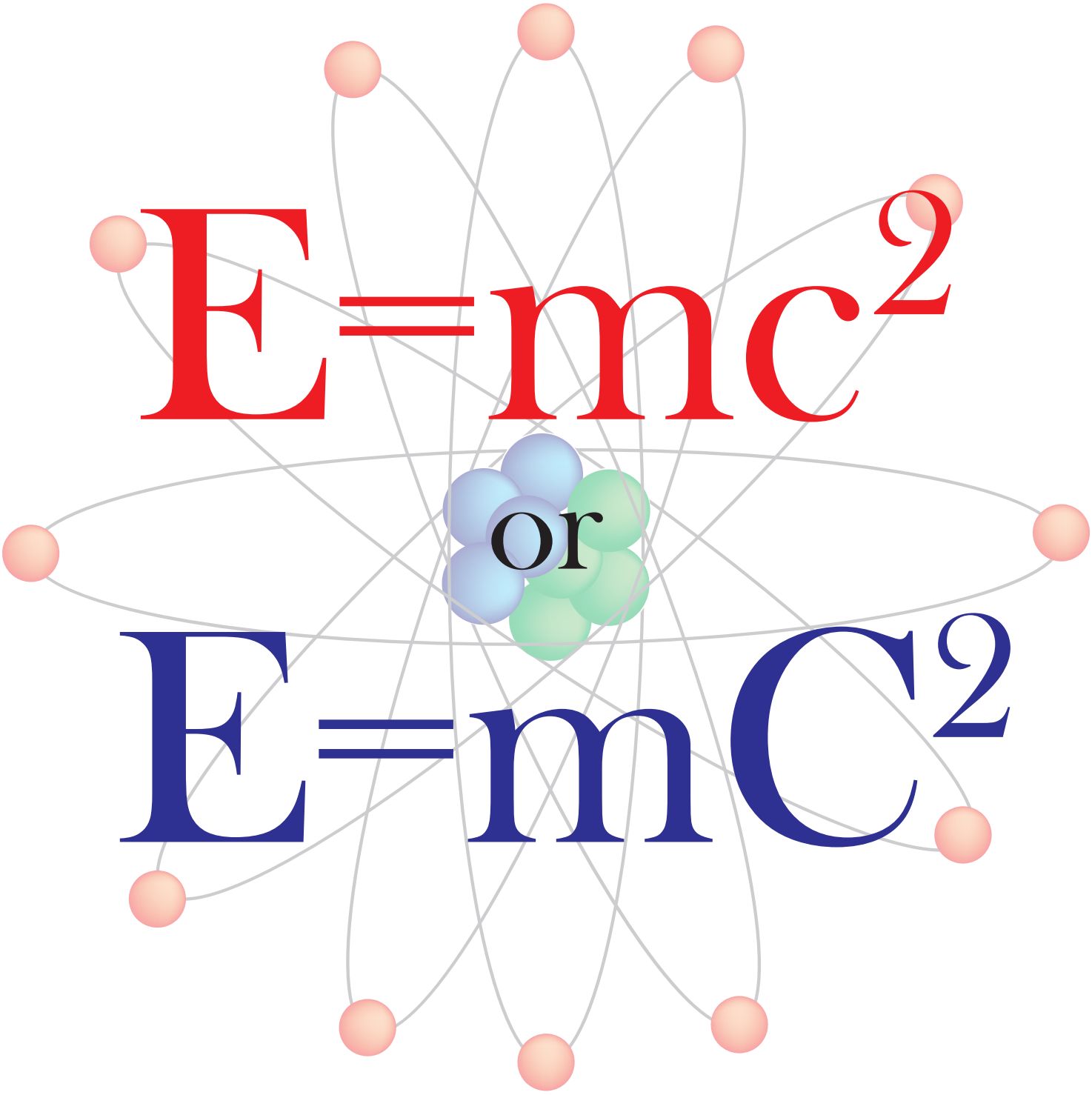
THE GOLDEN CENTURY

- Science and Scientists -

year I - N. 7



E = mc2 The most famous equation

Causality and Logic

Taurus Edition

Preface

I must apologise to the relativists, I must do it because I did not intend to offend anyone. I only tried to correct an incongruence which perists for a long time. The very ugly habit to call *speed of light* any type of electromagnetic radiation it should cease. It is not scientific and it is not correct. If a man of science is trying to say that gamma rays are powerful, he must use the compactness of their oscillations, he must use their frequency which gives not only their energy, but also and above all the type of space used by these rays. The speed of $3x10^8$ common to all electromagnetic radiations it says very little as a member of an equation. As very little it says a ray of light brought down candel-like by the gravitational force of a black hole. In a couple of occasions I have already said that there is no need to bring into play the huge power of a black hole to demonstrate what a little girl armed with a simple household mirrow can do with a ray of light. All junk that for years now is pushing science into philosophy's territory.

I must also apologise to quantum physicists. I have taken away their beloved nonlocality, a very special unit to safeguard their stronghold. I left them flabbergasted, like the little boy looking at his favorite toy now broken. Not having yet understood that the universe possesses a linear field and a nonlinear field is terrible, for me it is simply inconceivable. The linear field, as James Clerk Maxwell, has demonstrated it goes to infinity, while the nonlinear field is local, very much so. Further, its wavelength expands in time and it extends in space up to and not exceeding 299 million 792 thousand 458 cycles and/or metres per second. And this, it will get rid of another incongruence.

