

## BIO-QUANTUM COMPUTING

Pathways of mental change



Visual Instant Messenger

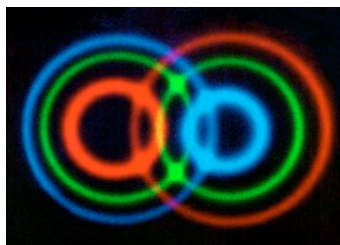
“SCIENCE OF QUALITY SERIE n° - 3- ”

“Through the inherent property of *IN-FORM-ACTION*, can be formed a new definition *Science of Quality*”

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Bio-quantum-computer research (1), introduced here, is considered to be a breakthrough technology with high expectations for a new generation of computers that work on a completely new principle, and that holds many possibilities inconceivable with existing computers (2). First of all it is necessary to start with some definition and a general knowledge of Quantum Computers innovation.

“**Q.bit**”, (3), indicated by  $|0\rangle$  and  $|1\rangle$  probabilistic state, defines the unit of information of quantum computers. Unlike the binary “**bit**” of current computers has only two possible states (**0**) or (**1**). The unit of measurement of quantic-computers, the “**qbit**”, uses a much more complex logic involving multiple states entanglement, enabling a new efficient processing of information. The Austrian physicist Erwin Schrödinger coined the term ‘*entanglement*’, to describe the peculiar connection between quantum systems, e.g. when **Q. particles** show a sharing interchange of information states. **Quantum Entanglement** corresponds to a non-local property of entangled particles forming a hybrid reticular network that permits us to calculate in parallel, multiple states of information simultaneously , unlike classical bits that have only one value at time. (4)



Entangled photons

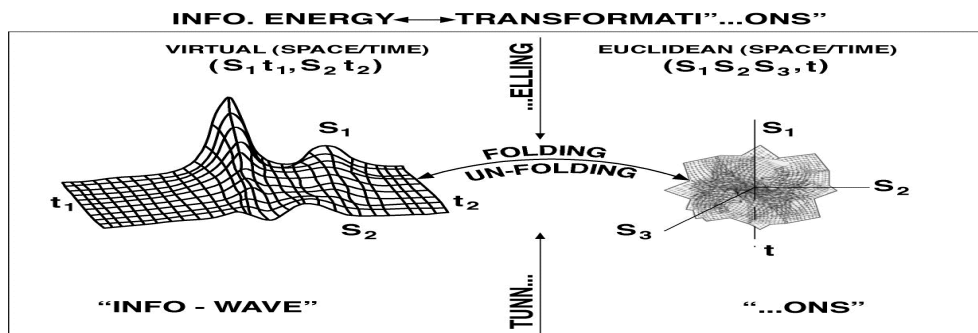
Therefore **Q. Entanglement** is the necessary ingredient of **Quantum Computation** (5) and can be referred to as a parallelism of states; a surposition of a set of simultaneous quantum state information. Transfer of this entangled quantum state to an arbitrary distant location is known as “**tele-transportation entanglement assisted**”.

**Teletransport** (6) does not exchange energy or matter but only pure information. Therefore tele-transportation in quantum computing does not allow communication of information at superluminal level because the transfer of information states happen simultaneously.

*The problem that needs an answer is to reply to the question: how is a simultaneous transfer of information possible when quantum particles becomes entangled? This question may require quantization of space-time dimensions to bond Quantum Mechanics with Special Relativity.*

### New Thinking on Space-Time Configurations.

Before a reply to the previous question, it is important to remember that major breakthroughs in physics are based on a change in the meanings of space-time configurations. (7). In fact, Einstein's theory of special relativity proposes a Space-Time distortion of the traditional Cartesian three orthogonal dimensions of space (3D) and only one time coordinate. Relativistic space and time are no longer split into two absolute entities because they belong together in a single continuous construct in four dimension space-time (4D) . It is important to remember that in an Euclidean space, solid bodied do not alter their size or shape when moved in it, while a fluid can alter both size and shape, but not volume when it is moved about. Conversely, in curved relativistic space we can observe, as in a curved mirror, that the reflected picture represent distorted figures in which forms and size and volume are dependent upon the position of the observer in a four dimensional (4D) continuum of the quadri-vector described by Albert Einstein. The observer cannot see the four dimensions; therefore Einstein said the relativistic curve of space-time may be conceived as a field where the curvature is caused by time. In conclusion, the special relativity view is maintaining the fundamental Euclidean perception of space shifted by time. Einstein's conception of unified space-time in complementary and interconnected 4D, nowadays needs to be modified to understand how entangled Q. Particles may take on superposition states, that combine parallel information energy as a simultaneous process. In fact we know that under experimental conditions, two entangled particles appear to influence one another instantaneously by means of a “*shared delocalized interchange*” of information. Hence entangled particles are interconnected informationally. Therefore those experiments of **Q.Computing** create an impact on contemporary science, allowing it to go beyond the model of over-simplified reality based exclusively on interaction of free-Energy (E) and Matter (M), with a very limited capacity to interpret information interactions, especially in relation to systems able to carry information at a distance. As a consequence, it seems difficult to understand *tele-transportation associated with entanglement* as an instantaneous non-local, exchange of information. In **teletransport** there is no involvement of energy (E) or matter (M) transfer. This is because interconnectedness of entangled particles only belongs to a transfer of pure information through a distance by resonance. For this reason, a solution can be found by introducing a new concept of “**information energy**” (I), as it is necessary to understand how (I) can interact with (E) and (M) to create all forms in the Universe. In this sense, this paper belongs to a talk-series whose goal is to open a debate on the “*Science of Quality*”. An analogy can be useful to introduce the “*In-Form-Action*” concept to understand tele-transportation as an exchange of pure information Energy. In fact we know that the superficial films of matter (M) has different cohesive properties of bulk in order to define the boundaries of the form in every substance. In a similar way, it will be possible to admit a complementary existence of a Superficial Information Energy (I), as a surface section of free-Energy (E), that contains the informational codex of the wave-particle states. Information Energy (I) can be transformed in Free Energy through a quantum-tunnelling effect.



