1}{\partial / \partial t}, \tag{11}$$

$$\hat{LR}_n = \sqrt{1 - c^2 \frac{\partial^2 / \partial x_n^{\,2}}{\partial^2 / \partial t^2}}\,\frac{E_0}{m_0 c^2} \tag{12}$$

4. SPACE TIME RELATIVE MAGNITUDE MEAN VALUES

We rewrite Eqs. (11,12,34) of Chapt. 4 and Eq. (3) of this Chapter:

$$\left\langle E \right\rangle^2 = c^2 \left\langle \mathbf{P} \right\rangle^2 + m_0^{\,2} c^4 \tag{13}$$

$$E^2 = c^2 \mathbf{P}^2 + m_0^{\,2} c^4 \tag{14}$$

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$$\hat{E} = i\hbar\partial / \partial t \quad , \quad \hat{\mathbf{P}}_n = -i\hat{\mathbf{n}}\,\hbar\partial / \partial x_n \quad , \quad \hat{\mathbf{P}} = -i\hbar\nabla \tag{15}$$

$$\hbar^2\partial^2\Psi / \partial t^2 - \hbar^2 c^2\nabla^2\Psi + m_0{}^2 c^4\Psi = 0 \tag{16}$$

Because of Eqs. (14,15,16), we notice, that for energy eigenvalue E, we have eigenfunction Ψ_E. We also notice, because of Eqs. (13,15,16), that for energy and momentum eigenvalues $\langle E \rangle$ and $\langle \mathbf{P} \rangle$ we have eigenfunction Ψ. Therefore we have the substitutions:

$$\hat{E} = i\hbar\partial / \partial t \rightarrow \langle E \rangle \tag{17}$$

$$\hat{\mathbf{P}}_n = -i\hat{\mathbf{n}}\,\hbar\partial / \partial x_n \rightarrow \langle \mathbf{P}_n \rangle \tag{18}$$

and the relations

$$\hat{E}\Psi = \langle E \rangle \Psi \tag{19}$$

$$\hat{\mathbf{P}}_n \Psi = \langle \mathbf{P}_n \rangle \Psi \tag{20}$$

In general for a space-time magnitude S of a space-time particle field we'll have:

$$\hat{S}\Psi = \langle S \rangle \Psi \tag{21}$$

i.e. the substitution:

$$\langle S \rangle \rightarrow \hat{S} \tag{22}$$

on condition that $\langle S \rangle$ is a function of $\langle E \rangle, \langle \mathbf{P}_n \rangle$. Therefore $\langle S \rangle$ behaves as an eigenvalue of S with eigenfunction Ψ.

We rewrite Eqs. (8,9,10) from Chapt. 4:

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$$\langle TR\rangle = \langle \overline{tr} \rangle = \langle E\rangle / E_0 \quad , \tag{23}$$

$$\langle VR\rangle = E_0 / \langle E\rangle \quad , \tag{24}$$

$$\langle LR_n\rangle = \sqrt{1 - c^2 \langle \mathbf{P}_n\rangle^2 / \langle E\rangle^2}\left(E_0 / m_0 c^2\right) \quad . \tag{25}$$

Because of relations (17,18), we have the substitutions:

$$\langle E\rangle^2 \to \hat{E}\,\hat{E} \tag{26}$$

and

$$\langle \mathbf{P}_n\rangle^2 \to \hat{\mathbf{P}}_n \bullet \hat{\mathbf{P}}_n \tag{27}$$

Thus we obtain:

$$-(\hbar^2 \partial^2 \Psi / \partial t^2) / \Psi = \langle E\rangle^2 \tag{28}$$

$$-(\hbar^2 \partial^2 \Psi / \partial {x_n}^2) / \Psi = \langle \mathbf{P}_n\rangle^2 \tag{29}$$

Taking into account Eqs. (23,24,25,28,29), we have:

$$\langle TR\rangle = \frac{i\hbar}{E_0 \Psi}\frac{\partial \Psi}{\partial t}, \tag{30}$$

$$\langle VR\rangle = \frac{-iE_0}{\hbar}\frac{\Psi}{\partial \Psi / \partial t}, \tag{31}$$

$$\langle LR_n\rangle = \sqrt{1 - c^2 \frac{\partial^2 \Psi / \partial {x_n}^2}{\partial^2 \Psi / \partial t^2}}\,\frac{E_0}{m_0 c^2} \tag{32}$$

and

$$\hat{TR}\Psi = \langle TR\rangle \Psi, \qquad \hat{VR}\Psi = \langle VR\rangle \Psi, \qquad \hat{LR}_n \Psi = \langle LR_n\rangle \Psi \tag{33}$$

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5. QUANTIZATION OF SPACE AND BASIC CONSTANTS

Because of Eq. (9) of Chapt. 4 for the state energy E we have:

$$\langle VR \rangle_E = E_0 / E \tag{34}$$

By definition the magnitude $V_0 \langle VR \rangle_E$ equals the mean value of particle field volume $\langle V \rangle_E$ for energy state E. Thus because of Eq. (34) we have:

$$\langle V \rangle_E E = V_0 E_0 \tag{35}$$

This equation is valid for any energy level of E_0 and therefore for $E_0 \to 0$. Thus we may assume that:

$$c_{VEg} = \lim_{E_0 \to 0,\ V_0 \to \infty} E_0 \cdot V_0 \tag{36}$$

where c_{VEg} is constant for all states of all gravitational particle fields, since it refers to a common state. From Eqs. (35) and (36), we have:

$$\langle V \rangle_E = c_{VEg} / E \tag{37}$$

Eq. (37) expresses the quantization of space provided that for discrete values of energy $E_1, E_2, \ldots$ correspond discrete values of volume $\langle V_{E1} \rangle, \langle V_{E2} \rangle \ \ldots$ By definition we can have:

$$V_0 = f \cdot L \tag{38}$$

For $f = (\text{lenght unit})^2$ and L equal to the wavelength λ of a particle whose energy $E_0 \to 0$ we have:

$$V_0 = 1 \cdot \lambda \tag{39}$$

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Because of Eq. (24) of Chapt. 4, E_0 can be written in the form:

$$E_0 = h\nu \tag{40}$$

For $E_0 \to 0$ the particle under study can be regarded as a photon. This implies that:

$$\lim_{E_0 \to 0} \nu\lambda = c \tag{41}$$

$$c_{VEg} = \lim_{E_0 \to 0} E_0 \cdot V_0 = h \cdot \lim_{E_0 \to 0} \nu\lambda = hc \tag{42}$$

Therefore for a space-time of reference with finite E_0 *we have finite volume* V_0 *so that*

$$V_0 = hc / E_0 \tag{43}$$

According to Sect. 4 of Chapt. 4, it is arithmetically valid that:

$$E_0 = h \tag{44}$$

This value corresponds, according to what was mentioned Sect. 2.2 of Chapt. 4, to the basic HMF; it does not mean that any other particle HMF obliges to be excluded.

Thus because of Eq. (43) arithmetically it is valid that:

$$V_0 = c \tag{45}$$

According to Eqs. (24,42) we obtain in general that:

$$\langle V \rangle \langle E \rangle = hc \tag{46}$$

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6. MINIMUM CONTRADICTIONS MATTER-SPACE-TIME GEOMETRY

6.1 Mean Values of Space-Time Relative Magnitudes

Taking into account Eq(3), we have:

$$\Box\Psi = -(m_0c^2/\hbar)^2\Psi \tag{47}$$

and

$$m_0c^2/\hbar = i\sqrt{\Box\Psi/\Psi} \tag{48}$$

where

$$\Box = \partial^2/\partial t^2 - c^2\nabla^2 \tag{49}$$

As we can notice, the probability density of Eq. (6) beyond functions related to Ψ wave function is also dependent on m_0. Because of Eq. (4) of Chapt. 4, we have:

$$\overline{tr}(\mathbf{r},t) = \left\langle \overline{tr} \right\rangle V_0 P(\mathbf{r},t) = \left\langle TR \right\rangle V_0 P(\mathbf{r},t) \tag{50}$$

and

$$\overline{lr}_n(\boldsymbol{r},t) = \left\langle \overline{lr}_n \right\rangle V_0 P(\boldsymbol{r},t) = \left\langle LR_n \right\rangle V_0 P(\boldsymbol{r},t) \tag{51}$$

Taking into account Eqs. (6,30,31,32,44,45,50,51), we have that the mean value of relative time and of relative length in a direction **n** are as follows:

$$\overline{tr}(\mathbf{r},t) = \frac{ic}{2h}\frac{\partial_t\Psi}{\sqrt{\Psi\Box\Psi}}\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right) \tag{52}$$

and

$$\overline{lr}_n(\mathbf{r},t) = -\frac{ih}{2}\frac{\Psi}{\Box\Psi}\sqrt{1 - c^2\frac{\partial^2\Psi/\partial x_n^{\,2}}{\partial^2\Psi/\partial t^2}}\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right) \tag{53}$$

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6.2 Deformity Transformations

By means of integration, Eqs. (52,53) can provide the real time that passes in a position of the HMF and the real distance at the time t between two points of the HMF. Thus we have:

$$\overline{tr}(\mathbf{r},t)=\left.\frac{\overline{dt}(\mathbf{r},t)}{dt}\right|_{r=const} \quad , \quad \overline{lr}_n(\mathbf{r},t)=\left.\frac{\overline{dx}_n(\mathbf{r},t)}{dx_n}\right|_{t=const}$$

$$\bar{t}(\mathbf{r},t)=\int_0^t \overline{tr}(\mathbf{r},t)dt \quad , \quad \overline{x}_n(\mathbf{r},t)=\int_0^{x_n} \overline{lr}_n(\mathbf{r},t)dx_n \tag{54}$$

Applying Eq. (4) of Chapt. 4, for relative time $\overline{tr}$ and relative volume $\overline{vr}$ - both of which are measurable magnitudes - and multiplying both parts we obtain:

$$\overline{tr}\,\overline{vr}=\left\langle\overline{tr}\right\rangle\left\langle\overline{vr}\right\rangle V_0^{\,2}[P(\mathbf{r},t)]^2 \tag{55}$$

In order that transformations of deformity are regarded as Lorentz' transformations, it must be valid that:

$$\overline{tr}\bullet\overline{vr}=1 \quad , \quad P(\mathbf{r},t)=const. \quad , \tag{56}$$

$$1=\int P(\mathbf{r},t)dr^3=P(\mathbf{r},t)\int dr^3=P(\mathbf{r},t)V_0 \quad \text{and} \quad P(\boldsymbol{r},t)=1/V_0 \tag{57}$$

$P(\mathbf{r},t)=1/V_0$, corresponds to a flat matter space time. In general, $P(\mathbf{r},t)\neq 1/V_0$. Therefore we have that $\overline{tr}.\overline{vr}\neq 1$. This implies that deformity transformations of Eq. (54) cannot be regarded as Lorentz' transformations.

6.3 The Property of Self-Similarity

Because of Eq. (31), for a relative length in a direction **n** in a matter system it is valid that:

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$$\overline{lr}_n(\mathbf{r},t) = \left\langle \overline{lr}_n \right\rangle V_0 P(\mathbf{r},t) \tag{58}$$

Applying this equation for two different directions $\boldsymbol{n}_1$ *and* $\boldsymbol{n}_2$ we obtain:

$$\frac{\overline{lr}_{n_1}(\mathbf{r},t)}{\overline{lr}_{n_2}(\mathbf{r},t)} = \frac{\overline{dl}_{n_1} / dl_0}{\overline{dl}_{n_2} / dl_0} = \frac{\overline{dl}_{n_1}}{\overline{dl}_{n_2}} = \left\langle \overline{lr}_{n_1} \right\rangle \Big/ \left\langle \overline{lr}_{n_2} \right\rangle = c_s \tag{59}$$

where $\overline{dl}_{n_1}, \overline{dl}_{n_2}$ are the mean real infinitesimal lengths in the directions n_1 and n_2 respectively, corresponding to the same infinitesimal length dl_0 at any point $(\mathbf{r},t)$ of the HMF; c_s has the same value in the whole extent since it is equal to a ratio which refers to the whole particle field. This means that if a shape is formed, through the lengths $\overline{dl}_{n_1}, \overline{dl}_{n_2}, ..., \overline{dl}_{n_N}$, in an infinitesimal area in the neighborhood of a point $(\mathbf{r},t)$ of the HMF, the same shape is formed at any other point of the HMF on condition that this shape corresponds to the same infinitesimal length dl_0. Thus, relation (59) expresses the self-similarity of the particle field at time t in the whole of its extent. It is noted that $\overline{dl}_{n_1}, \overline{dl}_{n_2}$ are lengths that correspond to matter since space-time itself is matter. Taking into account the above mentioned, we can conclude that the stochastic matter space-time has fractal properties because of the self similarity Eq. (59). It is noted that the geometry of matter systems in nature appears to be fractal-self-similar [6,7]; therefore it is expected that this fractal geometry can apply to any matter-space-time system. As it will be shown in Chapt. 9, Sect. 7.1, the property of self-similarity can be extended to a many bodies system in general.

Relativistic Behavior of Space-Time Operators

Applying Eqs. (10,11,12) for $E_0 = h$, we obtain:

$$\hat{TR} = \frac{i}{2\pi}\frac{\partial}{\partial t} \quad , \quad \hat{VR} = -2\pi i \frac{1}{\partial / \partial t} \tag{60,61}$$

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$$\hat{LR}_n = \sqrt{1 - c^2 \frac{\partial^2 / \partial x_n^{\,2}}{\partial^2 / \partial t^2}} \frac{h}{m_0 c^2} \tag{62}$$

As will be shown in Chapt. 7 for coexisting HMF of various values of energy E_0, it is valid that:

$$\frac{\partial x'_j}{\partial x_j} = \frac{\partial x_j}{\partial x'_j} = \gamma \qquad (j = 1,2,3,4) \tag{63}$$

where j indicates space and time dimensions. Applying Eqs. (63) to the operators of Eqs. (60,61,62), we have:

$$\hat{TR} = \frac{\hat{T}}{T_0} = \frac{i}{2\pi}\frac{\partial}{\partial t} = \frac{i}{2\pi}\frac{\partial}{\partial t'}\gamma, \quad \hat{TR}' = \frac{\hat{T}}{T_0'} = \frac{\hat{T}}{\gamma T_0} = \frac{i}{2\pi}\frac{\partial}{\partial t'} \quad , \tag{63}$$

$$\hat{VR} = \frac{\hat{V}}{V_0} = -2\pi i \frac{1}{\partial / \partial t} = -2\pi i \frac{1/\gamma}{\partial / \partial t'}, \quad \hat{VR}' = \frac{\hat{V}}{V_0'} = \frac{\hat{V}}{V_0 / \gamma} = -2\pi i \frac{1}{\partial / \partial t'} \tag{64}$$

$$\hat{LR}_n = \sqrt{1 - c^2 \frac{\partial^2 / \partial x_n^{\,2}}{\partial^2 / \partial t^2}} \frac{h}{m_0 c^2} = \sqrt{1 - c^2 \frac{\partial^2 / \partial x_n'^{\,2}}{\partial^2 / \partial t'^2}} \frac{h}{m_0 c^2} = \hat{LR}'_n \tag{65}$$

This shows that relative space-time operators are invariant to Lorentz' transformations.

7. CONCLUSIONS

On the basis of the claim for minimum contradictions:

1. The space-time operators have been defined and appear to be invariant to Lorentz' transformations.

2. Mean values of space-time magnitudes have been shown to be relativistic.

3. Deformity transformations of minimum contradictions matter space-time geometry can not be regarded as Lorentz' transformations.

4. The mean local geometry of a particle space-time field has been found. This geometry has fractal properties because of its basic property to be self-

similar. This is compatible to what we can see immediately in nature where fractal geometry seems to be verified. Thus, a unified matter field should have the same form everywhere i.e. to be fractal (see Chapt. 9, Sects. 7 & 8).

5. Basic laws of QM are valid; however they refer to space-time itself, which implies a space-time deformity.

6. The key role of function $P(\mathbf{r},t)$ has been stressed and the epistemological basis for its interpretation has been given.

Conclusions 1, 2 show a relativistic behavior of the geometry under study. Conclusions 3, 4 show a non-relativistic behavior. However it remains as basic point the fact that space and time even stochastic they are interconnected which is a relativistic property. Conclusion 4 also shows that minimum contradictions matter space-time geometry is fractal. Conclusion 5 shows the QM behavior but at the same time it stresses the difference from the classical point of view.

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CHAPTER 6. MINIMUM CONTRADICTIONS QUANTUM GRAVITY

1. GENERAL

The minimum contradictions particle space-time geometry has been defined in Chapter 5, and in Refs. [1-3]. This is a space-time quantum geometry enriched with matter properties such as energy and momentum. The purpose of the present Chapter is to show the dynamic properties of this space-time, *i.e.* to define the acceleration imposed on the unit of mass that exists at a point $(\mathbf{r},t)$ of the HMF. This acceleration is close correspondence with what we call 'gravitation'.

2. UNIFIED EQUATION

According to what was mentioned in Chapter 5 the energy of a space-time particle field is distributed according to probability density function $P(\mathbf{r},t)$. Because of Eqs. (23,44,50) in Chapt. 5 we have:

$$\bar{tr}(\mathbf{r},t)=\frac{\langle E\rangle}{(E_0/V_0)}P(\mathbf{r},t)=\frac{\langle E\rangle}{DE_0}P(\mathbf{r},t) \tag{1}$$

where DE_0 is the energy density of the reference space-time. The energy

$$\langle E\rangle P(\mathbf{r},t)dr^3 \tag{2}$$

corresponds to a mass

$$d\bar{m}=\left(\langle E\rangle/c^2\right)P(\mathbf{r},t)dr^3 \tag{3}$$

Space-time that corresponds to this mass can be regarded, in the infinitesimal neighborhood of $(\mathbf{r},t)$, as flat; thus because of Eqs. (14,15) of Chapt. 2, Newton's law is valid. In order for that mass to move in a direction x_i from the energy level

$$\langle E\rangle P(\mathbf{r},t)dr^3 \tag{4}$$

to the energy level

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$$\langle E\rangle\left[P(\mathbf{r},t)+dx_i\partial P(\mathbf{r},t)/\partial x_i\right]dr^3 \tag{5}$$

a force $d\mathbf{F}$ is needed such that $d\mathbf{F}\,dx_i$ equals the difference of the mentioned energy; *i.e.*:

$$d\mathbf{F}\,dx_i=\langle E\rangle\left[\partial P(\mathbf{r},t)/\partial x_i\right]dx_i dr^3 \tag{6}$$

Because of Newton's Law we have:

$$d\mathbf{F}=d\bar{m}\,\mathbf{g}_{xi} \tag{7}$$

It is noted that Eq. (15) in Chapt 2, is used instead of the more general Eq. (14) in Chapt. 2, because Eq. (7) refers to stochastic values at a given t at the neighborhood of $(\mathbf{r},t)$ for a given $P(\mathbf{r},t)$. The magnitude $\mathbf{g}_{xi}$ can be regarded as the component of the gravitational acceleration of the field in the direction x_i, since it represents the force that must be applied to a unit of mass at every point $(\mathbf{r},t)$ in order that energy be distributed according to the probability density function $P(\mathbf{r},t)$. Because of Eqs. (3,6,7), we obtain:

$$\bar{dm}\,\mathbf{g}_{xi}=\frac{1}{c^2}\langle E\rangle P(\mathbf{r},t)dr^3\mathbf{g}_{xi}=\langle E\rangle\frac{\partial P(\mathbf{r},t)}{\partial x_i}dr^3 \tag{8}$$

and

$$\mathbf{g}_{xi}=\frac{c^2}{P(\mathbf{r},t)}\frac{\partial P(\mathbf{r},t)}{\partial x_i} \tag{9}$$

Taking into account Eqs. (1,9) we obtain in general that:

$$\mathbf{g}(\mathbf{r},t)=\frac{c^2}{P(\mathbf{r},t)}\nabla P(\mathbf{r},t)=\frac{c^2}{\bar{tr}(\mathbf{r},t)}\nabla\bar{tr}(\mathbf{r},t) \tag{10}$$

From Eq(10) for a particle field, because of Eq. (6) in Chapt. 5, we obtain:

$$\mathbf{g}(\mathbf{r},t)=c^2\nabla\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right)\Big/\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{11}$$

Eqs. (10,11) are valid in the whole extent of a matter field since a matter field locally can be regarded as a particle field (see Chapt. 8). Eqs. (10,11) describe a unified equation which is valid everywhere. As will be shown in the next Section, Eq. (10) is compatible with Newton's Law for gravity.

3. NEWTON'S LAW VERIFICATION

The term 'verification' is not identified with the notion 'proof', and it needs the existence of an obvious hypothesis. According to this work there is not the notion of 'point mass' which is necessary for the classical laws. Thus, a simulation hypothesis is needed so that the classical laws can be regarded as deriving from the principles of this work.

Eq. (10) of gravitational acceleration derives, according to this work, from the principles of the basic communication system. Considering that gravitation can be simulated by a field that acts at a distance, we introduce the notion of a potential which is created around a mass. If E is the total energy of a point mass m due to the field of a mass M, then this energy can be regarded as a function of r so that:

$$E = \int_{r'=r}^{\infty} -dE(r') = \int_{r'=r}^{\infty} \mathbf{F} \bullet d\mathbf{r}' \tag{12}$$

where $\mathbf{F}$ is the force exerted on m because of the potential of M. On condition that $E(\infty) = 0$, we notice that:

$$E(r) \leq 0 \tag{13}$$

By definition $\langle V_E \rangle$ is volume mean value that contains energy E. $d\langle V_E \rangle$ can be regarded as deriving from a volume dV_0 of the Hypothetical Measuring Field (HMF). Thus the ratio:

$$d\langle V_E \rangle / dV_0 \tag{14}$$

expresses mean relative volume. By definition the mean values of a magnitude are regarded as being constant values of this magnitude in the whole extent of a field. Thus the mean relative volume of Eq. (14) must be constant

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everywhere. Therefore $d\langle V_E \rangle$ must be independent of r. This means that for a symmetric spherical field, we can write:

$$d\langle V_E \rangle = 4\pi r^2 f(r) dr \tag{15}$$

where $f(r)$ is a correction function so that $d\langle V_E \rangle$ is independent of r. This takes place when:

$$f(r) = C / r^2 \tag{16}$$

where C is a constant. Because of Eqs(15,16) we obtain:

$$d\langle V_E \rangle = 4\pi C dr \tag{17}$$

For $r = 1$ we have:

$$d\langle V_E \rangle = 4\pi 1^2 dr = 4\pi C dr, \quad C = 1, \tag{18}$$

and

$$\langle V_E \rangle = 4\pi r \tag{19}$$

Because of Eq. (19) and Eq. (46) in Chapt. 5, for a particle field we have:

$$E\langle V_E \rangle = hc \tag{20}$$

$$E = hc / 4\pi r \tag{21}$$

We apply the simulation described, on condition that any energy of mass m is due only to the field of mass M. If E_C is the energy that a point mass m obtains because of its motion, E_T is its total energy, and E_D is its dynamic energy (*i.e.* energy only due to the attraction by the field of mass M), then it will be valid that:

$$E_C = -E_T = E \tag{22}$$

$$E_T = E_D + E_C \tag{23}$$

$$E_D = -2E = -hc / 2\pi r = -\hbar c / r \tag{24}$$

MINIMUM CONTRADICTIONS QUANTUM GRAVITY

From Eq. (12) we obtain the force $\mathbf{F}$ of attraction between masses M, m:

$$\mathbf{F} = -\nabla E_D = \mathbf{e}_r \hbar c / r^2 \tag{25}$$

Where $\mathbf{e}_r$ is a unit vector parallel to $\mathbf{r}$ and towards the center. From relation (25) for $dm = 0$, *i.e.* where the kinetic energy E_C relates only to a circular motion, we have that:

$$\mathbf{F} = m\mathbf{g} \tag{26}$$

where $\mathbf{g}$ is the acceleration caused by the force $\mathbf{F}$. For the same, reason $\mathbf{F}$ is proportional to M. Thus, we may assume that:

$$\hbar c = fMm \tag{27}$$

where f is a constant. This equation shows that m is not independent of M which at first sight is in contrast with Newton's law where m is independent of M. However as was mentioned Eq. (20) refers to a particle field; thus particle pair M, m simulate this particle field.
From Eqs(25,26,27) we have:

$$\mathbf{F} = \mathbf{e}_r (fMm / r^2) \tag{28}$$

$$\mathbf{g} = \mathbf{e}_r (fM / r^2) \tag{29}$$

For $f = G$, relations (28,29) express the known Newton law for gravitation. As was mentioned, relation (28) is valid for particle pairs. However relation (29) can be regarded as a relation that gives the gravitational acceleration for any field created by a mass M on the condition that this mass is concentrated on one point. This acceleration can be regarded as acting on every particle of a set of particle masses that are considered to be concentrated on one point. *Thus, under the hypothesis that all elementary masses which constitute the mass m do not affect the field of mass M*, Newton's law for gravity derives for any point masses M, m; *i.e.*:

$$\mathbf{F} = \mathbf{e}_r (GMm / r^2) \tag{30}$$

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4. COMPATIBILITY OF THE UNIFIED EQUATION WITH NEWTON'S LAW

According to Eq. (10) for a constant in time symmetric spherical particle field we have:

$$\mathbf{g}(r) = \frac{c^2}{P(r)} \frac{\partial P(r)}{\partial r} \hat{\mathbf{r}} \tag{31}$$

where $P(r)$ is the probability density in the infinitesimal area around r .