I would now like to mention that throughout my work I have sustained that what science calls *empty space* is instead filled with the full scale of electromagnetic radiations. My assertion is fully warranted by the mere fact that the very first axiom of the theory herein propounded reads: *time and space are physically created by an electromagnetic process of temporal expansion and/or spatial extension to be identified with the existing electromagnetic spectrum.* I am then saying that what I call *free (optical) space* is filled with a substance made up of energy which varies with the varying: ① of the density of space (number of electromagnetic oscillations per second or oscillating frequency), and ② of the length of time (the length of the electromagnetic wave or wavelength in that frequency). That is: it varies with the varying of what I have called *time and/or space sub-dimensions.*

Each month some things new, very new. It is beautiful. I am not a "copy and paste" man. Science and Scientists, and we all have always associated time to the wavelength (lambda). From here on we must get used to associate space to the frequency (f). Then if we want this space to be quantized, the step is a short one. Electromagnetic radiations are an integral part of nature. It needs, to remove the names put there by Man and to leave the radiations' scale in its pristine form which is large and "heavy" and which comprises the sub-dimensions populated by waves and particles and the fully expanded dimension populated by living and non-living things. If we accept it all, it only needs to remind ourselves that the electromagnetic radiations' world is the waves' world which are much more precise and determinate of the atom.

My next *magazine* at the end of August will be all taken by relativity. And it shall actually be relativity that will allow me to present time and space the way they exist in nature. Time and space the way they are created by the filaments of electromagnetic radiations in their nonlinear conformation. I shall have the privilege to present for the first time in the history of science all the time and/or space sub-dimensions in mathematical form. For the first time in the history of science we shall have the opportunity to see the filaments of electromagnetic radiations in action and their importance in the universal context.

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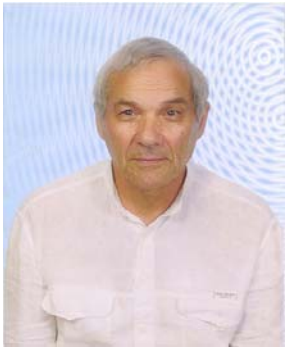

$E = mc^2$ The most famous equation

Foreword

The following three fundamental axioms are the foundation pillars upon which the proposition herein put forward rests.

I. Time and space are physically created by an electromagnetic process of temporal expansion and/or spatial extension to be identified with the existing electromagnetic spectrum.

II. Time and space have their origin in each and every electromagnetic pointlike point-source in free (optical) space as well as in matter.

III. Given (I) and (II), it follows that the speed at which time and space are created: (a) is the upper limit and dictates the physical laws in the world we live in (fully expanded time dimension), and (b) it is a function of linear and nonlinear motion in free (optical) space.

In particular, axiom (II) implies that space is permeated by an all-pervasive and permanent substance which I shall herein label *time-fabric,* meaning to say: a permanent non-zero source of energy. From this we may deduce that space is filled by pointlike point-sources which are magnetized by the finite and uniform speed of the expansion and/or extension. These point-sources during their decaying process form all lengths of time and all lengths of space. These lengths are the effective volume containing energy. The entire free (optical) space is, therefore, a universal unsaturated sink with continuous absorption because of the finite and uniform speed of expansion and/or extension.

Introduction

Before entering into the argument proper, I would like to say just a few words to put into focus some points pertaining the subject matter.

(i) We will be dealing with mass-energy equivalence clearly formulated by the equation in question which came to be known as *the most famous equation* not because of the aforesaid equivalence, but because of its association to nuclear fission and the energy of the missing mass released during fission.

(ii) Although the equation was tested for energy release from nuclear reaction in 1933, and definitely associated to nuclear fission and rendered famous after the atomic bombings of Hiroshima and Nagasaki in 1945, from the outright start Einstein himself in his 1905 and 1913 papers had associated the equation with the nucleus of the atom when he suggested to test the mass-energy equivalence with radioactive decay. In point of fact, he said and I quote: *it is not impossible that with bodies whose energy-content is variable to a high degree (e.g. radium salts) the theory may be successfully put to the test.*

(iii) The up and coming man of science likes to tell you that the letter "c" is just a constant and not the speed of light. They should remember, however, that in *illo tempore* as well as today they used to say and they are still saying: *the speed of light* and *the speed of light*

squared. One must not slide from science to philosophy or as far afield as the fairytale land. For example, when one talks of *energy of the vacuum* codified by Eisenberg's uncertainty principle it is implied the impossibility to quantify one such energy: ① because noone can tell you where this energy comes from, what is generating it, how long it stays with us, and when and how will disappear or, better still, ② because Science and Scientists did not make treasure as yet of the three axioms sustaining the theory here advanced. Theory this presenting, in clear notes and with mathematical support, the existence in free (optical) space of the full range of electromagnetic radiations which in their nolinear conformation allow us to quantify all the energy levels all along the time and/or space sub-dimensions.