$P(r)d\langle V_E \rangle$ represents the probability of energy to exist in the infinitesimal area of volume $d\langle V_E \rangle$. In an energy state E the ratio:

$$d\langle V_E \rangle / \langle V_E \rangle \tag{32}$$

represents the probability of energy to exist in volume $d\langle V_E \rangle$ on condition that we have a unique energy state E. If $P(E)$ is the probability for the energy state E to exist then the term:

$$P(E)d\langle V_E \rangle / \langle V_E \rangle \tag{33}$$

represents the probability of energy to exist in volume $d\langle V_E \rangle$ in general. According to what was mentioned this probability equals to:

$$P(r)d\langle V_E \rangle \tag{34}$$

Therefore we obtain that:

$$P(r)d\langle V_E \rangle = P(E)d\langle V_E \rangle / \langle V_E \rangle \tag{35}$$

In the case of a particle field, Eqs. (19) and (35) mean we have:

$$P(r) = P(E) / 4\pi r \tag{36}$$

Therefore, because of Eqs(31,36) we obtain:

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$$\mathbf{g}(r) = \frac{c^2}{P(r)} \nabla P(r) = -\frac{c^2}{r} \hat{\mathbf{r}} \tag{37}$$

Multiplying both parts of Eq(37) by m we have:

$$m\mathbf{g}(r) = -mc^2 \hat{\mathbf{r}} / r \tag{38}$$

The left part of this equation represents the force $\mathbf{F}$, due to the field, acting on mass m. The nominator of right part represents the total energy of mass m which is created when an negligible rest mass m_0 moves by means of the field from the infinity until position r. Conversely, mc^2 represents the energy required in order for this particle to escape the field. Thus we can write:

$$\mathbf{F} = m\mathbf{g}(r) \tag{39}$$

and

$$mc^2 = \int \mathbf{F} \bullet d\mathbf{r} \tag{40}$$

Because of Eqs. (38,39,40) it holds:

$$\mathbf{F} \bullet d\mathbf{r} = -\frac{dr}{r} \int \mathbf{F} \bullet d\mathbf{r} \tag{41}$$

Because of Eq(12) we have:

$$\mathbf{F} \bullet d\mathbf{r} = -dE(r) \tag{42}$$

Thus because of Eqs(41,42) we obtain:

$$dE(r) / E(r) = -dr / r \tag{43}$$

and

$$\ln[E(r)] = -\ln r + C = -\ln r + \ln C' = \ln(C' / r) \tag{44}$$

However, since according to relation (13) $E(r)$ is negative, $\ln E(r)$ has no meaning. If we write Eq. (43) in the following form:

$$d[-E(r)] / [-E(r)] = -dr / r \tag{45}$$

we will have:

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$$\ln(-E(r)) = -\ln r + C = -\ln r + \ln C' = \ln(C'/r) \tag{46}$$

and

$$E(r) = -C'/r \tag{47}$$

We notice that this equation has the same form with the one of Eq. (24). Working in the same way as in Section 3 we can reach to Eq. (30). This shows the compatibility of unified Eqs. (10,11) with Newton's law for gravity. Of course it is noted that what has been derived in the above analysis refers to the non-deformable space of the HMF; therefore we expect a modification of Eq. (30) such that we take into account the real distance which can be calculated according to the transformations of deformity (see Chapt. 5, Sect. 6.2).

We may notice that Newton's law has been derived on the basis of a simulation and assumption according to which is meaningful the notion of point mass and of a potential which is function of r. Eqs. (24,47) show that for discrete values of E we have discrete values of r which means that there are only certain permitted values of r; they refer to mean values of E and r. Eqs. (10,11) are more general and give information on the gravitational acceleration at any point $(\mathbf{r},t)$ for any matter space-time distribution.

5. RELATIVISTIC LAW

Eqs. (26,30) are valid on condition that $dm = 0$. This implies that there is a constant velocity, circular motion; *i.e.*, that $\dot{r} = 0$. In general if $\dot{r} \neq 0$, formulae (26,30) should be modified. According to this work, the gravitational (g) space is described by particle/gravitational waves. If the rest energy of a particle /gravitational wave is zero, then its velocity in the HMF equals the speed of light. It can be proved that if gravitational waves are propagated from their source with a finite speed c and therefore act on bodies at a distance with a corresponding delay, then Newton's law is modified so that the delay will be taken into account [4]. According to this work the speed of light equals the gravitational wave velocity [for $m_0 = 0$, see Eq. (3) in Chapt. 5]. On this basis, Gerber found a modified formula exactly the same as the relativistic formula given later by Einstein. Gerber predicted the same advance of Mercury's perihelion as was predicted later by relativity. According to this work, the relativistic gravitation law should be valid, since when space-time is assumed as a continuum, relativity is valid (see Chapt. 2, Sect. 2.1).

MINIMUM CONTRADICTIONS QUANTUM GRAVITY

Notice:

The purpose of this Chapter was to state a unified formula for quantum gravity. Of course this formula is very difficult to be verified on the quantum level. For this reason an effort was made to find some verification, under certain simplifications, through known formulae for gravitation (Newton's law *etc.*). However these simplifications help us to reach to compatible results with what is already known but, perhaps, create some misunderstandings. For this reason, if we were to discuss on the very nature of gravitation, it would be better to do it without any simplification.

The general formula $\mathbf{g}(\mathbf{r},t)$ proposed describes the force per unit of mass at any point $(\mathbf{r},t)$ of the Hypothetical Measuring Field (HMF); this formula is function of the probability density function $P(\mathbf{r},t)$ through which matter space-time is distributed. Therefore for a given matter space-time distribution the forces mentioned appear at once. The forces of a system regarded as a whole *e.g.* the forces between two bodies can be found through integration of the infinitesimal forces in the HMF. The forces calculated always take into account the matter distribution at every time t in the HMF. According to the spirit of this work there is not potential acting at a distance but at the same time forces are created instantaneously due to quantum matter space-time distribution. If we assume that quantum phenomena are ignored then we have an upper limit for speed of gravitational waves, as was mentioned in Sect. 4. However this is a simplification just for verification reasons.

6. THE REASON OF ATTRACTION

Relation (13) is valid on condition that the force between two bodies is attractive. Thus, the question is raised of whether this is valid. Because of Eq. (10) for gravitational acceleration in general we have:

$$\mathbf{g}(\mathbf{r},t) = \frac{c^2}{P(\mathbf{r},t)}\nabla P(\mathbf{r},t) \cong \frac{c^2}{P(\mathbf{r},t)}\frac{\delta P(\mathbf{r},t)}{\delta x_n} \tag{48}$$

where $\delta P(\mathbf{r},t), \delta x_n$ correspond to the direction defined by $\nabla P(\mathbf{r},t)$. For:

$$\delta P(\mathbf{r},t) \leq 0 \tag{49}$$

we obtain: $$\mathbf{g}(\mathbf{r},t) \leq 0 \qquad (50)$$

This means that we have an attraction towards the denser area. In the case of a gravitational field created by a mass M, because of inequality (49) we have an attraction towards the mass M since it can be regarded as the denser area. In extension derives that the force between two bodies is attractive. Thus, we have the reason of attraction through mental principles; not through empirical observations as the falling apple is.

7. CONCLUSIONS

1) On the basis of the claim for minimum contradictions a general formula for quantum gravity was stated.
2) Under certain simplifications this formula is compatible with Newton's Law. Under these simplifications it derives that the force between two bodies is attractive. On this basis we have the reason of attraction through mental principles, and not through empirical observations such as the falling apple is.
3) If we were to discuss on the very nature of gravitation it would be better to do it without any simplification; simplifications of this chapter were made only for verification reasons.

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MINIMUM CONTRADICTIONS EVERYTHING

CHAPTER 7. ELECTROMAGNETIC SPACE TIME

1. GENERAL

According to what was mentioned in previous Chapters, space-time is stochastic and it can be regarded as matter-ether. However, matter can be either mass or charge. Thus, there exist both mass-gravitational (*g*) and charge-electromagnetic (*em*) space-time. The (*em*) space-time behaves as a (*g*) one, since both are space-time and obey the same principles but it is not. Thus, any time interval in the (*em*) space-time is incomprehensible with respect to a co-existing (*g*) one and it can be regarded as an imaginary number, which is incomprehensible too. *According to statement V* (see Chapt. 2, Sect. 2.3), *the energy of an infinitesimal (em) space-time can be regarded as imaginary since it is equivalent to an (em) time interval. Therefore, in general, the electromagnetic energy and in extension (em) magnitudes can be regarded as imaginary.* The electromagnetic space-time can be regarded as a four dimensional space-time which coexists with the gravitational one. Taking into account what was mentioned about negative physical and geometrical magnitudes (see Chapt. 4 Sect. 5 and Chapt. 5, Sect. 2), we may assume that there exists also an anti-em space-time that corresponds to antimatter. Thus, space-time as a whole is described through sixteen dimensions, *i.e.* four dimensions for each of the following space-times: (*g*), (*anti-g*), (*em*) and (*anti-em*). This does not mean that space-time has 16 dimensions, simply it is described through 16 dimensions; in reality space-time is fractal (see Chapt. 9, Sect. 7,8). For the epistemological basis of the above mentioned see in Chapt. 3, Sect. 2.3, and Chapt. 5, Sect. 2. Note that Eq. (12).of Chapt. 4 is valid for positive and negative values of energy and momentum as well as for imaginary positive and imaginary negative values.

2. ELECTROMAGNETIC HYPOTHETICAL MEASURING FIELD (HMF)em

The electromagnetic Space Time should be studied through an Electromagnetic Hypothetical Measuring Field (HMF)em. Since the (HMF)em coexists with the gravitational one (HMF)g we should find the scale of their interconnection. By definition both (*em*) and (*g*) reference space-time are continua and flat.

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According to Lorentz transformations for a continuum space-time, we have (see Chapt. 2, Sect. 2):

$$x' = x\gamma - \upsilon\gamma t \tag{1}$$

$$t' = t\gamma - \frac{\upsilon\gamma}{c^2}x \tag{2}$$

$$\gamma = 1/\sqrt{1-(\upsilon/c)^2} \tag{3}$$

For $\upsilon > c$, x' and t' are imaginary; therefore they can be regarded as coordinate of the (HMF)em and γ can be regarded, under certain conditions, as the scale of coexistence of the (HMF)em with the (HMF)g. Thus we can write:

$$x_{em} = x_g\gamma - \upsilon\gamma t_g \tag{4}$$

$$t_{em} = t_g\gamma - (\upsilon\gamma/c^2)x_g \tag{5}$$

From Eqs. (4,5) we obtain:

$$\partial t_{em}/\partial t_g = \partial t_g/\partial t_{em} = \gamma \tag{6}$$

$$\partial x_{em}/\partial x_g = \partial x_g/\partial x_{em} = \gamma \tag{7}$$

Because of symmetry for any direction x_i including time regarded as 4^{th} dimension we can write:

$$\partial x_{jem}/\partial x_{jg} = \partial x_{jg}/\partial x_{jem} = \gamma \qquad (j = 1,2,3,4) \tag{8}$$

According to Lorentz transformations we will have:

for time, $$\tau_{em} = \gamma\tau_g \tag{9}$$

for length $$l_{em} = l_g/\gamma \tag{10}$$

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3. Coulomb Law - Coexistence Scale of (em) with (g) Space-Time

Because of Eq. (24) from Chapt. 6, we have:

$$E_D = -\hbar c / r \tag{11}$$

Electromagnetic space-time, according to what was mentioned is a gravitational space-time with imaginary magnitudes. Therefore for the (*em*) space-time we can write:

$$E_{Dem} = -\hbar c / r_{em} \tag{12}$$

Replacing the factor $\hbar c$ by its equal e^2 / α we obtain that:

$$E_{Dem} = -e^2 / \alpha r_{em} \tag{13}$$

where α is the fine structure constant. If we put :

$$E_{Dem} = iE_{Dem-g} \tag{14}$$

E_{Dem-g} represents gravitational energy as being real. Thus, Eq. (13) can be written in the following form:

$$E_{Dem-g} = -\frac{e^2}{i\alpha r_{em}} = -\frac{e^2}{r_g} \tag{15}$$

on condition that:

$$r_{em} = r_g / i\alpha \tag{16}$$

We notice that Eq. (15) expresses the Coulomb potential, on condition that the imaginary (*em*) space-time coexists with the real (*g*) one, and that its magnitudes correspond to the magnitudes of (g) space-time through a scale factor. Eqs. (10,16) imply:

$$r_{em} / r_g = 1 / \gamma = 1 / i\alpha \tag{17}$$

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Thus, the interconnection scale between the electromagnetic (*em*) and gravitational (*g*) space is:

$$\gamma = i\alpha \tag{18}$$

We may notice, for the same reason as in Chapt. 6, Sect. 3, that Coulomb's law can be derived from Eq. (10) of Chapt. 6 applied for the (*em*) space-time. For any magnitude of (*em*) or (*g*) space there is an equal amount of this magnitude in the (*em*) or (*g*) reference space-time, since, according to this work, space-time itself is matter. Thus we can state that (*em*) magnitudes, with respect to corresponding (*g*) ones correlate by the same scale $\gamma = i\alpha$.

Taking into account the structure of various magnitudes, we obtain:

for time, $$\tau_{em} / \tau_g = \gamma = i\alpha \tag{19}$$

for length, $$l_{em} / l_g = \gamma^{-1} = -i / \alpha \tag{20}$$

for volume, $$V_{em} / V_g = \gamma^{-1} = -i / \alpha \tag{21}$$

for energy-mass, $$m_{em} / m_g = E_{em} / E_g = \gamma = i\alpha \tag{22}$$

Because of Eq. (27) of Chapt. 6, for a particle field of the (*g*) space-time and for $f = G$ (see Chapt. 6, Sect. 3) we obtain:

$$\hbar c = G_g M_g m_g \tag{23}$$

Applying Eq. (23) to a particle field of the (*em*) space we have:

$$G_g M_g m_g = G_{em} M_{em} m_{em} = \hbar c \tag{24}$$

Because of Eqs. (22,24) we obtain:

$$G_{em} / G_g = 1 / \gamma^2 = -1 / \alpha^2 \tag{25}$$

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Taking into account Eqs. (15,24) we have:

$$E_{Dem-g} = -\frac{e^2}{r} = -k\frac{Q_{el}{}^2}{r} = -\frac{\hbar c}{\alpha r} = -\frac{G_g M_p{}^2}{\alpha r} = -\frac{G_{em} M_{pem}{}^2}{r_{em}} \tag{26}$$

where Q_{el} the electron charge and M_p the Plank mass. Eq. (26) shows the gravitational behavior of the (em) space related to Coulomb's potential.

All the above equations derive under the assumption that $\hbar$ and c are the same in (g) and in (em) space. In fact, c is the same because of Lorentz' transformations; hc is the same since, according to Eq. (46) of Chapt. 5, it describes energy multiplied by volume [according to Eqs. (21,22), the scale for energy is inverse to the scale for volume]. Thus $\hbar$ is the same in (em) and (g) space.

4. ELECTROMAGNETIC PARTICLE-SPACE-TIME WAVE EQUATION

Since (em) space-time behaves as gravitational, for this space Eq. (3) of Chapt. 5 is valid; *i.e.*:

$$\hbar^2 \frac{\partial^2}{\partial t_{em}{}^2}\Psi_{em}(\mathbf{r}_{em},t_{em}) - \hbar^2 c^2\left[\frac{\partial^2}{\partial x_{em}{}^2}\Psi_{em}(\mathbf{r}_{em},t_{em}) + \frac{\partial^2}{\partial y_{em}{}^2}\Psi_{em}(\mathbf{r}_{em},t_{em}) + \frac{\partial^2}{\partial z_{em}{}^2}\Psi_{em}(\mathbf{r}_{em},t_{em})\right] + m_{0em}^2 c^4 = 0 \tag{27}$$

where $(\boldsymbol{r}_{em},t_{em})$ is a point of the electromagnetic Hypothetical Measuring Field $(\mathrm{HMF})_{\mathrm{em}}$. According to what was mentioned $(\mathrm{HMF})_{\mathrm{em}}$ coexists with the $(\mathrm{HMF})_{\mathrm{g}}$ while various magnitudes correspond through a scale.

We define as function Ψ_{em}^{g} a function for which it is valid:

$$\Psi_{em}(\mathbf{r}_{em},t_{em}) = \Psi_{em}^{g}(\mathbf{r}_g,t_g) = \Psi_{em}^{g}(\mathbf{r},t) \tag{28}$$

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Taking into account Eqs(8,18,22,27,28) we have that:

$$\frac{\partial^2 \Psi_{em}}{\partial x_{jem}^2} = \frac{\partial^2 \Psi_{em}}{\partial x_j^{\,2}} (\partial x_j / \partial x_{em})^2 = \frac{-\alpha^2 \partial^2 \Psi_{em}^g}{\partial x_j^2} \qquad (j = 1,2,3,4) \tag{29}$$

$$m_{0em}^2 = -\alpha^2 m_{0g,eq}^2 \tag{30}$$

$$\hbar^2 \frac{\partial^2 \Psi_{em}^g(\mathbf{r},t)}{\partial t^2} - \hbar^2 \left[\frac{\partial^2}{\partial x^2} \Psi_{em}^g(\mathbf{r},t) + \frac{\partial^2}{\partial y^2} \Psi_{em}^g(\mathbf{r},t) + \frac{\partial^2}{\partial z^2} \Psi_{em}^g(\mathbf{r},t) \right] + m_{0g,eq}^2 c^4 \Psi_{em}^g = 0 \tag{31}$$

This equation can be written in the form:

$$\frac{\partial^2}{\partial t^2} \Psi_{em}^g(\mathbf{r},t) - c^2 \nabla^2 \Psi_{em}^g(\mathbf{r},t) = -(m_{0em} c^2 / ia\hbar)^2 \Psi_{em}^g \tag{32}$$

5. ENERGY AND MOMENTUM MEAN VALUES OF *(em)* SPACE-TIME

For an (em) space-time particle field, we have:

energy $$\hat{E}_{em} = i\hbar \partial / \partial t_{em} \tag{33}$$

momentum $$\hat{\mathbf{P}}_{nem} = -\hat{\mathbf{n}} i \hbar \partial / \partial x_{nem} \tag{34}$$

and $$\hat{\boldsymbol{P}}_{em} = -i \hbar \nabla \tag{35}$$

Taking into account Eqs. (6,7,18,28) and Eqs. (28,29) of Chapt. 5, we obtain:

$$\left\langle E_{em}\right\rangle = \frac{i\hbar}{\Psi_{em}}\frac{\partial \Psi_{em}}{\partial t_{em}} = \frac{-\alpha\hbar}{\Psi^{g}_{em}}\frac{\partial \Psi^{g}_{em}}{\partial t} \tag{36}$$

$$\left\langle \boldsymbol{P}_{em}\right\rangle = \frac{\alpha\hbar}{\Psi^{g}_{em}}\nabla\Psi^{g}_{em} \tag{37}$$

Taking into account Eq(14) we can write:

$$\left\langle E_{em}\right\rangle = i\left\langle E_{em-g}\right\rangle \tag{38}$$

$$\left\langle \boldsymbol{P}_{em}\right\rangle = i\left\langle \boldsymbol{P}_{em-g}\right\rangle \tag{39}$$

Because of Eqs. (36,37,38,39) we obtain:

$$\left\langle E_{em-g}\right\rangle = \frac{i\alpha\hbar}{\Psi^{g}_{em}}\frac{\partial \Psi^{g}_{em}}{\partial t} \tag{40}$$

$$\left\langle \boldsymbol{P}_{em-g}\right\rangle = \frac{-i\alpha\hbar}{\Psi^{g}_{em}}\nabla\Psi^{g}_{em} \tag{41}$$

As will be shown in Chapter 8, Eqs. (40,41), are useful in order that Minimum Contradictions Everything Equations can be stated.

6. GEOMETRY OF THE ELECTROMAGNETIC SPACE-TIME PARTICLE FIELD

Working in the same way as for derivation of Eqs. (52,53) of Chapt. 5, we can find the geometry of the (em) space-time particle field. Thus, we can write:

$$\overline{tr}_{em}\left(\mathbf{r}_{em},t_{em}\right) = \frac{ic}{2h}\frac{\partial_{tem}\Psi_{em}}{\sqrt{\Psi_{em}\Box\Psi_{em}}}\left(\Psi_{em}{}^{*}\partial_{tem}\Psi_{em} - \Psi_{em}\partial_{tem}\Psi_{em}{}^{*}\right) \tag{42}$$

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$$\overline{lr}_{nem}\left(r_{em},t_{em}\right)=$$

$$-\frac{ih}{2}\frac{\Psi_{em}}{\Box\Psi_{em}}\sqrt{1-c^2\frac{\partial^2\Psi_{em}/\partial x_{nem}{}^2}{\partial^2\Psi_{em}/\partial t_{em}{}^2}}\left(\Psi_{em}{}^{*}\partial_{tem}\Psi_{em}-\Psi_{em}\partial_{tem}\Psi_{em}{}^{*}\right) \tag{43}$$

Taking into account Eqs. (6,7,8,18,28) we obtain:

$$\overline{tr}_{em}(\mathbf{r},t)=-\frac{\alpha c}{2h}\frac{\partial_t\Psi^g_{em}}{\sqrt{\Psi^g_{em}\Box\Psi^g_{em}}}\left(\Psi^g_{em}{}^{*}\partial_t\Psi^g_{em}-\Psi^g_{em}\partial_t\Psi^g_{em}{}^{*}\right) \tag{44}$$

$$\overline{lr}_{nem}\left(r,t\right)=$$

$$-\frac{h}{2\alpha}\frac{\Psi^g_{em}}{\Box\Psi^g_{em}}\sqrt{1-c^2\frac{\partial^2\Psi^g_{em}/\partial x_n{}^2}{\partial^2\Psi^g_{em}/\partial t^2}}\left(\Psi^g_{em}{}^{*}\partial_t\Psi^g_{em}-\Psi^g_{em}\partial_t\Psi^g_{em}{}^{*}\right) \tag{45}$$

Eqs. (44,45) describe the (em) space-time particle field geometry in terms of $(\mathrm{HMF})_g$; this was possible because of the coexistence of the $(\mathrm{HMF})_g$ with the $(\mathrm{HMF})_{em}$ through a scale.

7. FORCE PER UNIT OF ELECTROMAGNETIC MASS

The gravitational acceleration of (em) field is the force exerted per unit of electromagnetic mass at a point $(\mathbf{r}_{em},t_{em})$. Because of Eqs. (6,7,8,18,28), and Eq. (11) of Chapt. 6, we obtain:

$$\mathbf{g}_{em}(\mathbf{r},t)=i\alpha c^2\frac{\nabla\left(\Psi^g_{em}{}^{*}\partial_t\Psi^g_{em}-\Psi^g_{em}\partial_t\Psi^g_{em}{}^{*}\right)}{\left(\Psi^g_{em}{}^{*}\partial_t\Psi^g_{em}-\Psi^g_{em}\partial_t\Psi^g_{em}{}^{*}\right)} \tag{46}$$

Eq. (46) describes the force exerted per unit of electromagnetic mass at a point $(\mathbf{r},t)$. We may notice that for different signs $(\pm i)$ of an electromagnetic mass within the field under study we obtain different signs of the force exerted because of Eq(46); this corresponds either to attraction or repulsion between different or same signed charges.

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The electromagnetic force per unit of Eq. (46) includes all actions of the Ψ_{em} wave function of the electromagnetic space-time field. *Thus, it can be regarded not as electric strength, but as a force that takes into account both the electric field and the magnetic induction.* This means that when the (*em*) space-time tends to be continuum, then this force it is expected to approach Lorentz' force [3].