Argument

Given the above facts, we all are now in a position to assess the most famous equation of them all in what may be said to be the appropriate context. Further, I am myself in a position to prove beyond any reasonable doubt that:

I Physical science's most famous equation was not formulated in accordance to its physical significance;

II I shall introduce the most likely candidate to replace the offender; that is, the incongruent c^2, and then, only then;

III I shall reformulate the most famous equation of them all. In the meantime, here it is, the old girl in its full glory:

$$E = m\ c^2$$

Electron microscopes use a particle beam of electrons to illuminate the specimen and have a greater resolving power than light-powered optical microscopes. This is because electrons have wavelengths shorter than visible light (photons) and as such attain a better resolution than optical microscopes (in the order of 0.3 as against 400 nanometres). With wavelengths this short, we are allowed to move only in the outer shell of the atom, that's a long way away from the nucleus, a looong way away. We may then ask ourselves: why should Einstein be allowed to enter the nucleus with this type of wavelengths? Don't run to check them, here they are: the visible light falls in the region of 380-750 nanometres.

The speed of light inside the nucleus of an atom? How can the light's wavelength enter the atom to prise open its nucleus, to poke neutrons and to split protons? The speed of light in the atom's *sancta sanctorum*? It is impossible! The thought of it is simply absurd, it is preposterous.

There never was, of course, the speed of light in the nucleus. What the great man put in there, unaware as he was, it was the early stage of the physical process of creation whose inner structure covers the gamma rays range of frequencies. This is the weapon that Einstein put inside the nucleus, this is the weapon that can and will split hundreds of protons because it has the strength to do it. The sharp thickly compacted vibrations have very cutting edges and can prise open two protons very easily. The great man knew about it.

I recall to mind here that in 1921 he was awarded the Nobel Prize in Physics for his work on the *photoelectric effect*. He knew then that even within the visible spectrum range of frequencies, photons from the blue end of it had enough energy (sharper vibration edges) to free electrons from a metal plate whereas photons from the red end of the spectrum weren't energetic enough to do the job.

As for that c^2 above, the strength is given to it by its speed. More precisely, the squared speed of light in a vacuum multiplied by the mass of a body (ninentynine per cent of which is inside

the nucleus) gives the potential energy entrapped in that body. The wavelength, which at first sight seems to be the more important, does not come into it because in the visible spectrum it is much too long and its energy is harmless. A little girl playing with a household mirror can do what she wants with a ray of light. She can stop it, divert it, bounce it back and forth at will,etc. Moreover, the speed of light, like any other electromagnetic radiation, runs orthogonal to the process of creation and obviously retains the same speed of the process whose decreasing energy is progressively bonded for the physical creation of each and every wavelength. It is here, then, where the almighty strength lies because this is the expanding and/or extending field or, if you prefer to see it the other way around, the almighty gravitational field.

Keeping in mind the above facts, it seems to be clear that the equation under scrutiny will have to be adjusted. The most suitable candidate for it could be the first axiom of the theory herein expounded which reads: *time and space are physically created by an electromagnetic process, expanding in time and extending in space, to be identified with the existing electromagnetic spectrum*. The physical properties of this spectrum are well known. What is not known is that its gradation scale is, as mother nature dictates, embedded into space; and one and only one of its transverse sections is occupied and used by the speed of light. In other words, the electromagnetic spectrum in its nonlinear conformation circumscribes the entire range of electromagnetic radiations and it has the function of lengthening, during its expansion, all the wavelengths from cosmic rays up to the brain waves. The energy spent for the waves' lengthening is the same energy that pushes outwards to contribute to the expansion of the universe.

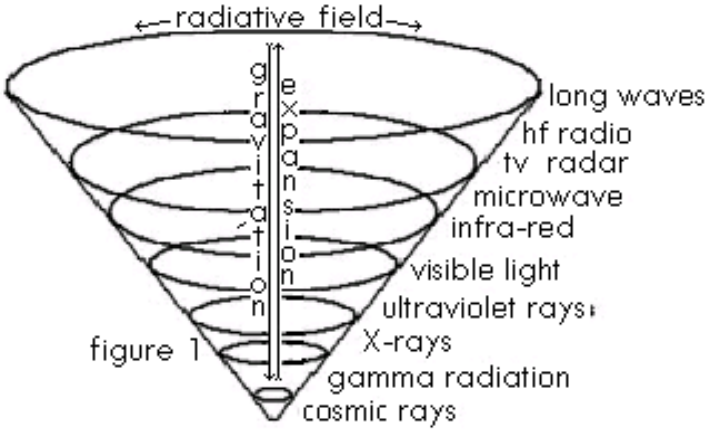

figure 1

Actually, the real McCoy is the physical process of creation represented here with a cone-like figure. For example, if we put the cone upright, as seen above, we can easily see all radiations running orthogonal to it. From the almighty little one at the bottom called cosmic radiation... to visible light confined half way through... to long radio waves. They all have the same speed of their maker, they all have a frequency range which belongs to their maker, they all have an inner structure belonging to a transverse section of their maker.

There may be a better candidate, of course, perhaps one equally suitable. In all instances it must have two necessary requisites:

(a) It must be able to move inside the nucleus and it must, therefore, have the radial speed of $3x10^8$ cycles per second to quantify the work done, and to honour the genius of Einstein who first formulated the equation, and

(b) All or part of it must oscillate in the frequency range of 10^{19} cycles per second and over, with wavelength less than 10 picometres to be able to prise open the nucleus and operate inside of it.

As the mathematically trained reader will have already resolved, to do the job of splitting two protons we need both, we need the speed and we need the energy. Think fast please. If the speed were the only thing needed, the third member of the equation could then be microwave radiation (same speed as c) or could be radio waves (same speed as c) or, on the higher energy side, could be X-rays radiation (same speed as c).

Back on track. How can we get energy out of dividing a length of nothing (empty space) by a mental abstraction (time)? Does it make any sense? For physical Science and physicists it shouldn't because a length of empty space has no physical properties and a second of time is even more aleatory. It does, however, make a lot of sense if we put away that *length of nothing* and that *mental abstraction* and accept that time and space are a product of nature and as such are themselves pure energy.

Am I then walking on scientific ground if I say that the only radiation allowed inside the nucleus is gamma radiation? Of course I am. The c^2 of old must be read and understood as: *gammarays*^{2} because that's what makes the equation work, because gamma radiation is the only radiation inside the nucleus. Not even X-rays are allowed to get through to the nucleus. Gamma radiation is the only radiation possessing both requisites. Here they are:

1) Energy: 1.24 Mega ElectronVolt just enough energy to split protons at will; anything less will not do.
2) Speed: $3x10^8$ cycles per second = $3x10^{20}$ (frequency range) multiplied by one picometer, that is, $1x10^{-12}$ (wavelength range).

I would now like to think aloud and pass some useful comments. (1) the equation works, the many successful atomic fission blasts can testify to that, (2) it is the speed of that c^2 and not the energy that translates itself into mighty strength, (3) the speed translates itself into strength because it is radial (it must, since it is inside the nucleus and operates within nuclear energy) and not linear as intended by Relativity, (4) the current formalism, that is: physicists, refer to that c^2 as the *speed of light in vacuum* implying, at the same time, a linear speed... up up and away, (5) I have proven beyond any reasonable doubt that the speed and not the energy generates the power of the all-important parameter c^2, (6) I have indirectly proven that there exists in nature a mighty strength (with the same speed as that c^2 able and capable of bursting into the nucleus and split protons at will, (7) I have identified this mighty strength with gamma radiation and given to it the notation C^2.

Yes, we know that the equation works. Yes, we know that the wavelength characterizing the speed of light is much too long and cannot even get close to the nucleus, let alone inside of it. Yes, we saw, and it was well known, that it is the speed of that c^2 quantifying the nuclear fission taking place inside the nucleus. By the way, it should have been the energy and not the speed quantifying the nuclear fission. If incited, radio waves, for example, could not do any harm not even to a fly. What then? Yes, we know that to split protons one needs a mighty strength which, inside the nucleus, can only be given by gamma rays. Any first year student knows that to split protons it is needed a neutron and that the fission generates new neutrons in the form of gamma rays. What has the speed of light got to do with all this? Nothing. Although it has the right speed to do the job, it cannot enter into the nucleus since its wavelength is much too long. Further, in the impossibility-type postulate that the speed of light were to enter inside the nucleus, its energy which runs in the order of 2 to 3 ElectronVolts wouldn't even tickle a proton, let alone moving it or pushing it into a corner. In point of fact, the idea, as I said earlier, is simply preposterous. It would be a different thing altogether if the guest were to be gamma radiation the photons of which have about 10.000 times as much energy as the photons in the visible spectrum. We can,

then, understand and explain the workings of that c^2, we can explain the why and the wherefore two or more protons are forced apart. Certainly, we can now thread our way through a crowd, we can blindly walk on familiar ground and we are, needless to say, at liberty to call it C^2 or give to it any symbol that comes to mind in this glorious and eventful first blush of the morning.
Back with my feet on the ground. Here to say that the old girl will have to finally wear a new dress. The last term of the equation is in all truth incongruent. However, if there is a similar or better candidate for the job, as suggested above, I shall be the first to acclaim the new comer. In the meanwhile, let me rewrite the old equation and introduce what will be the proper solution of it. Here is the old girl in her almighty suit of armour:

$$E = m\ C^2$$

where C^2 is the gamma rays range of frequencies and, I may add, the most suitable candidate that I know of. If Science is there to reconcile what happens in practice with scientific laws, then it is necessary to replaced the third member of the equation and its unscientific description, viz: [where c^2 is the speed of light in vacuo (measured in metres per second = linear speed)] with the right term and a proper specification such as [where C^2 is the gamma rays range of frequencies (measured in cycles per second = radial speed)].