8. CONCLUSIONS

On the basis of the claim for minimum contradictions the electromagnetic particle field, *i.e* its geometry and the basic electromagnetic magnitudes, has been described in terms of the $(HMF)_g$. Key role of this analysis played the coexistence scale between $(HMF)_g$ and $(HMF)_{em}$. We may notice the complete correspondence between the *g* and the *em* space and the verification of Coulomb's law on the basis of Newton's law, which in turn has been verified according to the unified formula for gravity as it has been stated in Chapter 6. It is noted that Newton's law verification according to the unified formula mentioned has been derived on condition that $\dot{m} = 0$ (see Chapt. 6, Sect. .4). This unified formula is powerful enough so that it can verify the relativistic formula for gravitation. For the same reasons in the case of (*em*) space-time field it is not restricted only to Coulomb's field verification but it can refer to all electromagnetic actions including the influence of the magnetic induction. It is stressed that the very nature of quantum gravity is different from the one obtained through simplifications made for verification reasons (see Chapt. 6, Sect. 5 - notice and Chapt 6, Sect. 6).

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CHAPTER 8.
EQUATIONS OF MINIMUM CONTRADICTIONS EVERYTHING

1. THE MANY-BODY SYSTEM

The analysis has so far shown that we can express a particle field in space time terms. However, there is always a function Ψ that depends on a mass m_0. A more general description of space should be independent of any notion of mass. According to Eq. (3) of Chapt. 5, Schrödinger's relativistic equation is valid for gravitational space-time. It can be written as follows:

$$\frac{\partial^2 \Psi_g(\mathbf{r},t)}{\partial t^2} - c^2 \nabla^2 \Psi_g(\mathbf{r},t) = -(m_{0g}c^2/\hbar)^2 \Psi_g(\mathbf{r},t) \tag{1}$$

It is recalled that according to this work there is no potential acting at a distance (see Chap. 5, Sect. 1). If we put $\Box = \partial^2/\partial t^2 - c^2\nabla^2$ we obtain:

$$\frac{\Box \Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)} = -(m_{0g}c^2/\hbar)^2 \tag{2}$$

$$\frac{\partial}{\partial x_j}\frac{\Box \Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)} = 0 \qquad (j = 1,2,3,4) \tag{3}$$

We notice that Eq. (3) is independent of mass m_0. For the same reasons for an (em) space-time particle field, because of Eq. (32) of Chapt.7, we can write:

$$\frac{\Box \Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)} = -(m_{0em}c^2/i\alpha\hbar)^2 \tag{4}$$

$$\frac{\partial}{\partial x_j}\frac{\Box \Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)} = 0 \quad \text{for } j = 1,2,3,4 \tag{5}$$

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According to the Claim for Minimum Contradictions, in order that further contradictions be avoided, a matter system in general should be described through the same principles as a particle field is. This can be valid when a matter-space-time field behaves locally as a space-time-particle field and obeys Eqs. (3,5).

Eqs. (3,5) express basic law that matter-space-time obeys. These equations imply a statistical interpretation and a distribution of matter space-time according to Eq. (6) of Chapt. 5 applied either for (g) or (em) space-time; *i.e.*, according to:

$$P(\mathbf{r},t) = (i\hbar / 2m_0c^2)\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right) \tag{6}$$

As was mentioned in Chapt. 5, Sect. 2, Eq. (6) is valid only on condition that the space-time particle field described extends to infinity. In this case, the Ψ function is described locally by an equivalent local space-time particle field wave function Ψi, where this field is regarded as extended to infinity. This can occur when Ψ is derivable everywhere but its derivatives are not continuous, which means that Eqs. (2,4,6) have constant values of m_{0g} or m_{0em} only in an infinitesimal vicinity of various $(\mathbf{r},t)$. Because of Eq. (4) of Chapt. 4, we can write:

$$\overline{sr}(\mathbf{r},t) = \left\langle \overline{sr} \right\rangle_i V_0 P_i(\mathbf{r},t) = \left\langle \overline{sr} \right\rangle V_{0T} P(\mathbf{r},t) \tag{7}$$

where V_0, $\left\langle \overline{sr} \right\rangle_i$, $P_i(\mathbf{r},t)$ refer to local particle fields and V_{0T}, $\left\langle \overline{sr} \right\rangle$, $P(\mathbf{r},t)$ to the whole matter system.

Notice:

In reality, the equivalent local particle field is not extended everywhere unless the whole constitutes a particle field. The part of this particle field that exists in reality is an infinitesimal area around the point $(\mathbf{r},t)$; this area behaves as if this local particle field was extended to the infinity. On this basis, the coexistence of (em) and (g) space-time in an infinitesimal area of a point $(\mathbf{r},t)$ can be studied with the aid of local coexisting (em) and (g) space-

time particle fields regarded as extended to infinity. Thus, as will be shown in Sect. 2, the communication between (*em*) and (*g*) infinitesimal space-time around a point $(\mathbf{r},t)$ is studied with the aid of a closed system consisting of (*em*) and (*g*) particle fields regarded as extended to the infinity.

2. COMMUNICATION BETWEEN GRAVITATIONAL AND ELECTROMAGNETIC SPACE-TIME LOCAL PARTICLE FIELDS

2.1 Discontinuity of Mean Values

From Eqs. (17,18) of Chapt. 5 for energy and momentum we have:

$$i\hbar\partial\Psi/\partial t=\langle E\rangle\Psi \quad , \quad -i\hbar\nabla\Psi=\langle\mathbf{P}\rangle\Psi \tag{8}$$

According to Eq. (11) of Chapt. 4 we have:

$$\langle E\rangle^2=c^2\langle\mathbf{P}\rangle^2+{m_0}^2c^4 \tag{9}$$

Because of Eq. (16) of Chapt.5, and taking into account Eqs. (8,9), we obtain:

$$i\partial_t\langle E\rangle+\langle E\rangle^2=c^2\langle\mathbf{P}\rangle^2+{m_0}^2c^4 \tag{10}$$

Thus, from Eqs. (9,10) we have that $\partial_t\langle E\rangle=0$; since $\langle E\rangle$ is position independent we have:

$$\frac{d}{dt}\langle E\rangle=0 \tag{11}$$

Eq. (11) shows energy conservation; at the same time it shows that if $\langle E\rangle$ changes then it changes in a discontinuous way. Because of Eqs. (9,11), we obtain:

$$\frac{d}{dt}\langle P\rangle=0 \tag{12}$$

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2.2 The (em) and (g) Communication-Conservation Principles

According to the spirit of this work, Eq. (11) is valid both for the (*g*) and the (*em*) space. Therefore, we have:

$$\frac{d}{dt}\langle E_g \rangle = 0 \quad , \quad \frac{d}{dt}\langle E_{em} \rangle = 0 \tag{13}$$

Eqs. (13) show that $\langle E_g \rangle$ and $\langle E_{em} \rangle$ are constant in time; however, if the (*g*) space-time communicated with the (*em*) one, the changes of $\langle E_g \rangle$, $\langle E_{em} \rangle$ should be discontinuous.

We may notice that if $m_0 = 0$, Eq. (9) is valid both for real and imaginary energy and momentum. Thus, we may assume that only photons ($m_0 = 0$) can convert (*g*) space-time into (*em*) one and inversely. Because of Eqs. (13), we obtain:

$$\frac{d}{dt}\langle E_{em-g} \rangle = 0 \tag{14}$$

where $E_{em} = iE_{em-g}$; E_{em-g} can express energy which can be converted from (*em*) into (*g*) form.

In a closed system consisting of a real (*g*) space-time particle field and a coexisting imaginary (*em*) one, by definition, there are no photons that flow out the system, while energy conversion, according to Eqs. (13), takes place only through photons. Thus in the case of energy conversion we have:

$$\delta\langle E_g \rangle + \delta\langle E_{em-g} \rangle = 0 \tag{15}$$

$$\langle E_g \rangle + \langle E_{em-g} \rangle = const. \tag{16}$$

Eqs. (15,16) express the energy conservation principle of the closed system mentioned consisting of a gravitational and a coexisting electromagnetic space-time particle field. *Therefore Eqs. (15,16) can apply to the coexisting local space-time particle fields of section 1.* It is noted that the energy con-

servation principle as it has been expressed by the Eqs. (15,16) is compatible with the First Axiom of Thermodynamics.

Because of Eq. (9), any change of energy implies a change of momentum and vise versa. Therefore, energy changes through photons imply momentum changes through the same photons. This implies that in the case of energy-momentum conversion we will have:

$$\delta\langle P_g\rangle+\delta\langle P_{em-g}\rangle=0 \tag{17}$$

$$\langle P_g\rangle+\langle P_{em-g}\rangle=const. \tag{18}$$

Eqs. (17,18) should be valid for any direction of vectors $\langle \mathbf{P}_g\rangle, \langle \mathbf{P}_{em-g}\rangle$; therefore we should have:

$$\delta\langle \mathbf{P}_g\rangle+\delta\langle \mathbf{P}_{em-g}\rangle=0 \tag{19}$$

$$\langle \mathbf{P}_g\rangle+\langle \mathbf{P}_{em-g}\rangle=const. \tag{20}$$

Since mean values are position independent, Eqs(16,20) can be written as follows:

$$\frac{\partial}{\partial t}(\langle E_g\rangle+\langle E_{em-g}\rangle)=0 \tag{21}$$

$$\frac{\partial}{\partial t}\left(\langle \mathbf{P}_g\rangle+\langle \mathbf{P}_{em-g}\rangle\right)=0 \tag{22}$$

Taking into account Eqs. (17,18,19,20) of Chapt. 5 and Eqs. (40,41) of Chapt. 7 we obtain:

$$\partial_t\left[\frac{\partial_t\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}+\alpha\frac{\partial_t\Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)}\right]=0 \tag{23}$$

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$$\partial_t \left[\frac{\nabla \Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)} + \alpha \frac{\nabla \Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)} \right] = 0 \qquad (24)$$

Eqs. (23,24) express the energy and momentum conservation of the coexisting equivalent local space-time particle fields characterized by local space-time wave functions $\Psi_{gj}(\mathbf{r},t)$ and $\Psi^g_{emj}(\mathbf{r},t)$; these functions in an infinitesimal vicinity of a point $(\mathbf{r},t)$ coincide with $\Psi_g(\mathbf{r},t)$ and $\Psi^g_{em}(\mathbf{r},t)$ wave functions of the whole matter field.

2.3 Real (*g*) and Imaginary (*em*) Eigenvalues

As was mentioned in Sect. 2.1, energy and momentum appear in discrete values. In Sect. 2.2 the way of communication between (*g*) and (*em*) space was shown. According to this point of view, we can have discrete values of energy and momentum through energy conversion by means of photons. Thus, we may assume that we have discrete values of energy and momentum in Schrödinger's relativistic Eqs. (2,4) because of energy and momentum conversion through photons. According to Section 1, both (*g*) and (*em*) space-time are described by a complex space-time wave function. The real component of such a function could correspond to an ideal (*g*) space-time while the imaginary component could correspond to an ideal (*em*) one. Thus, both (*g*) and (*em*) space-time could be regarded as result of a gravi-electric oscillation. According to what was mentioned, we may assume that we reach to statistical interpretation of (*g*) and (*em*) space-time because of energy and momentum conversion through photons; (*g*) space-time cannot exist without (*em*) and *vice-versa*. Real eigenvalues could correspond to (*g*) space-time while imaginary eigenvalues could correspond to (*em*) one.

3. BASIC EQUATIONS OF MINIMUM CONTRADICTIONS MATTER SPACE-TIME

According to what was mentioned in Sects. 2.1 and 2.2, we have the set of equations that together characterize a Matter Space-Time Field as a whole. Since this field includes everything, this equation set can be regarded as Equations of Minimum Contradictions Everything. These equations to-

gether with the geometry and the gravitational acceleration equations implied are the following:

a. Space-Time Wave Equations:

$$\frac{\partial}{\partial x_j}\frac{\Box\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}=0 \qquad (j=1,2,3,4) \tag{25}$$

$$\frac{\partial}{\partial x_j}\frac{\Box\Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)}=0 \qquad (j=1,2,3,4) \tag{26}$$

b. Energy Conservation:

$$\partial_t\left[\frac{\partial_t\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}+\alpha\frac{\partial_t\Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)}\right]=0 \tag{27}$$

c. Momentum Conservation:

$$\partial_t\left[\frac{\nabla\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}+\alpha\frac{\nabla\Psi^g_{em}(\mathbf{r},t)}{\Psi^g_{em}(\mathbf{r},t)}\right]=0 \tag{28}$$

d. Geometry of (g) space-time:

(*i.e.* mean relative time and mean relative length in a direction $\mathbf{n}$ at a point $(\mathbf{r},t)$ (see Eqs. (52,53) of Chapt. 5.)

$$\overline{tr}_g(\mathbf{r},t)=\frac{ic}{2h}\frac{\partial_t\Psi}{\sqrt{\Psi\Box\Psi}}\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{29}$$

$$\overline{lr}_{gn}(\mathbf{r},t)=-\frac{ih}{2}\frac{\Psi}{\Box\Psi}\sqrt{1-c^2\frac{\partial^2\Psi/\partial x_n{}^2}{\partial\Psi/\partial t^2}}\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{30}$$

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e. Geometry of (*em*) space-time:

i.e. mean relative time and mean relative length in a direction **n** at a point $(\mathbf{r},t)$ (see Eqs. (44,45) of Chapt. 7).

$$\overline{tr}_{em}(\mathbf{r},t) = -\frac{\alpha c}{2h}\frac{\partial_t \Psi^g_{em}}{\sqrt{\Psi^g_{em}\Box\Psi^g_{em}}}\left(\Psi^{g}_{em}{}^{*}\partial_t\Psi^g_{em} - \Psi^g_{em}\partial_t\Psi^{g}_{em}{}^{*}\right) \tag{31}$$

$$\overline{lr}_{nem}(\mathbf{r},t) =$$

$$-\frac{h}{2\alpha}\frac{\Psi^g_{em}}{\Box\Psi^g_{em}}\sqrt{1-c^2\frac{\partial^2\Psi^g_{em}/\partial x_n{}^2}{\partial\Psi^g_{em}/\partial t^2}}\left(\Psi^{g}_{em}{}^{*}\partial_t\Psi^g_{em} - \Psi^g_{em}\partial_t\Psi^{g}_{em}{}^{*}\right) \tag{32}$$

f. Force per unit of (*g*) mass at a point $(\mathbf{r},t)$

(See Eq. (11) of Chapt. 6):

$$\mathbf{g}(\mathbf{r},t) = \frac{c^2\nabla P(\mathbf{r},t)}{P(\mathbf{r},t)} = \frac{c^2\nabla\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right)}{\left(\Psi^*\partial_t\Psi - \Psi\partial_t\Psi^*\right)} \tag{33}$$

g. Force per unit of (em) mass or charge at a point $(\mathbf{r},t)$:

(See Eq. (46) of Chapt. 7)

$$\mathbf{g}_{em}(\mathbf{r},t) = \frac{c^2\nabla P_{em}(\mathbf{r},t)}{P_{em}(\mathbf{r},t)} = \frac{i\alpha c^2\nabla\left(\Psi^{g}_{em}{}^{*}\partial_t\Psi^g_{em} - \Psi^g_{em}\partial_t\Psi^{g}_{em}{}^{*}\right)}{\left(\Psi^{g}_{em}{}^{*}\partial_t\Psi^g_{em} - \Psi^g_{em}\partial_t\Psi^{g}_{em}{}^{*}\right)} \tag{34}$$

4. CONCLUSION

On the basis of the claim for minimum contradictions, we have the set of equations that together characterize a Matter Space-Time Field as a whole. Since this field includes everything, this equation set can be regarded as Equations of Minimum Contradictions Everything. These equations describe a *Space-Time Quantum Mechanics.*

Notice:

It is commonly known that basic target of modern physics is to find Everything Equations. According to this work "Everything" cannot be precisely described. The only we can do is to approach a Minimum Contradiction Everything.

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CHAPTER 9. CONSEQUENCES OF THE MINIMUM CONTRADICTIONS PHYSICS OF EVERYTHING

1. SELF - NORMALIZATION

A basic element of this work is that space-time is statistically interpreted. Most of the conclusions are derived on the basis of statistical relations of various space-time magnitudes. These conclusions and consequences are related to the way the equations of minimum contradictions everything have been derived, as well as to the interpretation of various phenomena, as will be shown in this Chapter. The reason why we have enough information to draw these conclusions is the clear statistical interpretation that is due to the property of Ψ wave functions to be self-normalized. In fact, according to the claim for minimum contradictions, the Ψ wave function of a matter system is equivalent to a local Ψ_i wave function that obeys Schrödinger's relativistic equation. These local Ψ_i wave functions describe coexisting equivalent local (g) and (em) particle space-time that are regarded as extended to the infinity, so that Schrödinger's relativistic equation probability density function $P(\mathbf{r},t)$ can apply. According to Eq. (5) of Chapt. 5, we always have:

$$\int P(\mathbf{r},t)dr^3 = 1 \tag{1}$$

Because of this equation, we have clearly stated statistical relations which permit us to draw conclusions related to forces unification, spin interpretation, matter system quantization, second thermodynamic law derivation, arrow of time and fractal properties interpretation as well as to new explanation of various phenomena including possibility to technological applications. The property of self-normalization of the theory proposed constitutes a basic difference in relation to existing current theories or new proposed ones which use the requirement for re-normalization. This requirement derives from the necessity for various magnitudes to be statistically interpreted but through functions which, taken alone, do not imply a statistical nature. In these cases, big problems are raised, related to various phenomena and mainly to description and interpretation of gravity. The statistical nature of space-time constitutes the basic consequence of the main principle of this work, *i.e.* of the claim for minimum contradictions.

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2. UNIFICATION OF FORCES

2.1 Photons

According to Chapt. 4, Sect. 3,4, Ψ is a complex statistically interpreted wave function and this implies that $m_0 \neq 0$. Thus, the question is raised of whether photons $(m_0 = 0)$ exist and are compatible to the basic claim of this work. Photon is an oscillating matter space-time field that has no energy when the oscillation stops. Therefore photon has meaning only when it is regarded as traveling within 'non existing space-time'. The notion of 'non existing space-time' derives from the fact that space-time is stochastic and therefore there is a probability not to exist. Photons play key role in quantum states formation and in the conversion of one kind of space-time into another (see Chapt. 8, Sect. 2.2) [1]; their action is taken into account by space-time Ψ wave functions described by the equation set of minimum contradictions everything, *i.e.* Eqs. (25-34) in Chapt. 8, but they are invisible since they are traveling within 'non-existing space-time'. However, we should distinguish the notion of photons from the notion of radiation since radiation refers to a space-time wave within existing space-time, which implies that it has rest mass either of (g) or (em) space-time [2,3,4]; thus we may assume that speed of radiation approaches to the ideal speed of light in an asymptotic way [2]. If this is the case, radiation constitutes space-time formation generally described by the equations of Minimum Contradictions Everything.

2.2 BASIC INTERACTION FORCES

Eqs. (33,34) from Chapt. 8 describe the forces per unit of mass of (g) and (em) space-time matter fields. They derive on the basis that there is a probability density function through which space-time either (g) or (em) is distributed. These forces correspond to quantum gravity applied either to (g) or (em) space-time. A verification of this has been offered (Chapt. 6, Sects. 2,3,4) through derivation of Newton's law on the basis of the general formula described by Eq. (10) of Chapt. 6. For the same reason, Coulomb's law is verified, since equations related to (em) space-time have the same form with the ones related to (g) one (see Chapt 7, Sect. 3). On this basis we have:

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1. A unified formula for quantum gravity applied to strong force of (g) space-time.
2. A unified formula for electromagnetic force at quantum level of electromagnetic interaction.
3. Verification of gravitation Newton's law on the basis of the general formula, Eq. (10), Chapt. 6.
4. Verification of Coulomb's law on the basis of general formula of Eq. (10) of Chapt. 6 applied to (em) space-time. The electrical forces described by the general formula are not restricted to the ones of Coulomb's field (see Chapt 7, Sect. 7). Thus we may assume that magnetic induction is taken into account. When quantum phenomena are ignored this force is expected to approach Lorentz' force; this is compatible with the analysis related to this subject done by P. Beckmann [5].
5. There remains the weak force, *i.e.*, the force that is regarded as responsible for radiation. For this force, we may notice the following: Eqs. (25-34) from Chapt. 8 can apply to a system regarded as a whole, where according to Sect. 2.1 the existence of radiation is taken into account (see also Chapt. 11, Sect. 3, notice 1).

What we mean by weak force falls into the category of (g) and (em) forces in general on condition that creation or existence of radiation appears in the general system described by Eqs. (25-34), Chapt. 8. An example of radiation production without any force required can be understood by the following example. According to Eq. (46), Chapt. 5, for a particle field we have:

$$\langle E \rangle = hc/\langle V \rangle \tag{2}$$

$$\langle V \rangle \uparrow \Rightarrow \langle E \rangle \downarrow \tag{3}$$

Because of Eqs. (2,3), photon emission is needed for energy balance, since any energy change takes place through photons (see Chapt. 8, Sect. 2.2). On this basis, Hawking's black hole radiation can be explained [6,7]; in this case $\langle V \rangle \uparrow$ is compatible with expansion of the Universe. Therefore, we notice that radiation is produced not because of a particular force, but because of boundary conditions imposed.

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3. AN INTERPRETATION OF SPIN

According to Eqs. (33,34), Chapt. 8, we have that there is gravitational acceleration in both (g) and (em) space-time particle fields. Because of this, a change of momentum $\mathbf{P}$ should take place, so that the field under study can be regarded as creating gravitation; otherwise we would have a constant direction of $\mathbf{P}$ which implies the absence of any force towards a direction different of the one of $\mathbf{P}$. Therefore, we may assume that there is an angular momentum:

$$\mathbf{M} = \mathbf{P} \times \mathbf{r}_P \tag{4}$$

creating change of $\mathbf{P}$, where $\mathbf{r}_P$ has the same direction with $\mathbf{r}$. Because of Eq. (28) of Chapt. 4 we have:

$$h = P\lambda_{eq} \tag{5}$$

On this basis we can write:

$$\mathbf{h} = \mathbf{P} \times \mathbf{r}_{eq} \quad , \quad \mathbf{r}_{eq} \bullet \mathbf{e}_{\perp p,h} = \lambda_{eq} \tag{6}$$

where $\mathbf{h}$ is a vector, $\mathbf{e}_{\perp p,h}$ is a unit vector perpendicular to $\mathbf{P}$, $\mathbf{h}$ and $\mathbf{r}_{eq}$ has the same direction with $\mathbf{r}$.

Eqs. (6) are valid for any particle and can acquire physical meaning through Eq. (4). Kanarev [8] was the first who proposed that Plank's constant corresponds to a vector. Symbolizing by $\mathbf{S}_g, \mathbf{S}_{em}$ the spin of (g) and (em) space-time particle fields, we can write:

$$\mathbf{S}_g = 1\mathbf{h}_g \quad , \quad \mathbf{S}_{em} = 1\mathbf{h}_{em} \quad , \quad |\mathbf{h}_g| = |\mathbf{h}_{em}| = h \tag{7}$$

According to Chapt. 7, Sect. 3, h is the same with respect either to (g) or (em) space-time. Therefore there is meaning if we add $\mathbf{S}_g$ and $\mathbf{S}_{em}$. If

$$\mathbf{S}_g + \mathbf{S}_{em} = 0 \tag{8}$$

we could say that we have spin 0, while if :

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$$\mathbf{S}_g + \mathbf{S}_{em} = 2\mathbf{h} \tag{9}$$

we could say that we have spin 2. Of course, this needs more explanation, as will be shown below. Because of Eqs. (39,40) in Chapt. 4, we have:

$$\overline{sr}(\mathbf{r},t) = \left\langle \overline{sr} \right\rangle V_0 P(\mathbf{r},t) \tag{10}$$

$$Sr = \left\langle \overline{sr} \right\rangle V_0 \Psi \tag{11}$$

$$\overline{sr}(\mathbf{r},t) = \delta_S \left| Sr \right| \tag{12}$$

$$P(\mathbf{r},t) = \delta_s \left| \Psi \right|^2 \tag{13}$$

where $\delta_s = 1$ for matter and $\delta_s = -1$ for antimatter. According to Eq. (13), the real axis is not perpendicular to the imaginary one; $P(\mathbf{r},t)$ is not reduced to the form $\Psi^* \Psi$, but it continues to derive from $|\Psi|^2$ as it does according to the QM [9,10]. It is noted that nothing compels us to accept that the imaginary axis should be perpendicular to the real one; the physical meaning of various magnitudes gives meaning to the complex representation [6].

On the basis of what was mentioned, we may assume that the imaginary axis of the Ψ wave function can correspond to $\mathbf{S}_{em}$ while the real one can correspond to $\mathbf{S}_g$. Note that according to the spirit of this work the imaginary number i is related to (em) space. Thus the Ψ wave function can be regarded as a gravi-electric oscillation consisting of real and imaginary components. For real eigenvalues of various magnitudes we have (g) space-time, while for imaginary eigenvalues we have (em) space-time.

If $\left\langle E_g \right\rangle \neq 0$ and $\left\langle E_{em} \right\rangle = 0$, it means that (em) space-time is converted into (g) one forming so real (g) eigenvalues. If this is the case we can write:

$$(\measuredangle\, \mathbf{S}_g, \mathbf{S}_{em}) = 180^{\circ} \Rightarrow \mathbf{S}_g + \mathbf{S}_{em} = 0 \Rightarrow \text{spin} = 0 \tag{14}$$

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$$(\measuredangle\, \boldsymbol{S}_g, \boldsymbol{S}_{em}) = 120^{\circ} \Rightarrow \mathbf{S}_g + \mathbf{S}_{em} = 1\mathbf{h} \Rightarrow \text{spin} = 1 \tag{15}$$

$$(\measuredangle\, \mathbf{S}_g, \mathbf{S}_{em}) = 0^{0} \Rightarrow \mathbf{S}_g + \mathbf{S}_{em} = 2\mathbf{h} \Rightarrow \text{spin} = 2 \tag{16}$$

For $\langle E_g \rangle \neq 0 \, \langle E_{em} \rangle \neq 0$ we have coexisting of (g) and (em) space-time particle fields. In this case the real and the imaginary axis of Ψ_g wave function coincide with the ones of Ψ^{g}_{em}. For coexisting (em) and (g) space-time particle fields, because of Eqs. (16,20) of Chapt. 8, we have:

$$\langle E_g \rangle + \langle E_{em-g} \rangle = const. \tag{17}$$

$$\langle \mathbf{P}_g \rangle + \langle \mathbf{P}_{em-g} \rangle = const. \tag{18}$$

Thus there is an equivalent particle for which is valid:

$$\langle E_{eq} \rangle = \langle E_g \rangle + \langle E_{em-g} \rangle \tag{19}$$

$$\langle \mathbf{P}_{eq} \rangle = \langle \mathbf{P}_g \rangle + \langle \mathbf{P}_{em-g} \rangle \tag{20}$$

Therefore there is an eingenfunction Ψ_{eq} with eingenvalue $\langle E_{eq} \rangle$ and $\langle \mathbf{P}_{eq} \rangle$. Thus this equivalent particle should have spin:

$$\mathbf{S}_{eq} = 1\mathbf{h} \tag{21}$$

Since

$$|\mathbf{S}_g| = |\mathbf{S}_{em}| = h \tag{22}$$

vectors $\mathbf{S}_g$, $\mathbf{S}_{em}$ should form an angle of 120° so that:

$$\mathbf{S}_{eq} = \mathbf{S}_g + \mathbf{S}_{em} = 1\mathbf{h} \tag{23}$$

In this case both coexisting (*g*) and (*em*) particle fields should have spin 1/2 in order that the whole spin is 1.

We notice that we can have spin 1/2 for particle fields described by Shrödinger's relativistic equation. This is in contrast with what has been accepted until now. However we may notice that this spin does not correspond to a simple Shrödinger's relativistic equation. *We have spin 1/2 for the equations of Minimum Contradictions Everything as they have been described in Chapt. 8, Sect. 3., i.e. for coexisting (g) and (em) space-time particle fields that constitute basic structure element of reality.*

4. MATTER SPACE-TIME SYSTEM QUANTIZATION

4.1 Matter Space-Time System Quantum Energy States

Because of Eq. (7) of Chapt. 8, for relative time and volume we have:

$$\overline{tr}(\mathbf{r},t)=\langle TR\rangle_i V_0 P_i(\mathbf{r},t)=\frac{1}{E_0}\langle E\rangle_i V_0 P_i(\mathbf{r},t)=\frac{1}{E_{0T}}\overline{E}\,V_{0T}P(\mathbf{r},t) \quad (24)$$

$$\overline{vr}(\mathbf{r},t)=\langle VR\rangle_i V_0 P_i(\mathbf{r},t)=\langle V\rangle_i P_i(\mathbf{r},t)=\langle \overline{vr}\rangle V_{0T}P(\mathbf{r},t)=\overline{V}\,P(\mathbf{r},t) \quad (25)$$

Thus, we have:

$$\langle E\rangle_i/\langle V\rangle_i=\overline{E}/\overline{V} \quad (26)$$

where $\overline{E}$, $\overline{V}$, are the mean energy and mean volume of the whole matter system.

The mean energy density at point $(\mathbf{r},t)$ on the basis of the equivalent local particle field equals to $\langle E\rangle_i/V_0$ while on the basis of the whole field equals to $\overline{E}/V_{0T}$. Thus we will have:

$$\overline{E}=\langle E\rangle_i V_{0T}/V_0 \quad , \quad \overline{V}=\langle V\rangle_i V_{0T}/V_0 \quad (27)$$

$$d\overline{E}=d\langle E\rangle_i V_{0T}/V_0 \quad , \quad \overline{dV}=d\langle V\rangle_i V_{0T}/V_0 \quad (28)$$

Eqs. (28) imply the following conclusion:

Conclusion I: An energy change of a matter system implies an energy change of its equivalent local particle fields.

Because of Eq. (11) of Chapt. 8 and Eqs. (27) we have:

$$d\bar{E} / dt = 0 \tag{29}$$

Eq. (29) imply the following conclusion:

Conclusion II: A matter space-time system appears in quantum energy states.

Notice: Eq. (29) is valid for a range of time, while Eqs. (28) correspond to an abrupt change of energy.

4.2 Mean Energy – Mean Volume Correlation

Because of Eq. (46), Chapt. 5, we have:

$$\langle E \rangle_i \langle V \rangle_i = hc \tag{30}$$

Taking into account Eqs. (26,27,28,30) we have:

$$\bar{V} \uparrow \Rightarrow \langle V \rangle_i \uparrow \Rightarrow \langle E \rangle_i \downarrow \Rightarrow \bar{E} \downarrow \tag{31}$$

This expresses the following conclusion:

Conclusion III: A mean volume increase of a matter space-time system implies a mean energy decrease of this system.

4.3 Energy Conservation of a Closed Matter Space-Time System

Because of Eq. (29) we may notice that we can have energy change only through photons for the same reason as described in Chapt. 8, Sect. 2.2. Following the same methodology as in Chapt. 8, Sect. 2.2, and taking into account Conclusion II, we have that for a closed system it is valid that:

$$\bar{E}_g + \bar{E}_{em-g} = \text{constant} \tag{32}$$

This expresses the energy conservation principle for a closed matter system consisting of coexisting (g) and (em) space-time.

4.4 Momentum Conservation of a Closed Matter Space-Time System

A stochastic matter space-time derives through distribution of relative space-time magnitudes which belong to a plane space-time (see Chapt 4, Sects. 2.1,2.2). For a plane space-time because of Eq. (11), Chapt. 4 we have:

$$\bar{E}^2 = c^2 \bar{P}^2 + \bar{E}_0^{\,2} \tag{33}$$

Because of Eqs. (29,33) we obtain:

$$d\bar{P} / dt = 0 \tag{34}$$

Following the same methodology with the one of Chapt. 8, Sect. 2.2, we conclude that for a closed system is valid that:

$$\delta\bar{\mathbf{P}}_g + \delta\bar{\mathbf{P}}_{em-g} = 0 \tag{35}$$

This expresses the momentum conservation principle for a closed matter system consisting of coexisting (g) and (em) space-time.

4.5 Gravitation and Electromagnetic Force

According to Sect. 4.4 $\bar{\mathbf{P}}_g$ and $\bar{\mathbf{P}}_{em-g}$ can be regarded as belonging to a plane space-time. Therefore, for very small differences of momentum, we can write according to Eq. (14) of Chapt. 2:

$$\bar{\mathbf{F}}_g = \delta\bar{\mathbf{P}}_g / \delta t \quad , \quad \bar{\mathbf{F}}_{em} = \delta\bar{\mathbf{P}}_{em-g} / \delta t \tag{36}$$

$\bar{\mathbf{F}}_g$ is the mean force acting on the (g) space-time because of the system under study (due to (g) photons action).

$\bar{\mathbf{F}}_{em}$ is the mean force acting on the (em) space-time because of the system under study (due to (em) photons action).

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Therefore $-\bar{\mathbf{F}}_{em}$ is the force on the system because of (*em*) space-time. Thus because of Eqs. (35,36) we obtain:

$$-\bar{\mathbf{F}}_{em} = \bar{\mathbf{F}}_{g} \tag{37}$$

Because of Eq(37) the force $-\bar{\mathbf{F}}_{em}$ acts as a force due to a gravitational field. For the same reason we can write:

$$-\bar{\mathbf{F}}_{g} = \bar{\mathbf{F}}_{em} \tag{38}$$

Therefore we reach the conclusion:

Conclusion IV: An electromagnetic field, within a matter system, creates a gravitational field whose the acting force equals the electromagnetic force on the system, and *vice-versa.*

This conclusion partially coincides with the Kopernicky's hypothesis [11], according to which the gravitational forces are a secondary manifestation of electric and magnetic phenomena; there is theoretical and experimental work supporting this hypothesis.

According to this work gravitation is not a secondary phenomenon; it is the force required to act per unit of mass so that mass is distributed according to a probability density, a fact that leads to Eq. (33) of Chapt. 8. The matter electromagnetic field is regarded as an imaginary gravitational matter field, while charge is regarded as an imaginary mass.

According to this work photons are 'ideal particles' whose speed equals the speed of light. Photons are media through which gravitation and electromagnetic forces are created.

Electromagnetic space-time photons can be converted into (*g*) ones creating gravitation when incorporated to a (*g*) space-time. Inversely gravitational space-time photons can be converted into (*em*) ones creating electromagnetic force when incorporated to a (*em*) space-time.

In the case of motion due to a gravitational force the question is raised of where the energy required comes from. Taking into account what was mentioned (*em*) space – time photons are required to produce (*g*) ones in order

that gravitation is created. On this basis we may assume that when a gravitational force, acting on a system, produces work the following process is valid:
1. (g) photons coming from the space-time surrounding a system are converted into (em) ones which are incorporated to the system.
2. (em) photons created are converted into (g) ones creating so the gravitation field.
Therefore during the attraction of two bodies we may assume that photon absorption, from the surrounding space-time takes place.

5. SECOND LAW OF THERMODYNAMICS

Applying the conservation principle for a closed matter system consisting of coexisting (g) and (em) space-time, we have:

$$d(\overline{E}_g + \overline{E}_{em-g}) = 0 \tag{39}$$

Because of relation (31), we have that:

$$\overline{V}_g \uparrow \Rightarrow \overline{E}_g \downarrow \tag{40}$$

In the case of a closed system existing within an expanding universe (see section 10), we may assume that $\overline{V}_g \uparrow$. This implies, because of relation (40) and Eq(39), that:

$$d\overline{E}_{em-g} \geq 0 \tag{41}$$

Inequality (41) states that energy of (g) space is always converted into (em) space. As was mentioned in Chapt. 8, Sect. 2.2, (g) space can be converted into (em) space and *vice-versa* only through photons. Therefore because of Eq. (39) and inequality (41), energy of (g) space is converted into photons, a part of which heats the whole system. Thus, we can write:

$$dQ = TdS = \phi d\overline{E}_{em-g} \geq 0 \quad , \qquad (0 \leq \phi \leq 1)) \tag{42}$$

where dQ is the heat inflow because of photons mentioned, T is the absolute temperature and dS is the change of entropy. From relations (42), we obtain:

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$$dS \geq 0 \tag{43}$$

This inequality expresses the Second Law of Thermodynamics.

6. THE ARROW OF TIME

For the same reasons as in Section 5 we have:

$$\overline{E}_g + \overline{E}_{em-g} = \text{constant} \tag{44}$$

$$\overline{V}_g \uparrow \Rightarrow \overline{E}_g \downarrow \Rightarrow \overline{E}_{em-g} \uparrow \tag{45}$$

i.e., the evolution of Universe implying $\overline{V}_g \uparrow$ expresses the passage from $\overline{E}_g$ to energy $\overline{E}_{em-g}$; since, according to Statement V (Chapt. 2, Sect. 2.3), energy is equivalent to time, this passage-change expresses what we consider as Arrow of Time [12]. We may notice that the notion of Arrow of Time or Sensible Time is very close to the notion of entropy, as has been mentioned in Section 5.

7. THE PROPERTY OF SELF-SIMILARITY

Because of Eqs. (7) from Chapt. 8, for a relative length in a direction $\hat{\mathbf{n}}$ it is valid that:

$$\overline{lr}_n(\mathbf{r},t) = \left\langle \overline{lr}_n \right\rangle_i V_0 P_i(\mathbf{r},t) = \left\langle \overline{lr}_n \right\rangle V_{0T} P(\mathbf{r},t) \tag{46}$$

Applying this equation for two different directions $\mathbf{n}_1$ and $\mathbf{n}_2$ we obtain:

$$\frac{\overline{lr}_{n_1}(\mathbf{r},t)}{\overline{lr}_{n_2}(\mathbf{r},t)} = \frac{\overline{dl}_{n_1}}{\overline{dl}_{n_2}} = \left\langle \overline{lr}_{n_1} \right\rangle_K \Big/ \left\langle \overline{lr}_{n_2} \right\rangle_K = \left\langle \overline{lr}_{n_1} \right\rangle \Big/ \left\langle \overline{lr}_{n_2} \right\rangle = C_S \tag{47}$$

where $\overline{dl}_{n_1}$, $\overline{dl}_{n_2}$ are the mean real infinitesimal lengths in the directions $\mathbf{n}_1$ and $\mathbf{n}_2$ respectively, corresponding to the same infinitesimal length dl_0 at a given time t at any point $(\mathbf{r},t)$ of the HMF while k indicates a finite area

around any point $(\mathbf{r},t)$; C_S has the same value in the whole extent since it is equal to a ratio which refers to the whole. For the same reason as in Chapt. 5, Sect. 6.3, we have that if a shape is formed through the lengths $\overline{dl}_{n_1},\overline{dl}_{n_2},...,\overline{dl}_{n_N}$ in an infinitesimal area in the neighborhood of a point $(\mathbf{r},t)$ of the HMF, the same shape is formed at any other point of the HMF on condition that this shape corresponds to the same infinitesimal length dl_0 at a given time t. Thus, the above relation expresses the self-similarity of the matter system at time t in the whole of its extent. It is noted that $\overline{dl}_{n_1},\overline{dl}_{n_2}$ are lengths that correspond to matter since space-time itself is matter. Taking into account the above mentioned, we can conclude that the stochastic matter space-time has fractal properties because of self similarity implied by Eq. (47). It is noted that, as Mandelbrot has shown, the geometry of matter systems in Nature appears to be fractal-self-similar [13,14,15]; therefore it is expected that this fractal geometry can apply to any matter space-time system as it is suggested according to this work.

8. FRACTALS' INTERPRETATION

For a flat space-time with energy $\langle E\rangle$ and momentum $\langle\mathbf{P}\rangle$, in the direction of $\langle\mathbf{P}\rangle$, we have that:

$$\langle LR\rangle=\langle VR\rangle=E_0/\langle E\rangle \tag{48}$$

and because of Eqs(46)

$$\overline{lr}(\mathbf{r},t)=V_0P_i(\mathbf{r},t)\,E_0/\langle E\rangle_i=V_{0T}P(\mathbf{r},t)\,E_{0T}/\overline{E} \tag{49}$$

Working the same way as in 4.1 we have:

$$V_0/\langle E\rangle_i=V_{0T}/\overline{E} \tag{50}$$

Therefore it holds that:

$$\overline{lr}(\mathbf{r},t)=V_0P(\mathbf{r},t)\,E_{0T}/\langle E\rangle_i \tag{51}$$

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By definition we have:

$$\overline{dS} = \overline{lr}\,dS \tag{52}$$

For $\overline{lr} = const.$, we have:

$$\Delta S = \overline{\Delta S}/\overline{lr} \tag{53}$$

For $\overline{lr} = 1$ we have $\Delta S = \overline{\Delta S}$. Thus ΔS measures the length of any line of a surface where $\overline{lr} = const.$ *e.g.* a section of this surface with a plane. If we put:

$$\overline{lr} = \alpha^{D-1} \tag{54}$$

we will have:

$$\Delta S = \overline{\Delta S}(1/\alpha)^{D-1} \tag{55}$$

Thus, magnitude ΔS behaves as length of a coastline in Richardson's experiments [13,14,15]. According to Mandelbrot, D is the fractal dimension and a is the unit of measurement. We notice that the unit of measurement a is connected with the notion of length contraction $\overline{lr}$, *i.e.*, the higher length contraction (the smaller $\overline{lr}$), the smaller measuring unit α. However the question is raised of why we can have different values of D for the same values of $\overline{lr}$ and a. Because of Eq. (46) of Chapt. 5 and Eq. (26) above, we obtain:

$$\langle E\rangle_i^{\,2} \Big/ \langle E\rangle_i \langle V\rangle_i = \langle E\rangle_i^{\,2} \Big/ hc = \overline{E}/\overline{V} \tag{56}$$

$$\langle E\rangle_i = \sqrt{hc\,\overline{E}/\overline{V}} \tag{57}$$

This implies that $\langle E\rangle_i$ is the same everywhere but it depends on the density $(\overline{E}/\overline{V})$ of the matter system. Because of Eqs. (51,57), it holds that we can have the same $\overline{lr}$ for different matter system energy densities. This implies that we can have different values of D for the same values of $\overline{lr}$ and a but for different matter system energy densities.

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On the basis of Eq. (51), it can be derived that at a time t we have [16]:

$$\begin{aligned}\overline{dS}^2 &= (f_x\overline{dx})^2 + (f_y\overline{dy})^2 + (f_z\overline{dz})^2 - c^2(f_t\overline{dt})^2 \\ &= \left[\overline{lr}(\mathbf{r},t)\right]^2 (dx^2 + dy^2 + dz^2 - c^2dt^2)\end{aligned} \tag{58}$$

where f_x, f_y, f_z, f_t are the same everywhere at time t. For $\overline{dt} = 0$ we notice that Pythagorean theorem is non valid for $\overline{dS}, \overline{dx}, \overline{dy}, \overline{dz}$ even though they correspond to orthogonal dimensions. This is valid because these quantities are statistical. All these can be regarded as related to statistically orthogonal systems which are closed to Brown fractals [13]. According to Conclusion I of Sect. 4.1, we have that *an energy change of the whole matter system implies an energy change of the equivalent local particle fields and vice versa.* This means that a local change, having as result a change of the local energy eigenvalue, implies a change of the whole system. This is compatible to properties of chaotic fractal systems [15]. Thus, we may notice that minimum contradictions point of view can lead us to forms that appear in Nature.

9. NEW EXPLANATIONS OF VARIOUS PHENOMENA

9.1 Non Locality Effect

The non Locality Effect is a phenomenon of interaction at a distance without transmission with certain velocity of this interaction through some medium. Such a phenomenon has been verified experimentally (see Alain Aspect [17]), and it might be explained according to the present work. In fact since space-time, according to the spirit of this work, is regarded as stochastic, the 'non-existing', which is dimensionless, has some probability to 'exist' everywhere. Therefore, *the distance between two different points of a space-time-matter field has a probability to be zero.* Moreover, the 'non existing-dimensionless' might be regarded as active (See Sect. 10 - creation from zero. See also Chapt. 11, Sect. 3,4). Thus, an active 'non existing-dimensionless' due to zero distance might act everywhere at the same time.

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9.2 Electron Cluster's Stability

For same sign charge clusters (*e.g.* electron clusters) we should have repulsion, which implies electric cluster instability as C. Whitney has noticed [18]. According to this work, an electron cluster can be regarded as an imaginary gravitational space-time formation. Thus, the local gravitation-like acceleration in the area of an electron cluster is proportional to the gradient of the probability density function [see Eqs. (10,11) in Sect. 5 and Eq. (34) in Chapt. 8]. Therefore, the stability of an electron cluster is due to the imaginary mass-charge distribution according to a probability density function in the area of the cluster regardless of the charge sign.

9.3 Casimir Effect

Because of Eq. (10) in Chapt. 6, what is shown in Fig.1a will take place, that is the attraction on an object is attributed to the fact that the space-time-aether under the object attracts the object more than the upper one and that $\overline{tr}_2 > \overline{tr}_1$. If we reduced the energy density under the body [6,19,20], *i.e.* if we succeed in having $\overline{tr'}_2 < \overline{tr}_1$ then an ascending movement of the object will start as it is shown in Fig. 1b.

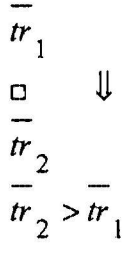

Figure 1a.

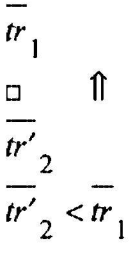

Figure 1b.

On the basis of the above mentioned, the Casimir effect can be explained [20]. The particle fields which are trapped in the very small gaps of the Casimir plates have small volume expectation values and according to Eqs. (23,46), Chapt. 5, they have high-energy expectation values and high mean relative time in contrast to particle fields with high volume expectation values out of the plates. Thus a gravitational force like the one that is described in Fig. 1 is created, resulting in the attraction of the plates.

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10. THE EVOLUTION OF THE UNIVERSE AS AN ELECTRO-GRAVITIC PHENOMENON

10.1 Space-Time Compatibility [21]

A question arises as to the meaning of the phrase 'space-time contains energy'. An answer could relate to the space-time compatibility. The motion -including acceleration - of a space-time with respect to another implies the existence of a relative time; inversely: *the existence of a relative time of one space-time with respect to another should imply a motion in order for those space-times to be compatible.* For the purposes of this work we will refer to this as *space-time compatibility.*

An example for understanding the use of *space-time compatibility* is the following: if we regard an atom as a space-time system then the splitting of the atom corresponds to an abrupt exposition of the split parts to the surrounding space, *i.e.* to the abrupt appearance of a high relative time which creates all space-time compatible kinds of motion, such as radiation and/or particle emission.

10.2 Universe from Zero – Evolution [22]

For a closed system, according to Eq. (32), we have:

$$\bar{E}_g + \bar{E}_{em-g} = \text{constant} \tag{59}$$

If we consider the Universe as a closed system that has been derived from zero, then the following equation applies:

$$\bar{E}^U_g + \bar{E}^U_{em-g} = 0 \tag{60}$$

where the superscript U indicates Universe quantities. Because of relation (31) of Sect. 4.2, we have:

$$\bar{V}^U_g \uparrow \Rightarrow \bar{E}^U_g \downarrow \tag{61}$$

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Thus, when $\overline{E}_g^U$ is very high, the volume $\overline{V}_g^U$ that contains $\overline{E}_g^U$ will be very small. Universe's expansion means increase of $\overline{V}_g^U$ and decrease of $\overline{E}_g^U$ as well as increase of $\overline{E}_{em-g}^U$ according to the Eq. (60). From the Eq. (60) it is derived that for positive value of $\overline{E}_g^U$ the $\overline{E}_{em-g}^U$ value will be negative. Thus, the Universe evolution is a process reverse to that of the Universe creation, and during evolution the quantity $\overline{E}_g^U$ decreases tending to zero, while the quantity $\overline{E}_{em-g}^U$ increases tending also to zero.

According to the above-mentioned ideas, we notice that creation of Universe is a process of zero splitting into (*g*) and (*em*) energy. The evolution of Universe is a reverse process based on Universe's expansion. Thus the question is raised of why Universe expansion takes place.

As long as Universe is created from zero, it exists within 'non existing'. Therefore at the end of Universe relative time, with respect to 'non-existing', always appears having as result, according to space-time compatibility, as was mentioned in Sect. 10.1, a motion towards to 'the non-existing-dimensionless' which implies expansion.

According to the above mentioned, the evolution of Universe implying $\overline{V}_g^U \uparrow$ expresses the passage from $\overline{E}_g^U$ to energy $\overline{E}_{em-g}^U$; since energy is equivalent to time (Statement V of Chapt. 2), this passage-change expresses what we consider as Arrow of Time [12] (see also Sect. 6).

10.3 Universe Within 'Non-Existing'

In Sect. 10.2 has been mentioned that Universe expands towards the "non-existing". However it implies that the 'non- existing' surrounds the Universe. If this is the case the length of closed a line of the end surface of Universe should be zero, since space does not exist out of Universe. At first sight, this implies that Universe's diameter should be zero. This is not true.

However there are infinite paths of zero length connecting two points belonging to the ends of a Universe diameter since Universe can be regarded as a stochastic space-time formation where participates the "non-existing-dimensionless".