Corollary

Looking back into the past, Einstein lived in a static world with an empy space; he made, nonetheless, good use of the speed of light which, in physical science, was and still is a very powerful tool to work with. Oftentimes, he used it as a *standard candle* or as a *radial speed*. See, time dilation, gravitational potential and, obviously, the case at hand. More often, however, we have seen and we see the speed of light as a *distance raunner*.
Nowadays, the world is expanding and space is filled with energy. It is against this background that we must see the existence of an electromagnetic process expanding in time and extending in space and the gradation scale of which is identifiable with that of the electromagnetic spectrum whose gamma rays are at home in the nucleus of an atom. This is of paramount importance to the theory herein advanced whose 1st axiom gives time and space *body,* gives time and space a physical structure. A length of space is not some *ad hoc* definition to suit a given operator, a length of space has an inner structure interwoven with extending magnetic and electric forces and fields whose filaments are extending linearly; likewise, an instant of time is not the offspring of a mental abstraction to satisfy a philosophical approach, an instant of time has an inner structure interwoven with expanding magnetic and electric forces and fields whose filaments are expanding radially. This is why, I should add, the speed of light can quantify a nuclear blast. It can do it because its speed is also the speed with which time and space are being created in an ascending sequence along the scale of the electromagnetic spectrum, from cosmic rays up to long waves which dwell in our brain, and therefore of all that which exists in our world. And it is because of the common speed tying up all electromagnetic radiations that brought about the improper usage of the speed of light in the equation under scrutiny.

Conclusion

As a final note, I shall now raise a question: is the idea of a process put there by mother nature too far fetched? For the die-hards, it certainly is. They may even go as far as tagging it *ridiculous*.

As for me, the humble creator, the idea is physically and mathematically sound. If you care to do some brief mental exercises, you can set your seal to what I have just said. As a matter of fact, if you accept that time and space are a product of nature created by an electromagnetic process in expansion and/or extension, you have found yourself with a clear picture of the inner structure of space. With this in mind, you will explain and put the word end (as I did) to all Relativity paradoxes, to all Quantum Mechanics paradoxes, to the wave-particle duality, to the incongruent two-hundred year-old two-slit experiment, to the frightening concept of nonlocality, and to all the rest. With a clear picture of the inner structure of space in mind, you will know what gravitation looks like, and you will explain the poorly understood origin of inertia. You will know the difference between energy and mass, and what makes mass distinct from weight. You will identify the electric charge and you will know why electric charges behave the way they do. After a hundred and twenty years of its discovery you will know what an electron looks like and what is its inner structure. You will know the photon's inner structure and why at interacting with matter takes the semblance of a particle. You will explain to yourself the *ghostly* behaviour of an excited atom in a resonant cavity. If you can do this and much, much more, you have moved much closer to nature, and you can step forward with long and rapid strides towards your glorious achievements. The price to pay for all this? Well, that's another story, and it is a long one.

To round off for the closing, I shall point out that by accepting the physical existence of the electromagnetic spectrum in its non linear conformation circumscribing the full range of electromagnetic radiations whose physical body is generated by an electromagnetic process which in turn creates the necessary filaments, Science will have found (i) the energy required for the expansion of the universe, (ii) the negative energy missing to satisfy the cosmological equilibrium, (iii) the scientific explanation for the existence of the universe, (iv) the *raison d'être* itself, and (v) the missing roots of *being and becoming* because the physical process of creation is an ongoing process from time immemorial.

This last sentence is inducing me to close my essay by going off on a tangent. Empirical evidence shows quite clearly that nature wanted to embed into space what Science calls electromagnetic radiations. We know that these radiations leave the microword to surface with a one millimetre wavelength in the fully expanded time dimension (our world) and cover it up as a snow mantle. Back in 1948 George Gamow was one of the few scientists to give a meaning to electromagnetic radiations leaving the microworld to surface in the macroworld at the blue end of the microwaves band of frequencies. Well, Gamow preferred to explain the presence of microwaves on all the universal surface as the *afterglow* left by the *big bang*. I preferred and prefer, as stated in other forums, to explain the presence of microwaves on all the universal surface as a tangible proof that electromagnetic radiations are here today to perform a precise task, and were there in the midst of time with the same task. They are leaving the indelible marks of their passage here, and left the same indelible marks of their passage there. They are nowadays surfacing in our fully expanded world with 1 millimetre wavelength here, and have surfaced in the fully expanded world billions and billions of years before 14 billions of years ago (big bang) with one millimetre wavelength there. This is the reality that we are seeing with our very eyes. This is what we all should call Science, and outside of it one can only tell fairy tales.

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7th of March 2018

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Causality and Logic

Subtitle: (The 1982 experiment of Alain Aspect et al revisited)

Foreword

The following three fundamental axioms are the foundation pillars upon which the proposition herein put forward rests.

I. Time and space are physically created by an electromagnetic process of temporal expansion and/or spatial extension to be identified with the existing electromagnetic spectrum.
II. Time and space have their origin in each and every electromagnetic pointlike point-source in free (optical) space as well as in matter.
III. Given (I) and (II), it follows that the speed at which time and space are created: (a) is the upper limit and dictates the physical laws in the world we live in (fully expanded time dimension), and (b) it is a function of linear and nonlinear motion in free (optical) space.

In particular, axiom (II) implies that space is permeated by an all-pervasive and permanent substance which I shall herein label *time-fabric,* meaning to say: a permanent non-zero source of energy. From this we may deduce that space is filled by pointlike point-sources which are magnetized by the finite and uniform speed of the expansion and/or extension. These point-sources during their decaying process form all lengths of time and all lengths of space. These lengths are the effective volume containing energy. The entire free (optical) space is, therefore, a universal unsaturated sink with continuous absorption because of the finite and uniform speed of expansion and/or extension.

Preamble

It is commonly known that Science is nowadays under the spell and guided by Relativity as far as the macroworld goes and even more by Quantum Mechanics for all the rest with particular reference to the microworld. Back in 1935, the scientists Einstein, Podolsky, and Rosen with their work EPR known afterwards as the EPR (Einstein-Podolsky-Rosen) paradox, tried to demonstrate that Quantum Mechanics was a theory basically incomplete. This experiment was followed by many others and the scientific debate between Einstein as the representative of the classical world where causality and logic are a daily reality and Bohr who represented the quantum world where both causality and logic have lost their significance, came to an end in 1982 with the experiment of the French experimenter Alain Aspect and collaborators. With this new experiment was reached, or better still was hastily reached, the conclusion that the laws of nature are fundamentally non-local, that is, in the world of the very small (microworld) the law of cause and effect showed itself to be non valid. So that, in a scientific bickering covering

two generations of scientists, Einstein and those that have embraced his line of thought have been just plain losers.
It is my view that an attentive look at our far and near universe, at everything existing around us, brings home the simple message that mother nature throughout the never ending billions of years has endowed the cosmos with a physical process of electromagnetic nature expanding in time and/or extending in space.
To demonstrate that I am on the right track, I would like, together with my readers, to revisit the Alain Aspect et al experiment considered to be the most effective bastion in defence of non-locality. Unlike the EPR paradox where we have coupled particles and spin, here we are dealing with photons and the mensuration of their polarization, rather than the mensuration of the spin components of the coupled particles.
My intention is simply to tie up with order and discipline some ropes left loose. The subject matter is complex and the Quantum Mechanics parlance is rather obscure. Let us slip into this crowded world and see what we can do.

Argument

It is my view, amply supported by my numerous arguments, that when the three fundamental axioms of the theory herein proposed will be part of our laws of physics; quantum theory, in its new suit of armour and free from the *uncertainty principle* and from the *wave-particle duality* burden, will become a creative body of knowledge and it can take the human race to technological heights never dreamed before. Having given my personal view on a theory; controversial, yes! but very productive, I would like to add that for a learned man surveying quantum theory, the all too many questions that remain without answers are simply intimidating. Apart from this, I shall now continue with my work to show what I wanted to say in the first place; that is, why the law of causality and logic must be reinstated. The winding road that we are about to undertake will eventually take us to a specific experiment thought to have settled, in favour of quantum theory, a disputation between Einstein as a representative of the classical world where causality and logic are constituent parts of a way of life and Bohr representing the quantum world where both causality and logic have lost their meaning.
In order to make the result of this well known experiment understandable, let me start by giving an interpretation of what in Quantum Mechanics is called *wave function*. In quantum theory, the state of a system is wholly specified by the wave function. In scientific parlance this means that the particle which by definition has a localized character is described by a spread-out wave function. The theoretical spread-out, according to quantum theory, may encompass the entire universe. For wave function here is meant the quantity specified by the matematical relation:

$$P_{(x)} = \psi^2_{(x)}$$

To be consistent with the probability interpretation of the above equation, we must think of the particle existing in some place since a probability is a positive quantity. To say it yet in another way: the particle's position is a probability proportional to the squared quantity of the wave function ψ(psi). Further, I shall say that according to quantum theory the instant of measurement is the actual registration of the result by some sort of electronic contrivance and it is also the instant that changes the state of a system from a quantum state (a superposition of here or there, dead or alive, short or tall) to a definite state (here, alive, tall, and so on).

At this stage of the experiment, even though there is no physical evidence of it, the wave function is said to collapse. Since the collapse; that is, the so-called reduction of the wave-packet (i) it is irreversible, and (ii) it may occur in seconds or in millions of light-years, I see another inconsistency in Quantum Mechanics within which (I) all processes are reversible in time, and (II) the time scale is not compatible with an automatic collapse. I shall herewith take into consideration what in quantum theory is known as *the measurement process* usually understood in terms of:

preparation for securing suitable measuring conditions
interaction between the apparatus and the object of measurement
recording the result which would cause the *wave collapse*

The apparatus needed to establish a nearness between the observer and the object observed is primary and its status is that of a system. The measurement itself is the act of ascertaining (i) the position or (ii) the velocity of the particle. It follows that a system in-between measurements exists only in a quantum state which is a mixture of position and velocity. From this, one may conclude that the system has no history in time. In recording the result, the wave function is said to collapse. A subtlety of the theory is that position, velocity (momentum), electric charge, and angular momentum of a particle are nothing but quantities we read from the measuring device, and therefore by themselves they mean nothing. These dynamical quantities, moreover, are represented by operators mapping an abstract mathematical entity called the *state vector*; or state of the system.

What follows is the interpretation of an experiment whose result was understood to mean that the law of causality does not apply to the quantum world and some say to our world. Throughout my work, I have reasonably argued that in any experiment of this genre what we are dealing with are not particles but real waves; that is, (a) imprinted waves in what is called wave behaviour of light and (b) torn away waves in what is called particle behaviour of light. Time has now come to get to the heart of the matter. As my readers can well see, I here need, ask, and obtain help from geometry.