11. EMPIRICAL STATEMENTS

We define a statement compatible to the theory proposed having a possibility to be verified through an experimental way as 'Empirical Statement'. Thus a verification of an Empirical Statement will constitute a verification of the theory proposed and *vice-versa.*

We can assume that the charge energy $\overline{E}^{-U}_{em-g}$ (see Section 10) is the energy sum of all the positive-negative charges regardless of whether they are joined or not. When there is an approach and coincidence tendency between positive and negative charges, which might be proton-electron couples, there is a tendency for nullification and increase of $\overline{E}^{-U}_{em-g}$. Thus, the approach between electrons and protons has as a result the increase, according to 10.2, of $\overline{E}^{-U}_{em-g}$ and due to Eq. (60), the decrease of $\overline{E}^{-U}_{g}$. Consequently, we may assume that the following Empirical Statement is valid [22].

Empirical Statement I: During the approach of an electron with a proton there is absorption of gravitational energy.

Taking into account Conclusion IV (section 4.5) we may state the following Empirical Statement.

Empirical Statement II: Electric charges on a matter system create a gravitational field whose the acting force equals the electric field force on the system and *vice-versa.*

This empirical statement can be experimentally verified for the case for asymmetric capacitor system (see Chapt. 10, Sect. 3.3). However, the question is raised of how the gravitation operates between two bodies, *e.g.* stars. According to this Statement, we should expect the existence of electric fields creating the gravitation. Taking into account the structure of various bodies, at first sight we have neutral charge atoms or molecules where nuclei are in electrical equilibrium with the surrounding electrons. However, as

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Kopernicky has shown, the attraction force described by Coulomb's law is bigger than the repulsion force described by the same law [11]. On this basis Kopernicky and Hughes have shown that gravitation can be regarded as a result of electric interactions. This is in agreement with Empirical Statement II but differs from the spirit of this work, as has been noted in Sect. 4.5; gravitation is not a secondary manifestation of electric and magnetic phenomena. Gravitation is a force required to act per unit of mass so that mass is distributed according to a probability density, a fact which leads to Eqs. (33,34) of Chapt. 8. It is noted that Eqs. (34) of Chapt. 8 can lead to Coulomb's law (see Chapt 7, Sect. 3), while it implies a probability for both positive and negative charges to exist in the vicinity of any point $(\mathbf{r},t)$ of the hypothetical measuring field (HMF); it is noted that $P_{em}(\mathbf{r},t)$ can be either positive or negative (see Chapt 5, Sect. 2).

12. PHOTON EMISSION, CHEMICAL REACTIONS

When electron of Hydrogen atom moves towards a smaller radius we have photon emission. According to the spirit of this work, this can take place according to Empirical Statement I; *i.e.*, gravitational energy absorption takes place whose a part is converted into photon emission [22]. According to what has been accepted untill now, photon emission takes place due to potential dicreasing. However, decreasing potential means decreasing work production ability. Thus, according to this point of view we have work production (energy emission) because of dicreasing of work production ability. This does not define where the produced energy is coming from.

According to the spirit of the present work, the energy produced due to chemical reactions can be explained; a chemical reaction can be regarded as an approaching or distancing process of various protons and electrons.

13. KOZYREV'S WORK

13.1 Kozyrev's Radiation

According to Kozyrev 's observations, the stars on which no nuclear reaction takes place are radiant, and this radiation is proportional to the electrons density at the radiating area [22,23,24]. This shows a relation between the radiation and the said electron-proton couples. However, because of the

stability of the atoms structure there is no approach between electrons and protons. Thus, the star Kozyrev radiation can be interpreted as follows:

During the approaching of $e^- + P$ in the radiating star atoms, according to the Empirical Statement I, we have a gravitational energy absorption $\overline{\delta E_g}$ that is converted into radiation during their distancing. The gravitational space energy absorption is compatible, with the gravitational space energy reduction trend because of the Universe expansion (see section 10.2).

The approaching-distancing of $e^- + P$ takes place by means of unstable states while the electron energy eigenvalue remains constant due to the structural stability of the atoms in the radiating stars.

In a circle motion of a particle, *e.g.* electron, an outside momentum is always required so that its momentum is continuously changing; this could take place through gravitational energy absorption which would imply a momentum interaction. Since electron's energy remains constant the energy absorbed should be radiated. This is compatible to Kozyrev radiation. It is also compatible to electron's radiation as it has been described by C. Whitney [25].

13.2 The Notion of the Acting Force – Kozyrev's Principles

According to what was mentioned in section 4.5, photons are the media through which gravitation and electromagnetic force are created. When a force is acting on a body it implies that a (g) space photon is inserted in the system which results to (g) photon conversion into (em) photon incorporated in the body and to (em) photon convertion into (g) photon creating a gravitation force. On this basis a mechanical force acts on a body through a gravitational field creation which means that there is not a difference between gravitational and mechanical forces in general.

Since force is transmitted through photons we have that the energy and momentum changes of a body should obey the following:

$$\delta E = c\delta P \tag{62}$$

where

$$c = dx / dt = \delta x / \delta t \tag{63}$$

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where δx and δt are regarded as non determined intervals of space and time related to photons observation. In fact for a photon we have:

$$\delta t = dt \Big/ \sqrt{1-(v/c)^2} \tag{64}$$

For $dt \to 0, v \to c$ we have that δt is undetermined. Because of Eq. (63), δx is undetermined as well.

The δx and δt could be regarded as intervals of space and time which appear between cause and effect. At first sight, we could say that the cause-effect process is transmitted with the speed of light; δx could be regarded as the interval within which a force acts. Thus, we could write:

$$\overline{F} = \delta E / \delta x = \delta P / \delta t \tag{65}$$

Eq. (65) expresses the mean value of the acting force. Because (g) and (em) are different space-time interconnected by relativistic scale (see Chapt. 7, Sect. 2,3) the time δt observed in the (g) space is different from the time δt_{em} during which the real cause-effect process takes place. Thus, at first sight, we may assume that the cause-effect process is characterized by a velocity c_2 such that:

$$c_2 = \delta x / |\delta t_{em}| = a\,|\delta x_{em}| / |\delta t_{em}| = ac \tag{66}$$

Taking all this into account, we reach to the conclusion that this work at first sight is compatible with Kozyrev's principles [23,26]. However, it needs more analysis. Recall that Kozyrev's principles are the following:

1. Time possesses direction or course that distinguishes causes from effects."

2. Causes and effects are always separated by non zero space δx and time δt intervals (discreteness of space-time structure)."

3. The rate of transition from cause to effect in the elementary cause-effect link is described by the time motion $c_2 \approx 2200 km/\sec \approx ac$."

We may notice, according to Chapt. 8, Sects. 2.1,2.2, that energy change takes place abruptly, which implies a discreteness of real time. The past corresponds to a discrete energy value $\langle E_1 \rangle$ while the future correspond

to a different discrete energy value $\langle E_2 \rangle$; it is obvious that there is no sensible time when $\langle E \rangle = const.$ (see Sect. 6).

14. DIRAC TREATMENT

Eqs. (25-34) of Chapt. 8 derive on the basis of Schrödinger's relativistic equation; a special case of this equation is Dirac's free particle equation. One may notice that all consequences of this work could derive from the Dirac equation, since $P(\mathbf{r},t) = \Psi^{+}\Psi$ implies that $\int P(\mathbf{r},t)dr^3 = 1$. However according to Rowlands [27,28], Dirac's equation describes fermions, which need their surroundings so that the whole can be described. The study of the interaction between a fermion and its surroundings requires the existence of a potential acting at a distance. A Dirac equation with a potential term requires a treatment involving renormalization. As was mentioned in Sect. 1, this does not imply a statistical nature of what is described; it is just a mathematical manipulation.

Besides, Dirac's requirement for linear operator correlation cannot be regarded as theorem of logic Λ. According to theorem I, the arbitrary requirement means that Dirac's treatment creates additional contradictions; *i.e.*, it is not compatible with the claim for minimum contradictions (see Chapt. 3, Sect. 2.1).

15. MAXWELL'S EQUATIONS AND GRAVITATIONAL WAVES

Eqs. (25,26), Chapt. 8 imply that there are m_{0g}, m_{0em} which are constant in the infinitesimal vicinity of any $(\mathbf{r},t)$. A special case of this equation is that with m_{0g}, m_{0em} having constant values everywhere. An even more special case is that with m_{0g}, m_{0em} being equal to zero. In this case we have:

$$\nabla^2\Psi_g(\mathbf{r},t) - \frac{1}{c^2}\partial^2\Psi_g(\mathbf{r},t)\Big/\partial t^2 = 0 \tag{67}$$

$$\nabla^2\Psi^g_{em}(\mathbf{r},t) - \frac{1}{c^2}\partial^2\Psi^g_{em}(\mathbf{r},t)\Big/\partial t^2 = 0 \tag{68}$$

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Taking into account Eq(36) of Chapt. 4, we obtain:

$$\nabla^2 Sr_g(\mathbf{r},t) - \frac{1}{c^2}\partial^2 Sr_g(\mathbf{r},t)\Big/\partial t^2 = 0 \tag{69}$$

$$\nabla^2 Sr^g_{em}(\mathbf{r},t) - \frac{1}{c^2}\partial^2 Sr^g_{em}(\mathbf{r},t)\Big/\partial t^2 = 0 \tag{70}$$

where: $$Sr = [\lambda r x_1, \lambda r x_2, \lambda r x_3, \tau r] \tag{71}$$

where $\lambda r x_n$ is the complex relative length in a direction $\mathbf{n}$ and τr is the complex relative time. In Eqs. (69,70) Sr corresponds to real value magnitudes.

For small space-time curvature from the GRT we have [29]:

$$\nabla^2 h_{\beta\delta} - \frac{1}{c^2}\partial^2 h_{\beta\delta}\Big/\partial t^2 = 0 \tag{72}$$

where $h_{\beta\delta}$ is the tensor describing this space-time. From Maxwell equations in vacuum, we obtain [5,30]:

$$\nabla^2 \phi(r,t) - \frac{1}{c^2}\partial^2 \phi(\mathbf{r},t)\Big/\partial t^2 = 0 \tag{73}$$

From Eqs. (70,73) we can conclude that:

$$Sr^g_{em,j} \sim \phi \quad (j = 1,2,3,4) \tag{74}$$

where subscript j indicates a component of Sr^g_{em}; this relation implies that the potential ϕ expresses a relative space-time magnitude.

From Eqs. (69,72), we may assume that space-time relative magnitudes can be regarded as components of tensor $h_{\beta\delta}$, which describes by itself space-time deformation.

CONSEQUENCES OF MINIMUM CONTRADICTIONS PHYSICS

A more general form of Eq. (70), because of Eq. (26), Chapt. 8, Eq. (36), Chapt. 4, Eq. (32), Chapt. 7 is the following:

$$\nabla^2 Sr^g_{em,j}(\mathbf{r},t) - \frac{1}{c^2}\partial^2 Sr^g_{em,j}(\mathbf{r},t)\Big/\partial t^2 = -(m_{0em}c / i\alpha\hbar)^2 Sr^g_{em,j}(\mathbf{r},t) \qquad (75)$$

According to relation (74), taking into account that relative time is a referred energy (see Chapt. 2, Sects. 2,3,4), considering that $Sr^g_{em,j}(\mathbf{r},t)$ is real and taking into account Eqs. (44,45), Chapt. 5, we can write:

$$\tau r^g_{em}(\mathbf{r},t) = Sr^g_{em,4}(\mathbf{r},t) = dE / dE_0 = \frac{dE}{dV_0}\frac{dV_0}{dE_0} = \rho c^2 V_0 / E_0 = \rho c^3 / h \qquad (76)$$

On this basis Eq. (75), describes a differential equation for charge density ρ.

On the simplification that relation (74) is valid for the left part of Eq. (75) and that Eq. (76) is valid for the right part of the same equation we obtain:

$$\nabla^2 \phi(\mathbf{r},t) - \frac{1}{c^2}\partial^2 \phi(\mathbf{r},t)\Big/\partial t^2 = k\rho \qquad (77)$$

where k is a coefficient depended on m_{0em}. Eq(77) is compatible with plasma equation whose limit case is Poison's equation [30,31].

Taking all these into account we may notice the compatibility of the equations derived on the basis of the claim for minimum contradictions with what the experience has until now revealed.

16. CONCLUSIONS

An effort was made, all consequences described in this Chapter, to be derived on the basis of previous conclusions of this work based on the claim for minimum contradictions. This consequences are related to phenomena for which the most accepted now physics has not given a clear answer. In particular they are ralated to the interaction between the electromagnetic and the gravitational field which is of vital importance for modern technological problems to be understood and maybe solved.

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CHAPTER 10. ON THE POSSIBILITY OF TECHNOLOGICAL APPLICATIONS

1. GENERAL

A first explanation for the excess heat during the light water electrolysis was given by A. Frolov on the basis of the theory proposed by this work, and more specifically on the basis of a first form of Eq. (15) of Chapt. 8 [1]. Thus, we have a first indication for using this theory in technological problems.

Taking into account the Empirical Statement I (see Chapt. 9, Sect. 11) we can explain why excessive heat is generated during the electrolysis of light water under R. Mills patent [2], Kanarev's plasma electrolysis [3] and Cold Fusion [4]. These cases can be explained through an irreversible proton-electron approaching-distancing process, which we could name:

"Space-Time Energy Pump" [4].

Taking into account Empirical Statement II we may notice the following: In a symmetrical electric field there is a mutual retraction which leads to a zero absorption of energy or momentum. Inversely in an asymmetric system momentum absorption is expected, meaning the development of force and in addition the absorption of gravitational energy. The above mentioned have been confirmed partly through Biefeld –Brown type asymmetric capacitors [5-10] and more clearly through Frolov's asymmetric capacitors [11]. The answer might be given through an explicit 'Over Unity Effect' through:

"Propulsion of a Wavy Asymmetric Capacitor with Zero Potential Casing" [12].

It is noted that there are already flying objects known as lifters working on the basis of the Biefeld –Brown effect (for more details see Sect. 4).

2. The Space-Time Energy Pump

We denote by E the energy level of an electron, excluding its rest energy, at a radius r_E in the hydrogen atom and by E_{el} the kinetic energy that the electron acquires during the free fall from radius $r \to \infty$ to radius $r = r_E$. According to the Empirical Statement I we have absorption of gravitational

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energy δE_g during the $e^- + P$ approach. By definition, it is valid that $E = -E_{el}$; therefore, the transposition from a lower energy value E_{el2} to a higher energy value E_{el1} is equivalent to the transposition from the energy level $E_2 = -E_{el2}$ to the energy level $E_1 = -E_{el1}$. If E_1 and E_2 correspond to fundamental energy levels of the electron in the hydrogen atom, then, *as it is commonly known, photon emission takes place*. Applying the energy conservation principle, we have as a result the following equations:

$$E_{el0} + E_{el2} + \delta E_g \downarrow = E_{el0} + E_{el1} + h\nu \uparrow,$$
$$\delta E_g = E_{el1} - E_{el2} + h\nu = (E_2 - E_1) + (E_2 - E_1) = 2(E_{el1} - E_{el2}) \quad (1)$$

where E_{el0} is the total electron rest energy related both to mass and charge which charge is regarded as an imaginary mass. The energy δE_g is converted partly into photons, *i.e.*:

$$h\nu = E_{el1} - E_{el2} = \delta E_g / 2 \quad (2)$$

and partly to energy increase at level E_{el1}, *i.e.*:

$$E_{el1} = E_{el2} + \delta E_g / 2 = E_{el2} + E_{el1} - E_{el2} \quad (3)$$

Taking into account the above mentioned, we conclude that the electron when approaching the proton increases in charge until it is valid that:

$$Q_{\text{proton}} + Q_{\text{electron}} = 0 \quad (4)$$

Taking into account the Empirical Statement I of Chapt.9, Sect.11 and Eq. (4) we can reach to results compatible to the following reactions::

$$e^- + P \rightarrow n + \text{ neutrino -0.783 MeV} \quad (5a)$$

$$\alpha + e^- + P \rightarrow n \quad (5b)$$

which corresponds to charge disappearance, to neutron production, and to energy absorption. Reaction (5.a) has been proposed and theoretically explained, by introducing a particle α named etherino [reaction (5.b)], according to "Hadronic Mechanics" by R.M. Santilli [13]. According to the spirit of the present work, charge is regarded as electromagnetic imaginary mass; therefore it can be taken also into account for the energy balance of reaction (5) [3,4]. After the first fundamental energy level of an electron in the hydrogen atom, there is no permitted state other than the one corresponding to the elimination of the couple $e^- + P$ and to the generation of a neutron and neutrino. *Thus, any other state can be regarded as unstable*.

When reaching an unstable state E_2 lower than the fundamental E_1 in order that gravitational space absorption and photon emission are possible, the conditions of the Eqs. (1) must be fulfilled. Consequently, it is valid that: $E_1 - E_2 = h\nu$.

Let us assume that a negative potential is imposed on the hydrogen atom so no other permitted level interferes between the level $E_1 = -13.6\text{eV}$ and the level $E_\infty = 0$; consequently any energy rejection should take place by photons of energy $-E_1$. Thus, it will be valid that:

$$E_1 - E_2 = -E_1 \quad \text{and} \quad E_2 = 2E_1 \tag{6}$$

Equation (6) can be extended to energy levels so that:

$$E_{k+1} = (k+1)E_1 \tag{7}$$

In fact Eq. (7) derives from

$$E_1 - E_{k+1} = -kE_1 \tag{8}$$

which states that there is an integer multiple of $-E_1$ which can be rejected in the form of quanta of energy $-E_1$. When electron reaches the state E_{k+1}, a gravitational energy absorption takes place according to Eq. (1) such that:

$$\delta E_{g\ k+1} = 2(E_1 - E_{k+1}) \tag{9}$$

Eqs. (6,9) imply:

$$\delta E_{g\ k+1} = k \times 27.2\text{eV} \tag{10}$$

On the basis of the aforementioned analysis, we can compose a space-time energy pump which can convert the surrounding's space-time energy into useful energy, by means of a system that displaces the electron of the E_1 fundamental level of the hydrogen atom to an unstable energy level E_{k+1} and returns it to the state E_1. In such a system gravitational space energy absorption $\delta E_{g\ k+1}$ will take place and its conversion into photons (useful energy) with simultaneous return of the electron to the stable state E_1.

The possibility for such photon emission is reinforced by the Kozyrev observations related to the interaction of matter with its surrounding space (see Chapt. 9, Sect. 13.1) [14,15,16,17]. On this basis, a light water electrolysis system proposed by Mills can be explained. According to Mills, it is possible to have fundamental energy states with fractional quantum number. Eq. (10) is similar to Mills' equation for energy production during the conversion of hydrogen's atom into a stable, according to Mills, state that he named 'hydrino' [1]. It is noted that 'hydrinos' have not been detected.

In general we could have a space-time energy pump through an irreversible $e^- + P$ distance approach process. On this basis Kanarev's plasma electrolysis could be explained. Kanarev showed that the process of light water electrolysis by itself constitutes an over-unity effect; *i.e.*, there is positive energy balance during the process:

1. water dissociation
2. hydrogen and oxygen molecules formation
3. hydrogen and oxygen reaction for water formation

On this basis, Kanarev invented a device that, according to his claims, can create a clear over-unity effect [2].

During the heavy water electrolysis, heavy hydrogen is formed on the cathode and oxygen on the anode. When palladium is used as a cathode, the heavy hydrogen is absorbed inside the palladium. Because of the negative cathode potential, the heavy hydrogen electron is on the first level, and a force is exerted on it, pushing it towards the nucleus. Thus, a distance approach

between $e^- + P$ will take place by means of unstable states, in the same way as it has already been mentioned. In this way, a space-time energy pump is formed, having as a result the gravitational space-time energy absorption and the production of photons that heat the whole electrolytic system.

The aforementioned concern an excess heat generated without any reaction. However, during the cold fusion phenomena, there is detection of nuclear reaction products. It is noted that during cold fusion phenomena the excess heat produced does not correspond to the energy produced due to nuclear reactions. Therefore we may assume that both phenomena take place: *i.e.*, excess energy phenomena without nuclear reactions and phenomena due to nuclear reactions themselves.

The limit case of Empirical Statement I are the following reactions [3,4,17]:

$$e^- + P \rightarrow n + \text{ neutrino} - 0.783 \text{ MeV} \tag{11}$$

$$e^- + D \rightarrow 2n + \text{ neutrino} - 0.783 \text{ MeV} \tag{12}$$

The energy of 0.783 MeV, according to Conte, approved by Mizuno's explanation [13], is covered by the electron capability to have – according to quantum mechanics – a presence probability under high energy, as well as by the developing of an excess potential in very small distances between electron and proton. However, the energy of 0.783 MeV is difficult to handle by means of low voltages. Thus, it is expected that the reactions (11,12) are significantly facilitated by the gravitational space-time energy absorption during the approach between $e^- + P$, which is not rejected, but it is used for the creation of the next stable state ($n+$ neutrino). As was mentioned, this too is compatible with Santilli's theory. [13]

3. PROPULSION OF A WAVY ASYMMETRIC CAPACITOR WITH ZERO POTENTIAL CASING

3.1 General

Inside a dielectric medium 1 (Fig. 1) metallic conductors 3 are placed, and electrically charged in relation to the metallic casing 2, which is electrically neutral [18]. This is achieved by means of high voltage imposed be-

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tween the conductors 3 and the metallic casing 2. We assume that the electrostatic field equation is everywhere valid, and is concerning isotropic materials with constant specific inductive capacity (dielectric constant). Thus, we have:

$$\nabla \cdot \mathbf{E} = -\nabla^2 \phi = \rho / \varepsilon \tag{13}$$

where $\mathbf{E}$ is the field intensity, ϕ the potential and ρ the density of spatial charge. Eq. (13) is a limit case of Eq. (77) from Chapt. 9, which constitutes a simplification of Eq. (75) from Chapt. 9. Therefore Eq. (13) can be regarded as compatible, under certain simplifications, with this work.

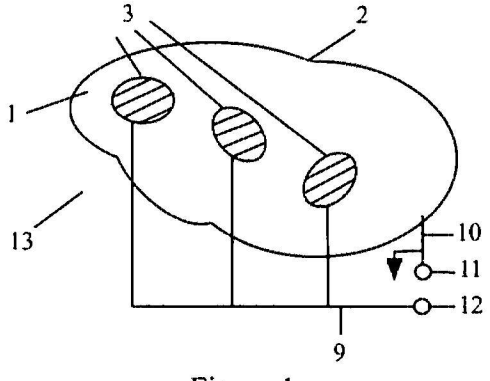

Figure 1.