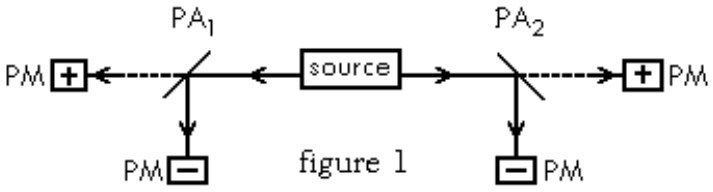

figure 1

The source of correlated photons is here an atomic cascade emission from excited calcium atoms. In the experiment, a stream of photons is sent from the source through two polarizing analysers PA_1 and PA_2 so that photons can be transmitted with vertical polarization and reflected with horizontal polarization with respect to the plane of light incidence. The correlation measurement (two correlated photons have origin from a single one) is done by the two analysers and the counting (counting the transit of photons) by the photo-multipliers PM set along the way. The set up is such that (i) the two polarizing analysers PA_1 and PA_2 are set at a distance of 13 metres, (ii) the time to cover this distance at the speed of light is 40 nanoseconds, (iii) any detection of a correlated pair of photons must not exceed the time limit of 20 nanoseconds, and (iv) this time limit would prevent any possible *telecommunication* between the correlated pair. It is claimed that any correlated pair (same photon with different polarization) is space-like separated; that is, the time required to communicate at the speed of light with each other is longer (40 nanoseconds) than the time given by the photo-multipliers (20 nanoseconds) to detect the correlation. Notwithstanding these precautions, there seems to be some sort of *conspiracy*

between the correlated pair. In brief, when one of the pair is in some way being interfered with, the other one reacts instantaneously. This phenomenon is nowadays known as *nonlocality* and it is strongly supported by Quantum Mechanics and its own adherents. The nonlocality is also understood to mean the end of causality as we know it. I say this because in the instant in which occurs the so-called reduction of the wave-packet, that is: the very instant that one of the two correlated photons reacts, our laws of causality and logic are no longer valid. This frightening resolution was, at the time, taken because, as it was amply challenged, the inequality in-between the two photons came up to be equal to 2 multiplied by the square root of 2.

Well, if one comes to think of it, and with respect to what I have argued up to here, it becomes clear that it is impossible to apply our causal laws to a quantum object. It is not possible simply because the state of a quantum object cannot be determined since we are not allowed to know both position and velocity. You see, a quantum object, as I have just indicated, has no history in time and if we try to uncover its past, we are only allowed to know either where it is or where it is going; never both. No history, no causality. The law of causation is nothing but a logical law wanting to say a law of correct reasoning which does not need empirical evidence to be proved in the same way that no empirical evidence is needed to prove that I am younger than my grandfather and older than my grandson.

Let me now leave to the quantum physicists a theory fraught with mystery and move on, together with you my readers, to witness once again history in the making. I shall begin by clarifying the following points:

a) A train of waves, or wave-packet in the visible spectrum consists at least of 1000 to as many as 1 million waves which correspond to what is called a single photon.
b) The electromagnetic signal carrying its own signature be it of wave or particle nature duplicates itself at the partition's branching off (two-slit, correlation spin, beam-splitter, etc.).
c) The phase shift is caused at the branching off where the source becomes double-source and it can also be increased by lengthening one of the two paths along which a duplicate signal moves.
d) If the signal is seen front on; i.e., from the point of enhancement (branching off) to the detection point, or vice versa, it must of necessity obey the inverse square law.

Here, we are not just recovering our laws of causality and logic, but we see another bastion crumbling to the ground. As a reminder, the interference fringes caused by light were first noticed by Francesco Grimaldi in the middle of the 17th century and later thoroughly investigated by Thomas Young. And as we have just seen, in the last fifty years or so, have become the battle ground for two opposing scientific views. This was particularly so where nonlocality and therefore causality and logic were concerned.

As a matter of fact, nowadays there is a long list of similar experiments aiming at finding an answer to a scientific debate initiated, as mentioned earlier, in the 1930s by Einstein and Bohr. These experiments are carried out with *light* and with *particles* and whether we consider electron diffraction, by-prism interference, spin-correlation, split-beam interference etc., they all have in common a very simple concept: a single source is changed to become a double-source which in turn (a) causes the light and dark fringes (interference); that is, it produces regions where the waves reinforce themselves and regions where they can interfere to cancel one another out; and (b) causes the quantum entanglement of the two particles; that is, the two particles although separated physically by a spatial distance behave in such a way to make one believe that they are still attached together as two parts of the same body.