The force $\mathbf{F}$ according to Eq. (13) for an area enclosed by a surface S is [19]:

$$\mathbf{F} = \frac{1}{2} \oiint_S [\mathbf{E}(\hat{\mathbf{n}} \cdot \mathbf{D}) + \mathbf{D}(\hat{\mathbf{n}} \cdot \mathbf{E}) - \hat{\mathbf{n}}(\mathbf{D} \cdot \mathbf{E})] dS \tag{14}$$

where $\mathbf{D}$ is the electric displacement and $\hat{\mathbf{n}}$ the orthogonal unit vector on the surface S directed outside the area enclosed by the surface S. Consequently, the resultant force $\mathbf{F}_{tot}$ on the whole system, according to Eq. (14) will be:

$$\mathbf{F}_{tot} = \frac{1}{2} \oiint_{out2} (D\mathbf{E}) dS = \frac{1}{2} \oiint_{out2} (dq / ds) \mathbf{E} dS = 0 \tag{15}$$

where dS is an elementary surface unit and dq the surface charge corresponding to the surface dS. The force F_{tot} is equal to zero because the field

intensity E on the outer surface of the casing 2 is equal to zero. From Eq. (13) it is derived that:

$$\frac{d\varepsilon E}{dx_n} = \rho, \quad d\varepsilon E = \rho dx_n = dq_n, \quad \varepsilon E_2 - \varepsilon E_1 = q_n \tag{16}$$

wherein q_n is the charge per surface unit (in a specific area) enclosed by two adjacent equipotential surfaces whose orthogonal distance at various points is very small but not equal to zero and which correspond to field intensities E_1, E_2. Concerning the forces df_n, f_n exerted on the charges dq_n, q_n, it will be:

$$\begin{aligned} df_n &= Edq_n = E\rho dx_n = E\frac{d\varepsilon E}{dx_n}dx_n = \frac{1}{2}d\varepsilon E^2, \\ f_n &= \frac{1}{2}(\varepsilon E_2^2 - \varepsilon E_1^2) = \frac{1}{2}\varepsilon(E_2 - E_1)(E_2 + E_1) = \frac{1}{2}q_n(E_1 + E_2) \end{aligned} \tag{17}$$

If $-q'$ are the inductive charges on various areas (per surface unit) being developed on the end of the dielectric means 1 due to the charges q existing on the metallic surfaces 2in, 3out (where the indicator "in" corresponds to an inner surface and the indicator "out" to an outer surface), then the charges $q, -q'$ will be distributed between field intensity limits E_1, E_2 (metal) and E_1', E_2' (dielectric means 1) in such a way that [20]:

$$E_1 = 0, \quad E_2 = E_0, \quad E_1' = E_0, \quad E_2' = E \tag{18}$$

wherein E_0 is the field intensity in the gap between the surfaces 2 in, 3 out and the dielectric medium 1. E_0, E, are correlated by the equations:

$$q - q' = q / \varepsilon_r \quad \text{and} \quad E_0 / E = \varepsilon_r, \tag{19}$$

wherein ε_r is the relative dielectric constant of the dielectric medium 1 [21]. Due to the Eqs. (17,18,19), the total resulting force per surface unit that is exerted on the charges $q, -q'$ will be the following:

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$$F_{q,-q'} = \frac{1}{2}(E_1 + E_2)q - \frac{1}{2}(E_1' + E_2')q' = \frac{1}{2}E_0 q - \frac{1}{2}(E_0 + E)q'$$
$$= \frac{1}{2}Eq\left[\frac{E_0}{E} - \left(\frac{E_0}{E} + 1\right)\left(1 - \frac{1}{\varepsilon_r}\right)\right] = \frac{1}{2}Eq\left[\varepsilon_r - (\varepsilon_r + 1)\left(1 - \frac{1}{\varepsilon_r}\right)\right] = \frac{1}{2}\frac{Eq}{\varepsilon_r} \quad (20)$$

Due to the Eq. (20), the total resulting force $d\mathbf{F}$, exerted on the charges $dq, -dq'$ corresponding to a surface element on the surfaces 2 in or 3 out, will be:

$$d\mathbf{F} = \frac{1}{2\varepsilon_r}\mathbf{E}dq = \frac{1}{2\varepsilon_r}\mathbf{E}\frac{dq}{ds}ds \quad (21)$$

Consequently:

$$\mathbf{F}_{tot} = \frac{1}{2\varepsilon_r}\oiint_{2in,3out}(dq/ds)\mathbf{E}ds = \mathbf{F}_M/\varepsilon_r\,, \quad (22)$$

wherein $\mathbf{F}_M$ is the total resultant force exerted on the conductors 2, 3, being derived if we assume that Eq. (14) is in force. According to Eq(15), $\mathbf{F}_{tot}$ should be equal to zero. However, when the total resultant force $\mathbf{F}_M$ exerted on the metallic elements 2,3 is not equal to zero, then, according to Eq. (22), $\mathbf{F}_{tot}$ will also not be equal to zero. The aspect that, according to Eq. (15), $\mathbf{F}_{tot}$ is zero, is compatible to the fact that the work of $\mathbf{F}_{tot}$ must be equal to zero when the externally offered energy is equal to zero (constant voltage and absence of leakages). However, Eq. (15) does not take into consideration the exact forces which are exerted on the sum of the charges $dq, -dq'$, as it has already been mentioned at Eqs. (16-22). Eq. (22) takes into account the forces and the particularities of the boundary conditions between the surfaces 2 in, 3 out and the dielectric means 1. Thus, the question is raised of whether the classical approach, where $\mathbf{F}_{tot}$ is zero, or Eq. (22), where $\mathbf{F}_{tot}$ can be non-zero, is valid.

According to what has been mentioned, Eq. (13) does not describe precisely what is happening in reality. Eq. (22) is more consistent, since it takes into account the existing real charges. Besides, the electric field acts

with intensity E on charges $dq, -dq'$ and because of Eq. (19) it acts on the equivalent charge dq / ε_r. From this derives an equation like Eq. (22) without having the coefficient 1/2, which is due to $dq, -dq'$ distribution. Thus, we have a strong indication that Eq(22), could be used as a first approximation.

3.2 Specific Arrangement [12]

The specific arrangement proposed is depicted in Fig.2. The elements 3 (3.1 and 3.2) and elements 2 (2.1 and 2.2) are formed by metal vapor deposition on the strong insulation solid dielectrics 1a and 1b, excluding the surfaces 8, in which the elements 1a and 1b are formed by casting plastic material, *e.g.* polyethylene. The surfaces 8 may be covered, during the metal deposition process, by silicon that is removed at the end of this process. The metal deposited can be the substratum for further metal deposition *e.g.* through electroplating. The Sections 1.a and 1.b are joined along the surface 8 by insulation adhesive forming plates of dimensions, *e.g.* 10 mm X 300 mm X 300 mm. In the case of metal deposition on dielectric, the developed cohesion is high enough to exclude the creation of gaps, which could be the cause of voltage breakdown; voltage breakdown is also avoided due to the curvature of all parts of elements 3 and 2. The metal elements 3 and 2 are connected to the ends 11 and 12 through which the high voltage is imposed.

We use the method of finite elements, for Eq. (13) solution related to the electric field of the arrangement of Fig. 2 with the following boundary conditions [19]:

1. The voltage on the elements 3 is 20.000 V
2. The voltage of the casing 2 is equal to zero.
3. The relative dielectric constant is $\varepsilon_r = 1$.
4. The teeth height of the elements 3 is 2 mm
5. The minimum distance between the elements 3 and 2.1 is 1 mm
6. The minimum distance between the elements 3 and 2.2 is 1.5 mm
7. The distance between two consecutive corresponding points of the teeth of elements 3 is 2 mm
8. The curvature radius of the lower parts of the elements 3 is 0.5 mm,

On this basis, a resultant upward thrust $\mathbf{F}_{tot} = 4.17 \mathrm{gr}^*/\mathrm{cm}^2$ is found. For various dielectric constants the force $\mathbf{F}_{tot}$ appears to be the same. In the

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case that $\varepsilon_r = 2.3$ the dielectric medium 1 may be polyethylene (PE). The maximum developed intensity is 230 kV/cm and lies under the limit at which the corona phenomena for the PE start. In this context, we observe that in order to have a high force $\mathbf{F}_{tot}$, it is significant that, the dielectric means 1 is a strong insulator, independently of its dielectric constant. Indeed, it is then possible for the same minimum distance between the elements 3 and 2.1 to appear higher allowable imposed voltage and consequently capability for higher thrust.

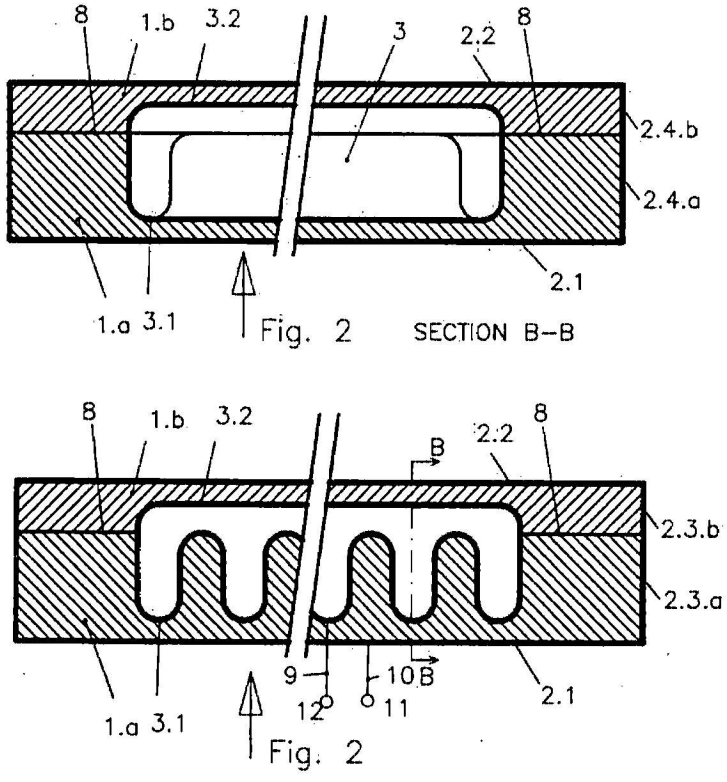

Figure 2. Zero potential casing asymmetric capacitor system, specific arrangement.

A simple and easily understandable asymmetrical capacitor is the one Frolov designed [11,22], depicted in Fig. 3. According to this Figure, the forces exerted on the central metallic plate are eliminated, while the remaining

forces are achieving an upward thrust. It is noted that Frolov's asymmetric capacitors have been experimentally verified. On the basis of these capacitors we can explain why arrangement of Fig. 2 works. Wavy element 3.1 can be approached by both horizontal and perpendicular direct lines. The horizontal lines form, with surface 2.1, flat capacitors of zero propulsion. The perpendicular lines form, with the surface 2.1, Frolov-like capacitors, which, according to what was mentioned, can produce propulsion. It is noted that the patent described in [10] (NASA-Campbell J.) works due to the fact that, beyond its particular geometry, the asymmetrical capacitors formed include perpendicular armature surfaces.

Frolov's capacitors are of open-type; *i.e.*, they exist within an electric field that is extended to the infinity.

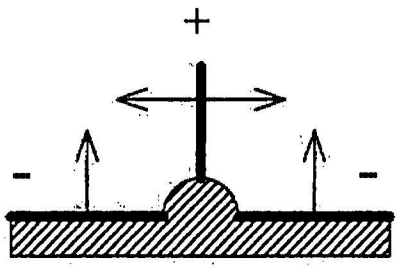

Figure 3. Frolov's asymmetrical capacitor.

The proposed asymmetrical capacitor system is restricted by an electrically neutral casing, which implies that the electrical field created is also restricted within this casing. Thus, if the system works, it does mean that it is not due to an electrostatic phenomenon. According to Empirical Statement II, the system can be regarded as a gravi-electric. The feature of metal deposition on wave formed strong insulation solid dielectric as indicated in Fig. 2 provide, for reasons mentioned above, a high thrust and a safe operation; this implies the existence of great measurable magnitudes which might assure an over-unity operation. Because of the fact that the elements 2.1 and 2.2 of Fig. 2 are metallic and electrically neutral, there exists the possibility of multiplication of the resultant thrust force by means of two or more systems proposed by consecutively placing the next one on the former one, as depicted in Fig. 4 where the purpose is the energy production.

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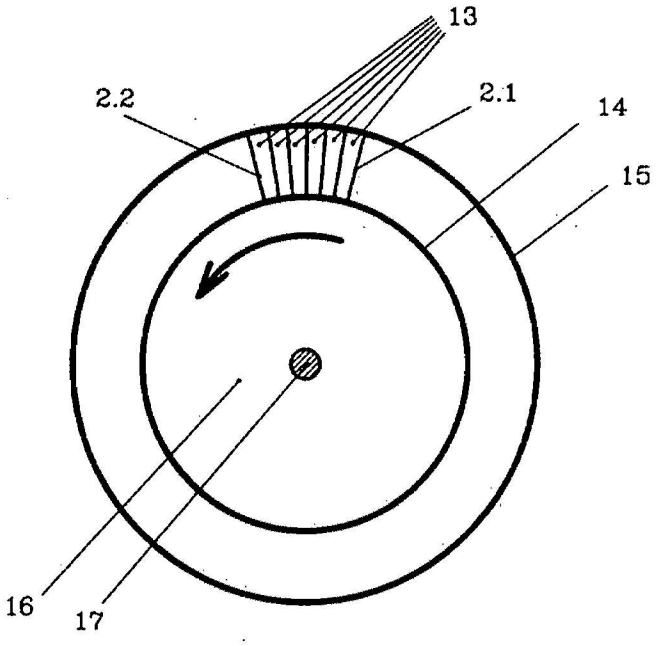

Figure 4. Zero potential casing asymmetric capacitor system

In the case of energy production device, the question is raised of where the energy produced comes from. On the basis of Empirical Statement II, gravitation is created due to asymmetric electric field. According to Chapt. 9, Sect. 4.5, the work of a gravitational force on a body is due to the body's (g) photons absorption from the surrounding space-time, to (*g*) photons conversion into (*em*) ones and to (*em*) photons conversion into (*g*) photons which create the gravitational field. As long as this process is non-reversible, radiation is expected so that the energy balance is kept [18].

It is noted that radiation of asymmetric capacitors in general has been detected during their operation at the VHF range [23].

3.3 Experimental Data

We use the method of finite elements for the arrangement of Fig. 1 with the following boundary conditions [19]:

1. The plates formed by the sections 1.a, 1.b are of 5mm x 150mm x 190mm;

2. The voltage on the elements 3 is 4.000 V;

3. The voltage of the casing 2 is equal to zero;
4. The specific inductive capacity of the dielectric means 1 is $\varepsilon_r = 2.3$;
5. The teeth height of the elements 3 is 4 mm;
6. The minimum distance between the elements 3 and 2.1 is 1,2 mm;
7. The minimum distance between the elements 3 and 2.2 is 1,5 mm;
8. The distance between two consecutive corresponding points of the teeth of elements 3 is 4 mm.

The curvature radius of the lower parts of the elements 3 is 1 mm, On this basis, a resultant upward thrust $\mathbf{F}_{tot} = 10.56 gr^*$ is found.

By imposing voltage of 4.000V in the arrangement described, we notice a non-reproducible phenomenon; *i.e.*, only sometimes do we observe the development of a force that is not always the same. The maximum of force-weight loss observed was of the order of $10 gr^*$ while the force remained after disconnecting the voltage. Similar results - possibly reproducible but weak - have been reported in A. Frolov's web site [24]. It is noted that in all cases the weight measured was influenced by the action of the high voltage wires, thus reducing the credibility of measurements.

However two times it has been observed that the force remained after disconnecting the energy supply wires while it was eliminated after discharging the system. Without any external influence the existence of an upward thrust has been observed on the charged asymmetric capacitor system described. These cases can be regarded as credible since there was not wires' influence. Due to the absence of any energy supply we may assume that this phenomenon corresponds to an over unity propulsion.

From these we conclude that there is a clear interconnection between the gravitation and the electric field. The irreproducibility mentioned needs more analysis and perhaps is due to dielectric behavior. It is noted that according to what was mentioned in Sect. 3.1 the dielectric is regarded as completely polarized (charges only at the end of surfaces). Polarized polyethylene for power cables has been studied in fields of strength $10 \div 40 MV/m$ [25], which means that in the case under study, for this strength order, the voltage imposed should be $20 \div 80 kV$. This of course, requires a specific care.

It is noted that during the connected cables operation the current intensity were so small that the ratio f = (Force – Weight loss) / (Energy Con-

sumption) was extremely big (...>1000 N/kw). For the case of a common propulsion *e.g.* for a jet this ratio is of the order of 4 N/kw [30].

Taking into account the above mentioned we conclude that there is a strong indication that we can have a considerable amount of propulsion through the asymmetric propulsion described. However this needs replication by other laboratories and further research.

The project of this asymmetric capacitor system was developed mainly in the Renewable Forms of Energy and High Voltage Labs of the Technological Institute of Larissa.

4. BIEFELD –BROWN EFFECT

Biefeld –Brown effect relates to a capacitor thrust that is acting towards the positive pole. This phenomenon has been interpreted on the basis of the concept of ionic wind; however nobody knows what this ionic wind is [23]. The intensity of this effect increases considerably in asymmetrical systems.

According to this work the force developed is interpreted on the basis of Empirical Statement II.

There are asymmetrical capacitors named 'lifters' creating considerable force (of the order of 1,5N) but with low ratio f (of the order of 4N / kW); note that lifters can fly [31].

Frolov's asymmetrical capacitors (see Sect. 3.2) create very low thrust (of the order of 0,1gr*) but they possibly work even with disconnected energy supply cable [24].

None of these capacitors is isolated from its environment; therefore we cannot pretend that these phenomena observed are gravi-electric.

The wavy capacitor described as specific arrangement in Sect. 3.2 has zero potential casing. Thus, if it works (*i.e.* if it will be generally accepted that it works), then it relates to a gravi-electric phenomenon; obviously, further research is needed for this.

4. CONCLUSIONS

On the basis of the above mentioned, we may conclude that there is strong evidence for over- unity effects operation. It is noted that this is compatible to the spirit of a physics of minimum contradictions everything since the basic explanation statements used are the Empirical Statements I and II,

while the basic equation used, *i.e.* Eq. (13), is a limit case of Eq. (77) of Chapt. 9, which derives under certain simplifications from Eq. (75) of Chapt. 9, which is in turn a limit case of the minimum contradictions equation Eq. (26) of Chapt. 8.

Notice:

1. Even though there are strong indications for over unity effects to exist, which might lead to the solution of energy problems, there is not any considerable official support [26-29]. This is mainly due to the fact that we can not accept that energy can derive from zero, since the common belief about space-time is that it by itself does not have any energy which could be used for energy production. Thus, the common belief is stronger than the already existing experimental results. Therefore we may notice that a philosophical approach could better affect the common belief and the official attitude related to the energy problem. Besides, there are similarities between the explanations deriving either from the present work or other theories evolved from different standpoints, thus reinforcing each other [29,30].
2. The technological applications mentioned are close to this work. However, there probably exist more effective over-unity arrangements [31,32,33,34] that might be compatible to this work, since the surrounding space–time is regarded as matter-ether.

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CHAPTER 11.
INITIAL CONDITIONS, EVOLUTION, INDETERMINISM

1. GENERAL

According to this work, 'Everything' cannot be precisely described. The only we can do is to approach a Minimum Contradiction Everything. However someone may notice the following:

Both (*g*) and (*em*) space-time are described by complex space-time wave functions. The real component of such a function corresponds to an ideal (*g*) space-time while the imaginary component corresponds to an ideal (*em*) one. Thus, both (*g*) and (*em*) space-time can be regarded as result of a gravielectric oscillation. Maybe we reach to statistical interpretation of (*g*) and (*em*) space-time because of missing elements; (*g*) space-time can not exist without (*em*) and vice-versa. The question is raised of whether a multi-dimensional space, including (*em*) or further measuring dimensions, can be determined when initial conditions are given. It is noted that a measuring dimension implies the existence of anterior and posterior, which according to Statement I together with logic Λ lead to contradiction (see Chapt. 1, Sect. 1 and Sect 2.3). Thus the most consistent attitude is, through the claim for minimum contradictions, to consider space-time as stochastic. However another question is raised of whether a statistically interpreted system can be completely determined. If we were to find the truth *i.e.* to determine reality, this truth should be able to be said through a language, which in turn requires 'anterior-posterior' and leads to contradiction. As was mentioned in Chapt. 3, Sect. 1, the claim for minimum contradictions includes the arbitrariness from breaking the silence. Therefore through this claim we cannot determine everything. It is impossible to have a finally true statement *i.e.* the one that states precisely the determination of a stochastic system since this statement should be stated in anterior-posterior terms. Therefore decision's source can been regarded as being out of space-time 'where' there is not anterior-posterior. We may notice that when we refer to ourselves in the past, we don't mean that it was another self who has been changed; *i.e.* we have the experience of something out of space and time that we consider as source of our decisions.

It is expected, that we can reach to similar results through Eqs. (25-32) of Chapt. 8 and their boundary conditions; *i.e.*, it is expected that the system

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described by these equations cannot be determined through ordinary boundary conditions. Because of the statistical interpretation of Ψ wave function the boundary conditions have meaning only on the basis of Eqs. (29-32) of Chapt. 8. Thus the question is raised of whether such boundary conditions are adequate to determine the system described by the equations mentioned. A first approach to the problem can show that ordinary boundary conditions, *e.g.* of Cauchy type [1], are inadequate to determine the system.

2. INITIAL CONDITIONS

The Cauchy type initial conditions are adequate to solve a problem on condition that there is a linear dependence on time; the problem under study includes second derivatives of time which implies boundary conditions [1]. These boundary conditions can be regarded in general as conditions of communication of the system under study with its surroundings. Such conditions are described by Eqs. (27,28) of Chapt. 8; *i.e.* conditions of communication between the (*g*) and the (*em*) coexisting space-time particle fields. As it has been noticed in Chapt. 8, Sect. 1, the coexisting particle (*g*) and (*em*) fields are regarded as extended to the infinity; this is satisfied because of Eqs. (29-32) of Chapt. 8, which imply that the local Ψ wave function is self normalized. As it will be shown below we make use of Eqs. (27,28) of Chapt. 8 and of the property that Ψ is self-normalized; this implies the existence of a probability density function $P(\mathbf{r},t)$ whose integral is unity. *On this basis the system under study should be self-determined, according to Cauchy treatment, when the initial conditions are given.*

Because of Eqs. (25,26) of Chapt. 8, for a particle field with given rest energy we have:

$$\hbar^2 \partial^2 \Psi / \partial t^2 - \hbar^2 c^2 \nabla^2 \Psi + m_0{}^2 c^4 \Psi = 0 \tag{1}$$

A special solution of this is:

$$\Psi = e^{i(\mathbf{P}\cdot\mathbf{r}-Et)/h} \tag{2}$$

and in general:

$$\Psi = \sum_i P(E_i) \Psi_{Ei} \tag{3}$$

where $P(E_i)$ is the probability of state E_i to exist. We have $P(E_i)=1$ when $E_i=\langle E\rangle$, $\mathbf{P}_i=\langle \mathbf{P}\rangle$. Thus in general we have:

$$\Psi = e^{i(\langle \boldsymbol{P}\rangle\cdot\mathbf{r}-\langle E\rangle t)/\hbar} \tag{4}$$

$$P(\mathbf{r},t)=(i\hbar/2m_0c^2)\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \quad , \quad \int P(\mathbf{r},t)dr^3=1 \tag{5}$$

$$i\,\hbar\partial\Psi/\partial t=\langle E\rangle\Psi \tag{6}$$

$$-i\,\hbar\partial\Psi/\partial x_n=\langle \boldsymbol{P}_n\rangle\Psi \tag{7}$$

Eqs. (4,6,7) are in agreement with what was mentioned in Chapt. 5, Sect. 4, and in Chapt. 8, Sect. 2.1 and implies that

$$\partial_t\langle E\rangle=0 \tag{8}$$

Since Ψ is complex we can write:

$$\Psi=\Psi_R+i\Psi_I \quad , \quad \Psi^*=\Psi_R-i\Psi_I \tag{9}$$

where $\Psi_R, i\Psi_I$ are the real and imaginary parts of Ψ.

On the basis of the methodology applied for numerical analysis (finite differences) [2] and taking into account that real or imaginary parts should be correlated only with real or the imaginary parts respectively, Eq. (6) can be written as follows:

$$\Psi_R(x_i^j,t^{j+1})-\Psi_R(x_i^j,t^j)=\frac{1}{\hbar}\langle E\rangle\Psi_I(x_i^j,t^j)\delta t+f_1 \qquad (i=1,2,3) \tag{10}$$

$$\Psi_I(x_i^j,t^{j+1})-\Psi_I(x_i^j,t^j)=\frac{1}{\hbar}\langle E\rangle\Psi_R(x_i^j,t^j)\delta t+f_2 \tag{11}$$

where f_1, f_2 are higher order infinitesimal quantities which can be ignored, x_i indicates a dimension of space *i.e.* x_1, x_2, x_3, superscript j indicates the

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status at a given dimension, δt a very small but non zero interval of time and where:

$$\Psi(x_i^j, t^j) = \Psi(x_1^j, x_2^j, x_3^j, t^j) \tag{12}$$

$$\Psi(x_i^j, t^{j\pm1}) = \Psi(x_1^j, x_2^j, x_3^j, t^{j\pm1}) \tag{13}$$

$$\Psi(x_i^{j\pm1}, t^j) = [\Psi(x_1^{j\pm1}, x_2^j, x_3^j, t^j), \Psi(x_1^j, x_2^{j\pm1}, x_3^j, t^j), \Psi(x_1^j, x_2^j, x_3^{j\pm1}, t^j)] \tag{14}$$

On this basis we have also the following:

$$\Psi_R(x_i^j, t^j) - \Psi_R(x_i^j, t^{j-1}) = \frac{1}{\hbar}\langle E\rangle \Psi_I(x_i^j, t^{j-1})\delta t \tag{15}$$

$$\Psi_I(x_i^j, t^j) - \Psi_I(x_i^j, t^{j-1}) = \frac{1}{\hbar}\langle E\rangle \Psi_R(x_i^j, t^{j-1})\delta t \tag{16}$$

$$\Psi_R(x_i^j, t^{j+1}) - 2\Psi_R(x_i^j, t^j) + \Psi_R(x_i^j, t^{j-1}) = \frac{1}{\hbar^2}\langle E\rangle^2 \Psi_R(x_i^j, t^{j-1})\delta t^2 \tag{17}$$

For the same reason we have:

$$\Psi_I(x_i^j, t^{j+1}) - 2\Psi_I(x_i^j, t^j) + \Psi_I(x_i^j, t^{j-1}) = \frac{1}{\hbar^2}\langle E\rangle^2 \Psi_I(x_i^j, t^{j-1})\delta t^2 \tag{18}$$

Working in the same way for momentum, because of Eq. (7) we obtain:

$$\Psi_R(x_i^{j+1}, t^j) - 2\Psi_R(x_i^j, t^j) + \Psi_R(x_i^{j-1}, t^j) = \frac{1}{\hbar^2}\langle P_{xi}\rangle^2 \Psi_R(x_i^{j-1}, t^j)\delta x^2 \tag{19}$$

$$\Psi_I(x_i^{j+1}, t^j) - 2\Psi_I(x_i^j, t^j) + \Psi_I(x_i^{j-1}, t^j) = \frac{1}{\hbar^2}\langle P_{xi}\rangle^2 \Psi_I(x_i^{j-1}, t^j)\delta x^2 \tag{20}$$

where δx is a very small but non zero interval, at any direction, of space.

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Eq. (25) of Chapt. 8 includes second derivatives with respect to space and time; therefore on the basis of Eqs. (17,18,19,20), this equation regarding to Ψ_R has the form:

$$F_R[\Psi_R(x_i^j,t^j),\Psi_R(x_i^{j-1},t^j),\Psi_R(x_i^j,t^{j-1}),\langle E\rangle,\langle P_{x1}\rangle,\langle P_{x2}\rangle,\langle P_{x3}\rangle]=0 \quad (21)$$

For the same reason regarding Ψ_I we have:

$$F_I[\Psi_I(x_i^j,t^j),\Psi_I(x_i^{j-1},t^j),\Psi_I(x_i^j,t^{j-1}),\langle E\rangle,\langle P_{x1}\rangle,\langle P_{x2}\rangle,\langle P_{x3}\rangle]=0 \quad (22)$$

Taking into account the above mentioned and Eqs. (29,30) of Chapt. 8, we obtain:

$$\overline{tr}(x_i^j,t^j)=F_{tr}[\Psi_R(x_i^j,t^j),\Psi_I(x_i^j,t^j),\Psi_R(x_i^{j-1},t^j),\Psi_I(x_i^j,t^{j-1}),\langle E\rangle,\langle P_x\rangle,\langle P_y\rangle,\langle P_z\rangle] \quad (23)$$

$$\overline{lr}_{x1}(x_i^j,t^j)=F_{lrx1}[\Psi_R(x_i^j,t^j),\Psi_I(x_i^j,t^j),\Psi_R(x_i^{j-1},t^j),\Psi_I(x_i^j,t^{j-1}),\langle E\rangle,\langle P_x\rangle,\langle P_y\rangle,\langle P_z\rangle] \quad (24)$$

$$\overline{lr}_{x2}(x_i^j,t^j)=F_{lrx2}[\Psi_R(x_i^j,t^j),\Psi_I(x_i^j,t^j),\Psi_R(x_i^{j-1},t^j),\Psi_I(x_i^j,t^{j-1}),\langle E\rangle,\langle P_x\rangle,\langle P_y\rangle,\langle P_z\rangle] \quad (25)$$

$$\overline{lr}_{x3}(x_i^j,t^j)=F_{lrx3}[\Psi_R(x_i^j,t^j),\Psi_I(x_i^j,t^j),\Psi_R(x_i^{j-1},t^j),\Psi_I(x_i^j,t^{j-1}),\langle E\rangle,\langle P_x\rangle,\langle P_y\rangle,\langle P_z\rangle] \quad (26)$$

Because of Eq. (2) of Chapt. 4 and Eq. (1) of Chapt. 6, Eq. (29) of Chapt. 8 can be written as follows:

$$\overline{tr}(\mathbf{r},t)=\frac{ic}{2h}\frac{\partial_t\Psi}{\sqrt{\Psi\Box\Psi}}\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right)=\frac{c\langle E\rangle}{h}P(\mathbf{r},t) \quad (27)$$

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Thus because of Eq. (5) we obtain:

$$\frac{h}{c}\int \overline{tr}(\mathbf{r},t)dr^3 = \int \langle E \rangle P(\mathbf{r},t)dr^3 = \langle E \rangle \tag{28}$$

Working in the same way and taking into account Eqs. (25,44) of Chapt. 5 we have:

$$\begin{aligned} &\frac{1}{c}\int \overline{lr_{xi}}(\mathbf{r},t)dr^3 \\ &= \int \langle LR_{xi} \rangle P(\mathbf{r},t)dr^3 = \langle LR_{xi} \rangle = \sqrt{1 - c^2 \langle P_{xi} \rangle^2 / \langle E \rangle^2}\, \frac{h}{m_0 c^2} \end{aligned} \tag{29}$$

where $i = 1,2,3$. In a stochastic space-time Eqs. (23,24,25,26) express the only real measurable geometrical magnitudes.

If we were to apply Cauchy-like initial conditions for stochastic space-time we should know at a given time the quantities $\overline{tr}(x_i^j, t^j)$, $\overline{lr}_{xi}(x_i^j, t^j)$ everywhere. Therefore according to Eqs. (28,29) the quantities $\langle E \rangle$, $\langle P_{x_1} \rangle$, $\langle P_{x_2} \rangle$, $\langle P_{x_3} \rangle$ should also be regarded as known.

Taking into account Eqs. (21-26) we may notice that we have six (6) equations with ten (10) unknowns. However because of Eqs. (28, 29) we may notice that the quantities $\langle E \rangle, \langle P_{x_1} \rangle, \langle P_{x_2} \rangle, \langle P_{x_3} \rangle$ can be written either in terms of Ψ_R or Ψ_I. Thus, we have four (4) more equations; *i.e.*, finally on condition that m_0 is known we have ten (10) unknowns with ten (10) equations.

These can apply both to (g) and to (em) space-time. Thus, in the equivalent particle space-time (g) and (em) fields described in Chapt. 8, on the basis of Cauchy-like initial conditions we have that the system is determined through twenty (20) equations and twenty (20) unknowns.

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Eq. (27) of Chapt 8 is implied by Eq. (8). Eq. (28) of Chapt. 8 as being equivalent to Eq. (20) Chapt. 8 implies three more equations with three more unknowns. In fact, because of Eq. (20), Chapt. 8, we have:

$$\left\langle \mathbf{P}_{g,x_i} \right\rangle + \left\langle \mathbf{P}_{em-g,x_i} \right\rangle = C_{x_i} \quad (i = 1,2,3) \tag{30}$$

Thus finally the system described by Eqs. (25-30), Chapt. 8, is approached by numerical analysis through twenty three (23) equations, and twenty three (23) unknowns on condition that m_{0g} and m_{0em} are regarded as known. It is noted that m_{0g} and m_{0em} describe properties of stochastic space-time, therefore if we were to treat Eqs. (25-32), Chapt. 8 as equations of pure space-time m_{0g} and m_{0em} should be regarded as unknown. This is compatible to Eqs. (25,26) of Chapt. 8 according to which m_{0g} and m_{0em} must be determined for the infinitesimal area of every point $(\mathbf{r},t)$. If the system was self-determined, it should be able to be described on the basis of initial conditions, as it has been mentioned at the beginning of this Section. Therefore, the system under study approached by numerical analysis through Cauchy-like initial conditions is undetermined since it is described through 23 equations with 25 unknowns.

3. EVOLUTION

Taking into account what was mentioned in Sections 1 and 2, we can look into the following cases.

1. $\langle E \rangle$ is constant

It is obvious that the system under study is uncertain, since nothing can be defined because of missing two equations. However, if this system exists, it means that m_{0g}, m_{0em} are definable.

For given m_{0g}, m_{0em} according to Eqs. (10,11), the evolution of the system can be determined. Thus, the question is raised of what gives values to m_{0g}, m_{0em} so that the (g) and (em) particle fields can exist. The reason why

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m_{0g}, m_{0em} can take values can be regarded as the reason of existence of the coexisting (g) and (em) particle fields which reason cannot be logically defined. This is compatible with the claim for minimum contradictions, which implies both logical and illogical dimensions.

2. $\langle E \rangle$ is changing

As was mentioned in Chapt 8, Sect. 2.2, if $\langle E \rangle$ changes, it does it abruptly. If $\langle E' \rangle$ is the next value of mean energy, we will have:

$$\delta\langle E \rangle = \langle E' \rangle - \langle E \rangle \tag{31}$$

Applying Eq. (10) for energy $\langle E' \rangle$, we obtain:

$$\begin{aligned} &\Psi_R(x_i^j, t^{j+1}) - \Psi_R(x_i^j, t^j) = \frac{1}{\hbar}\langle E' \rangle \Psi_I(x_i^j, t^j)\delta t = \\ &= \frac{1}{\hbar}\langle E \rangle \Psi_I(x_i^j, t^j)\delta t + \frac{1}{\hbar}\delta\langle E \rangle \Psi_I(x_i^j, t^j)\delta t \end{aligned} \qquad (i = 1,2,3) \tag{32}$$

$$\begin{aligned} &\Psi_I(x_i^j, t^{j+1}) - \Psi_I(x_i^j, t^j) = \frac{1}{\hbar}\langle E' \rangle \Psi_R(x_i^j, t^j)\delta t = \\ &= \frac{1}{\hbar}\langle E \rangle \Psi_R(x_i^j, t^j)\delta t + \frac{1}{\hbar}\delta\langle E \rangle \Psi_R(x_i^j, t^j)\delta t \end{aligned} \tag{33}$$

Eqs. (32,33) can apply both to (g) and (em) space-time and, as long as $\delta\langle E \rangle$ is the same for (g) and (em) space-time Eq. (27), Chapt. 8 is implied. Thus, the question is raised of whether $\delta\langle E \rangle$ can be defined.

According to Eqs. (6,7), $\langle E \rangle$ and $\langle \mathbf{P} \rangle$ behave as eigenvalues of energy and momentum. The particle field under study has various eigenvalues of energy $E_1, E_2, \ldots$. On condition that $\langle E \rangle$ is constant, it means that the system can have energy E_i under probability $P(E_i)$; the final result is that the system is reversible so that $\langle E \rangle = const.$

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If the system is non reversible, a state E_i does not imply a coming back so that $\langle E\rangle = const.$ In this case we have an energy change

$$\delta\langle E\rangle = E_i - \langle E\rangle \tag{34}$$

which has the probability $P(E_i)$ to occur. If this is the case we have a probabilistic evolution without the need of a probability operator [3]. On this basis, a concrete value of $\delta\langle E\rangle$ cannot be logically defined; *i.e.*, it cannot be defined through a self-determined process on the basis of initial conditions. Therefore, something else out of a logical – self-determined process selects the change status and the concrete value of $\delta\langle E\rangle$ so that the evolution can take place. All these constitute the simplest case where $m_{0g} = const.$ It is noted that Eqs. (25,26), Chapt. 8 are powerful enough to be valid for different m_{0g} at the vicinity of various $(\mathbf{r},t)$ of the hypothetical measuring field (HMF). If m_{0g} changed $\delta\langle E\rangle$ should be defined out of any probabilistic restriction.

When: $$\delta\langle E\rangle \geq 0 \tag{35}$$

it is implied that the system decides not to follow the arrow of time (see Chapt. 9, Sect. 6) and this corresponds to order creating.

When: $$\delta\langle E\rangle \leq 0 \tag{36}$$

it is implied that the system decides to follow the arrow of time; *i.e.*, its increasing entropy and this corresponds to a chaotic evolution. Such results have been presented by Prigogine, but through a different point of view [3,4].

As long as the evolution takes place we may assume that the system under study behaves as if it was able to decide to keep its original status or to change and to define the energy $\delta\langle E\rangle$. The coexisting (g) and (em) particle fields constitute basic structural element of reality. Thus we may reach to the following Conclusion V.

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Conclusion V: All real entities behave as if the had the ability to decide their evolution.

Notice:

1. Eqs. (25,26) of Chapt. 8 are powerful enough to be valid for different m_{0em} at the vicinity of various $(\mathbf{r},t)$ of the hypothetical measuring field (HMF). If m_{0em} is the rest energy of a space-time formation which describes radiation (see Chapt. 9, Sect. 2.1), $\delta\langle E\rangle$ can be regarded as the radiating energy due to irreversibility of the system.

2. As long as $\delta\langle E\rangle$ is known the evolution of the system can be defined according to Eqs. (32,33).

4. INDETERMINISM

We may notice that space-time itself as set of dimensions cannot determine the existence and the evolution of a system. However remains a hidden factor, which affects the existence of the stochastic space-time. This hidden factor is the "non existing-dimensionless", which according to what was mentioned, can be regarded as active. It is reminded that stochastic space-time can exist and not exist at the same time (see Chapt. 4, Sect. 1.2); therefore there is not anything else beyond space-time itself and the 'dimensionless' in order to decide for the existence and the evolution of a space-time system.

All these are in agreement to what was mentioned in chapter 3, *i.e.* with the claim for minimum contradictions. According to Statement I (see Chapt 1, Sects. 2.3 and 4 and Chapt. 3, Sect. 1) the most consistent attitude is silence. The decision to communicate logically leads to the claim for minimum contradictions which implies a logical and an illogical dimension. On this basis a minimum contradiction physics can be described (this is a basic subject of this book) and this leads to the Conclusion V. This conclusion is compatible to the notion of volition as described by Schopenhauer [5]. A dimension of this volition is logical and this is compatible with logic Λ. Another dimension of volition is illogical. The combination of these two dimensions characterizes both the communication and the reality itself. This might

be the reason why language, through all of its flexible possibilities, and not only through certain logical rules, can describe reality.

On this basis, we may notice the existence of a circle:

From mental principles to reality and from reality to mental principles.

However something remains deeper and this is silence. This is not disappointing since when we decide to communicate we observe a logical dimension but also an illogical dimension which leaves space for the free will.

Taking into account all the above mentioned, we may notice that the claim for minimum contradictions leads to an indeterministic point of view. All these refer to "Everything". Therefore, we may notice that the basic property of "Everything" is volition whose however basic dimension is logic. This is the reason why things even though acting under their volition they appear to have a considerable logical behavior.

Notice:

According to the minimum contradictions point of view, volition is something that cannot be mentally defined. Thus, volition is a property implying that all real entities "have the ability to do what they want". On this basis the notion 'volition' is identified with the notion 'free will'.

5. CHAOS AND ORDER

On the basis of what was mentioned in 2,3, we may notice the following.

a. In 2 has been shown by the aid of numerical analysis that the system of Eqs. (25-32) of Chapt 8 can be regarded as complete and self-determined on condition that it can be described through 25 equations and 25 unknowns. However we have only 23 equations and this implies that the system is uncertain.

b. On condition that rest energy is defined, we can determine the evolution if $\langle E \rangle = const.$ If $\langle E \rangle$ changes, we can have a probabilistic evolution.

c. The question is raised of whether a space-time system can be statistically determined. According to **b**. it can and this corresponds to a logical behavior. According to **a**, it cannot and this corresponds to a behavior which is illogical.

d. Even in the case of $\langle E \rangle = const.$ the geometry that describes the system is fractal – chaotic non Euclidean (see Chapt. 9, Sect. 7.3).

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On this basis it is expected an order in systems regarded as whole, where the probabilistic evolution can imply mean values determination and logical behavior appearance. This logical behavior should constitute an approximation leaving so space for the illogical behavior according to what was mentioned in **a, b, c**. As credible observation of such a behavior, might be regarded the one related to gravitation acting on systems regarded as whole, *i.e.* on stars. According to what was mentioned in chapter 6 we may notice that the general formula for gravitation (see Eqs. (10,11) in Chapt. 6) under certain simplifications (approximation) is compatible to Newton's and Coulomb's laws.

Thus from a chaotic description (general formula in terms of Ψ *wave function) we reach to order-describing equations of a system regarded as a whole (Newton's and Coulomb's laws).*

Beyond this, through Maxwell's and gravitational wave equations [Eqs. (25,26) of Chapt. 8] can derive when the reason producing uncertainty is ignored (see Chapt. 9, Sect. 15). Since Eqs. (25,26), Chapt. 8 derive on the basis of the claim for minimum contradictions Maxwell's and gravitational wave equations can be regarded as corresponding to the logical dimension of what is described by Eqs. (25,26), Chapt. 8; these equations predict with considerable accuracy phenomena that experience up to now has revealed. Therefore these equations constitute an order expression.

All these refer to order that appears in various systems. However as was mentioned in section 3, there is a possibility for order creation. An experience of this we have through biological organizations as it is described in the next Section.

6. EVOLUTION OF BIOLOGICAL ORGANISMS

According to Darwin's species evolution, mutations of the genome take place accidentally creating descendants where the stronger survives. This could be compatible with a deterministic point of view on condition that each mutation is regarded as result of a concrete cause. If there were not a concrete cause for each mutation, this would be in contrast with the rational thinking characterized by logic Λ. However one could say that a mutation could be regarded as a chaotic deterministic process. Thus the basic question is raised of whether chaos is deterministic or not. According to the present

point of view, chaos is not deterministic; in fact if it were deterministic something should be able to be precisely described (*e.g.* the governor law); this would be in contrast with Statement I due to contradictions implied by this statement.

According to the present point of view, the genome as being real entity has the ability to decide for its evolution, taking into account the external conditions imposed (see Sect. 3 - Conclusion V). This point of view is not apparently in contrast with Darwin's species evolution; it is another point of view of what 'accidental' means.

On this basis an effort has been made for the human balance system evolution to be interpreted [6].

7. CONCLUSIONS

On this basis the Equations of Minimum Contradictions Everything geometry and the force per unit of mass at a point $(\mathbf{r},t)$ of the HMF is defined. Taking into account these equations and using numerical analysis (finite differences) we can conclude that a space-time matter system cannot be determined on the basis of initial conditions (*e.g.* Cauchy-like initial conditions). Any matter space-time system is self-defined and behaves as if it had an ability to decide for its evolution; according to this point of view, biological organizations have the ability to decide for their evolution, which is another approach to species evolution in general.

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MINIMUM CONTRADICTIONS EVERYTHING

CHAPTER 12. SHORT ANALYSIS OF PREVIOUS WORKS

The previous articles related to the present monograph are based on the book "The Claim for Minimum Contradictions" [published by Trohalia in Greek (220 pages, ISBN: 960-7022-64-5)]. The starting points for writing this book were basic philosophical matters related with the deterministic or indeterministic perception, the ongoing interest around the Gödel theorem, the basic issue of physics that is the unification of general relativity with quantum mechanics and the growing indication of Vacuum Energy.

These articles are separated in four categories:

Category A

In this category belong articles in which "The claim for minimum contradictions" is based on Gödel's work while the unification of general relativity with quantum mechanics is achieved through a hypothesis stating the unification of physical meanings of the notions that result either from the general relativity theory or the quantum mechanics. *Articles A* provide the basis for all conclusions and interpretations for all article categories, but they are based on Gödel's Hypothesis, which is arbitrary, as has been noticed by Hillary Putnam and R. Penrose. This arbitrariness is a basic reason for which the articles of category C started.

Category B

These articles are based on the concept that in order for matter to exist it must have the "earlier-posterior" property in its whole extent. The epistemological part of these articles is based on "The claim for minimum contradictions". The conclusions of these articles are the same as with category A, but there is controversy for the validity of the concept they are based upon. This is a second reason for which there was an attempt for articles C to be written.

Especially stressed is the important role for articles B in order to reach to articles C as it will be further analyzed.

Category C

In this category belong all articles in which "The claim for minimum contradictions" is formulated on the basis of a theorem that has similarities to

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the Gödel's work, but there are also several basic differences such as the non-existence of arbitrary assumptions as this can be seen in corresponding articles.

The unification of general relativity with quantum mechanics is evident from "The claim for minimum contradictions" itself on the basis of the theorem mentioned. To be more specific the basis of "The claim for minimum contradictions" exhibits the common roots of general relativity with quantum mechanics while it finally leads to the concept of stochastic space-time. The general theory that results on the basis of "The claim for minimum contradictions" and the theorem mentioned is a Space-Time Quantum Mechanics, which under certain simplifications is compatible either with the general theory of relativity or the quantum mechanics.

It is noted that through articles C, we conclude to the same results as through A and B articles.

Category D

In this category belong articles leading to technological applications and having as theoretical background A, B and C articles.

These technological applications are cold fusion, excess heat during the light water electrolysis as described by R. Mills or Ph. M. Kanarev and propellant force of asymmetrical capacitors. The asymmetrical capacitors propulsion research is based on the Biefeld-Brown effect, the patents of T. Brown, the Frolov's asymmetrical capacitors and the suggested pending patent of the writer (PCT/GR000020) relative to propellant force of wavy asymmetrical capacitors having solid dielectric and zero potential casing.

A. SHORT ANALYSIS OF CATEGORY A ARTICLES

"The claim for minimum contradictions" derives from the basic philosophical dilemma:

"If the next moment is a causative result of the previous one, then: either there isn't free will or causality breaks".

In order to give an answer to this dilemma we use Gödel theorem and specifically the analysis prior to this theorem. The proof of Gödel's theorems is based on the propositional logic and Peanno's Arithmetic (PA) Axioms. A basic statement, required for Gödel's Theorem proof is:

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Gödel's Basic Statement: "If formula G (Gödel's formula) can be proved, then its negation (~G) can be proved as well".

This implies that Peanno's Arithmetic (PA), is inconsistent; the opposite statement is not always valid and this implies that (PA) is simply ω-non consistent.

However J. B. Rosser proved that if a theory T is an extension of (PA) [that is T can prove all theorems of (PA)], then there is a formula R_T so that the following theorem is valid:

Rosser's Theorem: "If formula R_T can be proved, then its negation ($\sim R_T$) can be proved as well and vice versa".

The basic communication system through which any theory is stated includes classical logic. Beyond it if we claim that syllogisms exist, it does imply that they can be found within space and time. As long as notions of space and time correspond to something measurable they imply arithmetic's validity. This is compatible with Peanno's Arithmetic (PA). This means that the basic communication system includes Aristotelian Logic, part of which is the propositional logic, and Peanno's Axioms. Thereafter, by Rosser's Theorem we have the following Statement of Inconsistent Communication:

Statement of Inconsistent Communication: "The basic communication system that is based on classic logic and that calls for arithmetic operation is inconsistent".

We notice that the answer to the basic philosophical dilemma mentioned *initially* has no meaning because this dilemma is logically phrased through the basic communication system that is inconsistent-contradictory. This imposes silence. The condition "initially" is cited because both *"Gödel's Basic Statement" and Rosser's Theorem* are based on the *Gödel* hypothesis:

Gödel's Hypothesis: "There is an algorithm that permits the derivation of only true statements".

Besides the trials realized it was impossible to prove this hypothesis, as noticed by H. Putnam and R. Penrose. This makes clear the reason why articles C are necessary so that "The Claim for Minimum Contradictions" can be better reasoned.

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Breaking the silence, despite the fact that the basic communication system is contradictory, needs the claim:

The Claim for Minimum Contradictions: "We accept as valid what includes the minimum possible contradictions (since contradictions are never vanished)".

On this basis physical laws ought to include contradictions as being formulated through a contradictory communication system. Thus, in the category A articles, we can notice what we could call *"Fragment Law", i.e.* a law including contradictions. Fragment Law is what is evident from the unification of physical meanings that are produced either from general relativity or through quantum mechanics. It is stressed that the unification of general relativity with quantum mechanics is possible with the following means:

1) Through a new privileged principle. Something along this line will be mentioned in articles C.

2) Through a mathematical process of already existing principles but also on the basis of some other concepts. This is how the super-string theories result. The other concepts that were mentioned are related to the demand for renormalization, and to the replacement of "point" with a "string" that during its movement creates a surface and not a curve.

It is obvious that something like that can not be proven and requires a priori. *Over and above, since we are mentioning probability density, this ought to relate with the notion of probability which by itself has the property of self-normalization. Otherwise we will have a mathematical process, where mathematics will try a posteriori to give a probability meaning to something that a priori does not reflect.*

3) With the unification of physical meanings as already mentioned.

By the unification of this type we have the following:

GRT and QM condense already revealed experience. These principles are not provable but were formulated in order for nature's laws to be compatible with experimental results.

Due to experience from general relativity a punctual matter is surrounded by a space-time continuum.

Due to experience from quantum mechanics any element of a field is described by a matter wave.

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As long as we wish the unification mentioned the following principles I_A and II_A should be valid:

Principle I_A: "Any infinitesimal space-time element can be regarded as a matter wave"

Principle II_A: "The energy of an infinitesimal space-time is equivalent to its internal time"

Internal time is the comparable time as noted in detail in relative articles. Type A articles have as a result the existence of stochastic space-time which fulfills the requirement of a 'fragment law'.

The basis for the study of unification of this type was initially the "Image Field".

As Image Field is defined a hypothetical field, which consists of a Euclidean space-time reference, in which at every point Λ_0 the real characteristics of the corresponding – through deformity transformations – point A of the real field exist.