As I have said at another forum, our world may be viewed in two distinct ways: nonlinear along the time expansion and/or space extension and linear transverse to the expansion and/or extension. When we look at a pencil of light sideways, we are looking at a telecommunication pathway where Maxwell's equations apply. If we were to look at the same pencil of light front on, however, we are looking at a light source where the inverse square law applies and where the quadrupole nature of gravitational waves (extension of space) prevents any form of telecommunication. If, for example, we consider the two photons from the view point of the source, we must of course account for the inverse square law.
From the above, may be deduced that the 13 metres existing between the two polarizing analysers are not covered by the *correlated pair* (polarized photons) belonging to the linear field, but rather by the wave which is extending itself in space in the nonlinear field. It does not exist therefore a communication as such between the *correlated pair* which have been forced along transverse directions; what we have instead is a spatial extension of the wave whose wavelength after 20 or 40 nanoseconds is no longer that of the original photon generated in the experiment. In other words, in exciting the vertically polarized photon we are exciting also the horizontally polarized photon being them one and the same thing; more precisely and to describe mother nature, what we are exciting is a train of waves which is extending itself in space in the nonlinear field.
In addition to it, I want to say that the wavelength of the photon in the above experiment is, roughly speaking, 500 nanometres; the intensity of the signal is proportional to the reciprocal of the square of the distance from the point-source to satisfy equation: force = $1/d^2$, the distance to be covered by the photon is the 13 metres existing in-between the two polarizing analysers. The safety margin given by the inverse square law is, then, some 12 thousand times the wavelength of the photon and this is more than enough to explain the so-called *nonlocality*.
In addition, it is to be noted that the process of extension is a local process; that is, the wave extends itself from a tiny length up to the length of 300 million metres. Consequently, the *nonlocality* that Quantum Mechanics arbitrarily extends to cosmological distances is a stance clearly unjustified, or to put it in another way: a statement with no scientific footing.

Conclusion

Although in the aftermath of the above the following becomes almost superfluous, I must mention that in quantum theory the state of the system is usually associated with the instrument; that is, the instrument is endowed with the primary role of being the *medium* through which the observer and the object being observed have made *contact*.
What needs to be done instead is to shift the primary role to the object being observed and its environment. It is this environment, moreover, that provides the characteristics of the time subdimension where the object belongs. It is this environment that specifies in a detailed form the filaments' function of electromagnetic radiations. Finally, it is this environment that can give its cycles' compactness and therefore the features of its space which in itself is one of a kind. For example, the wave function, in the above experiment of the polarized photons just described, it could and will be readily put in mathematical form such that:

$$|\Psi_t\rangle = \Sigma\, |\phi_t\rangle\, |\downarrow\uparrow\rangle\, |\alpha_n\rangle$$

where the (phi_t ket) is the wave associated with free (optical) space, the (up/down arrows ket) the polarization state of the photon, and the ($alfa_n$ ket) the energy proper of the environment.

The state of the system would then be defined by the time sub-dimension where the experiment is performed. This makes a lot of sense and it would spotlight reality a bit more. In particular if one thinks that every particle materializes itself in the fully expanded time dimension (our world), yes, but it comes from its own temporal world where the energy density per unit volume is unique to and characterizes that world.

To complement the above, I would now like to add that all the experiments mentioned here have been performed by operators who did not know and do not know that physical (optical) space is permeated by a permanent non-zero source of energy. For all of them the field hosts some sort of energy whose nature keeps on remaining elusive. An energy that the fathers of Quantum Mechanics, in their quest to find the necessary energy for the universe in expansion sustained in 1929 by the American astronomer Edwin Hubble, have found in such huge quantities to forget Hubble's expansion and dedicate themselves totally with diligence and zest to their own specialization. And it is this that are still doing today's Science and Scientists including the fact of not knowing how to quantize energy and clinging instead to the harmful uncertainty principle without realizing that they are looking at electromagnetic radiations existing in nature and that in their nonlinear conformation push outwards expanding in time, extending in space, and thereafter contribute locally and evenly to the expansion of the universe.

In addition to it, none of them was able or is able to make a distinction between linear and nonlinear field the way I have been presenting them in my work. None of them has the faintest idea that electromagnetic radiations in their nonlinear conformation are part and parcel of the universe and they were there much before the so-called big bang. None of them has ever spent a few minutes of his/her life to find out that electromagnetic radiations surface with the one-millimetre wavelength (the blue end of microwaves) in the fully expanded time dimension (our world) and cover it up as a snow mantle in the same fashion as they used to do it in the mists of time. Without such a background against which to experiment, it is (as any good footballer will tell you) like playing away from home in an unknown field permeated by thick fog. And finally, all of them should know that the wavelength has always been tied to time through the relations $f = 1/T$ and $f = 1/\lambda$ where it is shown that time has the same dimension of the wavelength lambda. What they do not know is that a similar relation exists between space and the frequency, that is: the number of cycles per second defines the type of space. Better still, the frequency gives the electromagnetic compactness of space. With a minor number of cycles we shall obtain a longer wavelength and a smoother and less energetic space. I am stating that space is quantifiable and that the uncertainty principle is not worth the paper it was written on. The electromagnetic universal network known as "electromagnetic radiations" exists in nature and its laborious filaments continue from time immemorial to weave time and to pave space. In my work I have endowed time with the mathematical quantity $1/(\mu_0\epsilon_0)^{½}$ whose reciprocal; namely, its smallest unit measure is: $3{,}335\text{x}10^{-33} = 1/T = f$. And this will signify that space possesses the inverse dimension of time.

As for the relationship between cause and effect, putting aside the revolutionary ideas of the quantum physicists, the reader with a hobby for science must willingly agree with me that John Bell in deriving his inequality did not intend to stimulate the French experimenters; it was instead Alain Aspect and his three colleagues who *proved,* without chasing it, the nonlocality of Bell's theorem.

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