Category A articles are the following:

A1. A.A. Nassikas, "The Hypothesis of the Unified Field and the Principle of its Dual Interpretation", Proceedings of III International Conference: "Problems of Space, Time, Gravitation", Russian Academy of Sciences (1994).

A2. A.A. Nassikas, "The Hypothesis and the Equations of the Unified Matter Field". **a)** Infinite Energy **3**, Nos. 13 & 14 (1997); **b)** Proceedings of International Conference "New Ideas in Natural Sciences", St. Petersburg's Physical Society, St. Petersburg, Russia, Eds. A. Smirnov and J. Klyushin (1996).

A3. A.A. Nassikas, "The Hypothesis of the Quantum Space Time – Aether", **a)** Congress-98 Fundamental Problems of Natural Sciences, Russian Academy of Science. St. Petersburg, Russia. 1998; **b)** as "A Hypothesis of Quantum Space-Time Aether" [Galilean Electrodynamics **11**, Special Issues 2, GED-East, 34-40 (2000)].

Results of these case studies are:

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a) The induction of a general formula for gravity that is valid everywhere. This formula with certain simplifications is compatible with Newton's law of gravity.
b) The formulation of space-time operators and the complete geometrization of a unified field. The geometry of a unified field is determined on the basis of Ψ wave function.
c) The stochastic – quantum space-time which is matter itself. In the stochastic space-time, the "geometry distribution" is based on a function that is self-normalized and because of this fulfills the demand to reflect probability. This probability is not always positive and as for this there is epistemological basis from "The claim for minimum contradictions" by which contradictions are never vanished.
d) The unified field equations are formulated and are valid everywhere. Since space-time is matter itself and does not consist of something empty in which the field can act we can state:

"There is no potential acting at a distance."

This statement facilitates the formulation of equations mentioned.
e) As a result the 2nd thermodynamic law is formulated. With the unification of this type in a closed expanding matter-space-time system entropy change is always positive. It is noted that the 2nd thermodynamic law was formulated as an axiom and not as something that can be proved.
f) The property of self-similarity of a matter system can be proved; this is compatible with the fractal geometry of nature. It is noted that fractal geometry as formulated by Mandelbrot uses the property of self-similarity as a principle which is not proved.
g) The Casimir phenomenon explanation is possible.
In article A.3 the term "Image Field" was substituted by the term "Hypothetical Measuring Field" (HMF) after P.F. Parshin's recommendation. This article was included in the 2nd Koryzev Issue of "Gallilean Electrodynamics-East", since the space-time described has material-active properties, which is compatible with Kozyrev's point of view.

B. SHORT ANALYSIS OF CATEGORY B ARTICLES

In the Congress 2000, St. Petersburg (Russia) an article was presented *in absentia* under the title:

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B1. A.A. Nassikas, "The Hypothesis of the Quantum Space Time – Aether and the Main Principles of Physics as Possible Consequences of a Unique Axiom" (1999).
The presenter was Russian Professor Dr. P.F. Parshin, who noticed that a wave function that was extrapolated on the basis of Fourier's analysis presented an obscurity. P.F. Parshin was one of the pioneers to question the relativity theory – member of the Editorial Board of the journal Gallilean Electrodynamics, and co-founder of its sister journal GED-East. After a long collaboration with P.F. Parshin, a solution was found to the question raised and the following article was written:
B2. A.A. Nassikas and P.F. Parshin, 2000, "On the Possibility of a Unique Axiom in Physics", **a)** Congress 2000, St. Petersburg, Russia; **b)** Galilean Electrodynamics **12**, Special Issues 2, GED-East, 23-27 (2001).
P.F. Parshin had passed away when this article was published. His contribution was decisive for the final configuration of type B articles matter that greatly affected articles C. With this a wish is expressed to honor the memory of this significant man and scientist.

The basic concept of these articles is that in order for something to exist it must be spotted in space and time. In order for a material area to exist it must have the "earlier-posterior" property in the whole of its extent. As noted in previous articles the "earlier-posterior" property do not only regard time but also space. When we refer to 10 cm, we actually refer to the 1, 2, 3, ...,9 cm, meaning the existence of "earlier-posterior". Based on these, the following principles can be stated:

Principle I_B*: "Any matter system can be expressed in space-time terms."*

Principle II_B*: "In the Hypothetical Measuring Field (HMF) the energy of an infinitesimal space-time element is equivalent to its internal time."*

It is obvious that principle II_B is identical to principle II_A of category A articles.

Over and above principle I_B, II_B, proves the common descent of relativity with quantum mechanics, meaning under some simplification both relativity and quantum mechanics can be derived. The wave function Ψ results without previous knowledge of quantum mechanics but directly through

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the Fourier analysis. *Articles B1, B2 constitute the starting point for type C articles* but are based on a concept that could include some controversy.

Actually by articles like these if something exists it ought to be countable, *i.e.* to be expressed in terms of 'earlier-posterior' and further in space-time terms. However this could be satisfied through the notion of absolute space where different material elements correspond to coordinates, without space-time constituting the fundamental category of nature.

C. SHORT ANALYSIS OF CATEGORY C ARTICLES

Based on the up-to-date experience, it is understood that axioms of physics and mathematics constitute obvious requests yet unproven. The following query is expressed:

Is there a privileged principle?

At first there isn't a privileged principle. However we can notice the following:

1. Any theory doesn't have meaning unless it can be expressed through the basic communication system.

2. The basic communication system includes the Aristotelian logic + Sufficient Reason Principle (logic Λ) as also the "earlier-posterior" Axiom. (for everything we seek the reason of its power, we do not communicate in a simultaneous way but place one word after an other, one phrase after an other, *etc.*)

3. The basic communication system can be proved to be contradictory and this imposes silence. The proof of inconsistency of the basic communication system constitutes the main target for type C articles. There have been several attempts and one of the basic queries made to the scientific community is if the following Theorem I and Statement I are valid.

Theorem I: "A system that includes logic Λ and a statement that is not a theorem of Λ leads to contradiction".

Statement I: "A system that includes logic _ and one synthetic sentence (e.g. the 'earlier-posterior' axiom) leads to contradiction"

Statement I refers to the contradiction of the basic communication system that leads to silence. One can notice basic similarities between Statement I and Rosser's Theorem. However Statement I doesn't require any ar-

bitrary hypothesis as Rosser's Theorem does; it requires the Sufficient Reason Principle stated as follows:

Sufficient Reason Principle: "No statement is valid if it cannot be proved from other valid statements different from it".

One could notice that this Principle too is arbitrary. However this Principle is a substantial part of our basic communication system without which no theory can be logically stated.

4. "Logical" breaking the silence, despite of existing contradictions, can take place only on the basis of *"The Claim for Minimum Contradictions"* as already noted in type A articles.

5. Based on Theorem I and Statement I, a physics theory is least contradictory when there aren't any principles besides those of the basic communication system. This can be demonstrated in detail in relative articles.

6. The conclusion is that:

"A physics theory is the least contradictory when it is stated with "earlier-posterior" and in extension with space-time terms".

Based on these results we conclude that there is a *privileged principle* and that is *"The claim for minimum contradictions"*, since it constitutes a necessary condition for any theory to be stated, through the basic communication system, with the maximum use of logic.

Basic consequences of Conclusion 6 are proposals identical to Principles I_A and II_A concepts. For the same reasons as in the articles B, the type C articles reveal the common origin of relativity and quantum mechanics. The wave function Ψ results without any previous knowledge of quantum mechanics but directly through the Fourier analysis.

Due to the equivalence of Conclusion 6 and Principles I_A and II_A, all the implications and interpretations of phenomena that are mentioned in type A articles are valid also for type C articles.

Type C articles that are evident only from the claim for minimum contradictions are the following:

C1. A.A. Nassikas, "A Claim for Minimum Contradictions in Physics". **a)** Congress 2000, St. Petersburg , Russia; **b)** Galilean Electrodynamics **10**, Special Issues 1, GED-East, 14-16 (2001).

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In this article an attempt is made for Theorem I to be proved. There are weaknesses due to the fact that there isn't use of the Sufficient Reason Principle.

The term 'earlier-posterior' was used by Aristotle in relation to the concept of time. Dr. Whitney noted that it would be proper for space-time to use the concept "anterior-posterior" that has a relation both with space and time. Ever since in relevant articles the term "anterior-posterior" is used.

C2. A.A. Nassikas, "The Claim for Minimum Contradictions and its Consequences in Thinking and Physics", Vienna Circle International Symposium, 2001.

In this article for the first time there is an attempt to prove that the laws of physics can result from principles of thought. In this article there is use of Sufficient Reason Principle but without an explicit meta-mathematic expression.

C3. A.A. Nassikas, "The Notion of Aether as a Possible Consequence of the Claim for Minimum Contradictions", Journal of New Energy, **6**, (1), (2001).

By this article the minimum contradictions physics is a physics of aether. Aether is considered the substance from which things exists and are made off. In this article Kozyrev's Axioms can be regarded as a result of the "Claim for Minimum Contradictions".

C4. A.A. Nassikas, 2002. "More on Minimum Contradictions in Physics", Galilean Electrodynamics **15**- East, Special Issues 2, GED-East, 22 (2004).

In this article a clear use of the sufficient reason principle is presented without a metamathematic expression. The proof of Theorem I in this article proposes a core approach; however, this proof cannot be regarded as the final one.

C5. A.A. Nassikas, "The Relativity Theory and the Quantum Mechanics under the Claim for Minimum Contradictions", **a)** PIRT-2002 London, Ed. M.C. Duffy; **b)** Hadronic Journal **5**, (6), 667-696 (2002).

In this article the proof of Theorem I is realized as in article C.2. In this article the notion of electromagnetic space-time and its co-existence with gravitational space-time are stressed to extrapolate conclusions relative to those of type A articles. At the same time the meaning of arrow of time is approached, an explanation for the meaning of order in a chaotic system and the epistemological basis for the acceptance of the negative probability meaning are

given. Also there is an explanation given for the 'non-locality effect' and the experiment of A. Aspect.

C6. A.A. Nassikas, "Minimum Contradictions Physics as a New Paradigm", Proceeings of the 2003 NPA Conference, Journal of New Energy **7** (3) 106-113 (2003).

In this article besides the basic elements for minimum contradictions physics there is a first explanation in cold fusion phenomena as also an explanation to the Biefeld-Brown effect. In this article the proof of Theorem I is as in article C.4.

C7. A.A. Nassikas, "On a Minimum Contradictions Physics", Proceedings of the NPA **1**, 81-84 (2004).

In this article, besides the basic elements of a minimum contradictions physics, the equations of a minimum contradictions space-time are briefly formulated where there is consideration of the co-existence of gravitational with the electromagnetic space-time. There is also an explanation to the propellant force that is developed in asymmetrical capacitors and generally in gravi-electric systems.

C8. A.A. Nassikas, "Basic Statements Required for a Minimum Contradictions Physics", presented *in absentia* at the PIRT- Calcutta Conference, 2004. Published in Rev, Bull. Cal. Math. Soc. **14**, (1) 1-8 (2006).

C9. A.A. Nassikas, "Basic Statements Required for a Minimum Contradictions Everything", presented "in absentia" at the NPA Conference, 2005.

C10 A.A. Nassikas, "Basic Statements Required for a Minimum Contradictions Everything-Aether", accepted for presentation at the PIRT-Moscow Conference, 2005.

Articles C8, C9 and C10 practically have the same objective, with the only difference being the semantic characterization of quantum space-time, as aether or everything generally. *The main objective of these articles is the integrated attempt to prove Theorem I and Statement I, which is the basis of all articles of category C.*

D. SHORT ANALYSIS OF D CATEGORY ARTICLES

In category D belong the following articles:

D1. A.A.Nassikas, "The Cold Fusion as a Space-Time Energy Pumping Process". Proceedings of the 8th International Conference on Cold Fusion, Ed. F.Scaramuzzi, Societa Italiana di Fisica, Nuovo Cimento (2000).

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In this article there is an examination of the energy conservation principle for a closed system as resulted on the basis of "The claim for minimum contradictions". The following empirical statement is proposed:

Empirical Statement IA: "During the approach of an electron with a proton there is absorption of gravitational energy from the surrounding space-time".

We define an 'Empirical Statement' as a statement compatible with the theory proposed having a possibility to be verified through an experimental way. Thus a verification of an Empirical Statement will constitute a verification of the theory proposed and vice-versa. Emperical Statement IA explains the excess heat generated during the light water electrolysis under R. Mills patent. Also by this empirical statement there is an explanation for excess heat that is produced during cold fusion.

D2. A.A. Nassikas, "Space Time Energy Pump", Proceedings of Int. Conference on Hydrogen Technologies (CH-Weinfelden, Jupiter-Verlag. 2001). This article has as starting point article D.1, includes proposals of technological application of Empirical Statement IA. There is also an explanation for excess heat during the light water electrolysis as described by Ph. Kanarev (Plasma Electrolysis).

D3. A.A. Nassikas, "Space Time Electrostatic Propulsion", Proceedings of PIRT IX, London, Ed. M.C. Duffy (2004).

Since Empirical Statement I includes the meaning of "gravitational energy absorption" obliges to extend to the direction of momentum. A generalization of Empirical Statement IA is the Empirical Statement IB:

Empirical Statement IB: "A charge within an electric field is an area in which gravitational energy and momentum can be exchanged".

In a symmetrical electric field there is a mutual retraction that leads to a zero absorption of energy or momentum. Inversely, in an asymmetric system, momentum absorption is expected, meaning the development of force and in addition the absorption of gravitational energy space. The above mentioned have been confirmed partly through the Frolov asymmetric capacitors. A final answer could be given through an explicit "Over Unity Effect". This is proposed but not verified by a wavy asymmetric capacitor with solid dielectric and zero potential casing (PCT/GR000020).

SHORT ANALYSIS OF PREVIOUS WORKS

E. THE PROPOSAL FOR WRITING THE PRESENT MONOGRAPH

It has been noticed that it is not completely clear that all articles mentioned constitute a unified whole without any gaps. Dr. Duffy proposed a book, based on these articles, to be written as a whole. This work is a monograph for a physics produced on the basis of the claim for minimum contradictions without any other previous principle accepted. Based on this physics, a theorist concludes to results compatible to those of an experimentalist. Beyond this compatibility there is something else that can explain new phenomena and lead to new technology. This monograph constitutes a unification of all article categories so that the results are derived without any gaps on the basis of the claim for minimum contradictions.

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PHILOSOPHICAL AND COSMOLOGICAL CONSEQUENCES

a) According to Putnam's *Minimal Principle of Contradiction*, "There is at least one a priori truth" [1]. According to Statement I (see Chapt. 1, Sect. 2.3), our communication system leads to contradiction. Thus, the question is raised: Can we say that nothing is truth? If so, according to Putnam, there is the truth: "nothing is truth". However, according to Statement I, "nothing can be stated", therefore, it cannot be stated that: "nothing is true", "it is true that nothing is true", "nothing can be stated", "it is true that nothing can be stated", and so on. For the same reason, it cannot be stated that the minimal principle of contradiction is true *i.e.* it cannot be stated that it is true that *not every statement is true and false.* As was mentioned, it can neither be stated that the claim of the minimum contradictions is true since this claim includes the arbitrariness deriving from breaking the silence (see Chapt. 3, Sect. 1). It is noted that the difference of the present aspect from Putnam's is due to the basic structure of language and more specifically to the anterior-posterior axiom and the sufficient reason principle.

b) The claim of the minimum contradictions appears in communication. Because of the existing contradictions, it implies a non-definite description of things. There are already expressed points of view, according to which, language does not define the things exactly.

Heracletus says for what language can express: "Λόγος οὐτε λέγει οὐτε κρύπτει αλλά σημαίνει" (Λόγος neither says nor hides but signifies) [2]. This is compatible to an ontological point of view (in Greek "*αποφατική άποψη*"), which is characterized by the notion "συναμφότερον", which means that something can be accepted as valid even if it is contradictory [2,3]; the latter has been empirically verified through investigation of texts from ancient times until now [3]. The communication vagueness implied by the claim of the minimum contradictions seems to have similarities with the vagueness of Wittgenstein's language games. However, this claim derives on the basis of correctness rules in contrast to Wittgenstein's point of view [4]. In all these cases, the present point of view might reinforce what intuitionally was accepted as valid.

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It is noted that, according to the claim of the minimum contradictions, there is a logical and an illogical dimension in our understanding of the world. This facilitates us to approach in a logically linked way notions such as free will, faith, intuition, *etc.*, which are incompatible, at first sight, to our original logical way of thinking [5,6].

c) As was mentioned in Chapt. 11, Sect. 1, the "non existing" is out of space-time; therefore, it is not characterized by the anterior-posterior axiom and Statement I (see Chapt. 1, Sect. 2.3) cannot apply to it. Thus, the "non existing" seems to be non-contradictory and this might be the "reason of existence" of the logical part of our thought.

d) A basic philosophical question is of what reality is. According to this work, reality is stochastic space-time which is matter itself and which implies the existence of 'non-existing dimensionless', which can be regarded as source of 'volition' – 'free will'. Thus, the 'non-existing dimensionless' is something active out of space-time *i.e.* something active which has not been created (in Greek $\dot{\alpha}\kappa\tau\iota\sigma\tau o\nu$) so that it can appear in space and time. Stochastic space-time can be described through a Hypothetical Measuring Field (HMF). Reality in general can be described through a Hypothetical Frame where Classical Logic, Sufficient Reason Principle and Space-Time constitute basic structural elements. However, reality itself is contradictory which results to the fact that the structural elements mentioned in reality appear as stochastic and describable by the Hypothetical Frame consisting of these elements at their ideal form.

e) The claim for minimum contradictions implies that matter space-time is stochastic and distributed according to the probability density of Schrödinger's relativistic Equation (see Chapt. 4, Sect. 5). The Ψ wave function can describe either the gravitational (g) or the electromagnetic (em) space-time matter field. These fields are interconnected and interacting through photons. On this basis the Equations of Minimum Contradictions Everything can be stated; geometry and force per unit of mass at a point (r,t) of the HMF can be defined (see Chapt. 8). Taking into account these equations and using numerical analysis (finite differences), we can conclude that a space-time matter system cannot be determined on the basis of initial conditions. Thus, any matter space-time system is self-defined and behaves as if it had an ability to decide for its evolution (see Chapt. 11). Thus, the main

property of a space-time matter system is the one of volition, whose basic dimension is however logic itself. According to this point of view, logic is not something out of things. On the contrary, it constitutes their basic property because of which things 'desire' the order appeared.

Another dimension of volition is illogical and this corresponds to a chaotic behavior. The combination of these two dimensions characterizes both the communication and the reality itself. This might be the reason why language, through all of its flexible possibilities and not only through certain logical rules, can describe reality.

On this basis, we may notice the existence of a circle:

From mental principles to reality and from reality to mental principles.

According to the claim for minimum contradictions, something deeper remains and this is silence (see Chapt. 3, Sect. 1). This is not disappointing since when we decide to communicate we observe a logical dimension but also an illogical dimension which leaves space for the free will.

f) According to this work, we can have two kinds of time: the internal time which corresponds to the notion of energy and the sensible time which corresponds to the notion of arrow of time which expresses a passage for a (*g*) to an (*em*) space-time (see Chapt. 2, Sect. 2.3 and Chapt. 9, Sect. 6).

g) The most accepted scientific and philosophical point of view is that space-time itself does not contain any matter which could be used for energy production in contrast to this work. This affects the common belief and the official attitude related to the energy problem solution on the basis of the interaction of the electric with the gravitational field even though there are strong indications for positive results. Energy production from space-time seems to be like energy production from 'nothing', which is so difficult to accept because questions would arise on what this 'nothing' is. An answer to these questions is given in this work. However the common belief about physics in general could be positively affected, mainly by modern philosophy, physics and mathematics works friendly to the common reader, *e.g.* such as the ones in Refs [7-10]. It is noted that the 'Green House Effect' creates an urgent need for the solution of the energy problem, regardless of whether it is philosophically accepted or not. This might affect the official attitude mentioned.

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h) A question arises as to the meaning of the phrase 'space-time contains energy'. An answer could relate to the space-time compatibility. The motion of a space-time with respect to another implies the existence of a relative time; inversely: *the existence of a relative time of one space-time with respect to another should imply a motion in order for those space-times to be compatible.* For the purposes of this work, we will refer to this as *space-time compatibility.* If we regard an atom as a space-time system then the splitting of the atom corresponds to an abrupt exposition of the split parts to the surrounding space *i.e.* to the abrupt appearance of a high relative time; according to 'space-time compatibility', this will create all space-time compatible kinds of motion, such as radiation and/or particle emission.

According to this work, the creation of Universe is a process of zero splitting into (*g*) and (*em*) energy. The evolution of Universe is a reverse process based on Universe's expansion. Thus, the question is raised of why Universe expansion takes place. As long as Universe is created from zero, it exists within 'non existing'. Therefore, at the end of Universe relative time with respect to 'non-existing' always appears having as result, according to 'space-time compatibility' (see Chapt. 9, Sect. 10.1), a motion towards to 'the non-existing-dimensionless', which implies expansion. However, this implies that the 'non- existing' surrounds the Universe. If this is the case, then the length of closed a line of the end surface of Universe should be zero, since space does not exist out of Universe. At first sight, this implies that Universe's diameter should be zero. This is not true. However, there are infinite paths of zero length connecting two points belonging to the ends of a Universe diameter since Universe can be regarded as a stochastic space-time island within "non-existing-dimensionless".

i) We may notice that the simple principles of Aristotle logic, which at first sight seem to be obvious to anyone, lead in a reasonable way to a more complicated way of thinking that is characterized by contradictions and, at the same time, by a tendency to logic. This way of thinking is in agreement with what the experience has revealed and it is powerful enough to have laws of physics derived. According to this, there are not privileged areas in nature. Even thought is regarded as a part of physical reality, as being uncertain itself; it becomes certain when it refers to the out of space-time 'non-existing-dimensionless'. This way of thinking though logically linked is far from what at a first sight we regard as true.

PHILOSOPHICAL AND COSMOLOGICAL CONSEQUENCES

j) The claim for minimum contradictions is a mental principle stated so that communication can be continued even after silence imposed by Statement I. Minimum Contradictions Physics is Physics deriving from this claim having a considerable approach to what is happening in Nature. Therefore the claim for minimum contradictions can be regarded as a principle approaching to Nature's function.

k) In this work, nowhere is proved that the theory proposed is the most accurate. Thus, the question is raised of *what is the relation between the minimum contradiction treatment accuracy achieved with respect to what is observed.* A first answer is that, under certain simplifications, both relativity theory and Q.M., which condense the experience gained, can derive from the claim for minimum contradictions.

However, according to the present point of view what really happens reflects to silence *i.e.* to something that cannot be described. Thus, the main results of this monograph reflect to a quality defined and to a quantity approached through a limit anthropocentric point of view. The term limit is used because the present point of view leads to the fact that:

"The limit inference of ratio is its rejection"

On this basis philosophical questions are raised as: *what is the relation between an anthropocentric minimum contradictions point of view and the "anthropic principle"?*

A first answer to this question is that the 'anthropic principle' implies that Nature is made in such a way that the Human existence is implied.

On the contrary minimum contradictions point of view shows how Nature can be seen through Human's mind.

Philosophical questions never stop until silence is imposed. New or old ways leading to 'what cannot be said' (in Greek $\dot{\alpha}\rho\rho\eta\tau o\nu$) seem to 'approach' better the truth. On this basis one could say that nothing we can do through a logical way since the core of decisions belongs to what cannot be said (in Greek '$\dot{\alpha}\rho\rho\eta\tau o\nu$') which can be regarded as something active that has not been created (in Greek '$\dot{\alpha}\kappa\tau\iota\sigma\tau o\nu$') which is expressed through volition-free will.

However, we may notice that according to the claim for minimum contradictions there is a logical attractor that rearranges the chaotic behavior;

an important part of volition is logical which implies that things 'desire' the order appeared.

The geometrical analog of real thought is fractal geometry, where chaos obtains a structure through attractors. Purely logical syllogisms correspond to Euclidean geometry, which is something ideal out of physical reality. What is happening within the '*ἄρρητον - ἄκτιστον*' reflects to results directly observed in Nature. The Greek terms mentioned are used in apophatism, which is a philosophical stream having a trend to be regenerated [2,3,10,11,12]; this shows a close relation between this stream and the present work. However according to this book the terms mentioned derive from purely mental principles, not from any metaphysical consideration.

All these, as mentioned in par. a, are not completely true since truth reflects to silence. However we cannot say:

"We can find the truth in silence."

since this statement as logically stated is contradictory [see par. **a)**]. Truth has a holiness that is disturbed when it is stated.

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