**Tunnelling effect characterize the transcription zone of the various space-time forms between (I) and (E)**

### Informational and Physical Quantum levels of Space-Time

The above idea can be supported by considering that in Quantum Mechanics, space-time needs to correspond to a discontinuous reality. This allows us to rethink “**Information Energy**” from the entirely new viable scientific perspective of space-time configuration. In fact in Q. Mechanics, there is the possibility of obtaining two discontinuous “*quantic-regions*” of space time, in order to understand how the forces of nature are mediated not only by means of the exchange of Q.particles, but also through instantaneous pure information (I), e.g. without the travelling effects of free-Energy dispersion. For this goal it is necessary to split space-time into levels of “*Quantum Discontinuity*”, where at the

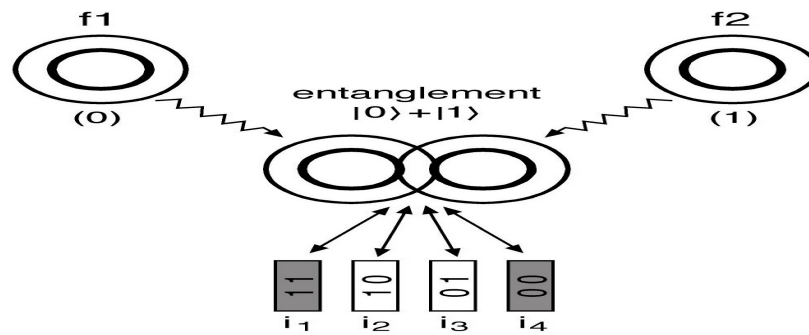
basic level, it takes the proper state the fundamental field of Information Energy (I) based on non Euclidean geometry, while at a higher level there exists the energy/matter interactions dimension, working on classical space-time architecture. The first level can be generated in a way that an “*entangled particle*” would be able to collapse in a composition of space and time structured as a planar morphology composed of (2D of Space + 2D of Time) , e.g composed by a one bit of space dimension (s1,s2), plus one bit of time dimension. (t1, t2). This basic quantic-level of space-time structure, is an expression of pure information Energy (I), that belongs to a special paradigm of pure “*information energy*”.

The second Q. level of the differentiated structure of space-time, is generated by the E/M interactions and exists in a second order of space-time in an Euclidean architecture based on 3D of space dimensions + 1D dimension of time. Lastly, the complete interaction of Quantum Energy levels in space/time, e.g among (I)+(E)+(M), gives all possible combinations to create the forms acting in the four dimensions of the universe (4D) where past, present, and future all exist simultaneously, as Einstein suggested in his later research on general relativity. Those quantised levels of 4D space-time permits separation of the “*information energy*” (I), as a virtual or potential energy, that can be transmitted in a flat 2D-space as a wave, where the 2D of time allows the field of information to be exchanged simultaneously. This is because the exchange of information does not respond to a linear dimension of time flow in a causal succession of past and present. The Euclidean dimension of space-time can be found again by the “*info.waves*”, through a reversible tunnelling or similar effects. This operation is capable of transforming the pure Information waves in photonic free energy. The last, existing through a folding operation from the fundamental Q.Bits. by means of a space coordinate transposition into a time coordinate, giving a way to jump up from the Virtual Space-time of (I) to the Euclidean domain of Space-Time of (E)/(M) interactions. Hence, the folding operation acts as a “space  $\leftrightarrow$  time transposition” that can be seen through an image, visualizing when a de-localized wave component of the virtual wave informational field collapses into a localised vibration in a way that a component of time of information energy becomes visible as a third component of space.

In conclusion, the quantization of the 4D of space-time into differentiated levels permits reference to the science of communication as two complementary discontinuous “*quantic-regions*” of space-time with different paradigmatic properties. In the first level, we assume the existence of *pure information energy* (I) able to communicate by means of tele-transposition. In the second level, there can interact two forms of Energy e.g. free-Energy (E) and condensed Energy (M), in a coherent dimension of ordinary Euclidean space-time .

It is important to underline that as a consequence of spitting the Informational from the Physical Quantum levels of space-time, the traditional Q. physics and special relativity, did not disappear, because the breaking of the old paradigm of science is no more based on an unitary generalized dimension of space-time. It regards only the fundamental level of pure Informational energy, and does not change the higher level of space time of E/M interactions. Therefore, this theoretical innovative approach of quantized space-time permits a mature science, a multiple view of understanding science and allows us to go beyond the classical limits of scientific disciplines. In it, we may find a solution to the emergent properties of the quantum level of “*Information Energy*” in terms of a theoretical integration with our former perception of science. In fact, in classical physics, **information** is considered a discrete entity living in time and space so that matter, energy, and also information are considered localized entities having particular space coordinates in relation to only one coordinate of time. Rather, in the *quantum informational substrate of (I)* , for the reason that it works without E/M collisions , it is possible to transfer information with zero consumption of energy e.g by means of **Q. teletransport**. As a practical consequence in the Informational level, Information Energy cannot be copied. This is because the non locality of Information permits the advent of four superpositions of parallel states working simultaneously, where a change in one state modify the complete assembly of shared informational states. This statement it is important, for instance in sending encrypted messages of pure information as in a money transfer. In ending the old way of thinking about quantized space-time, there is a gain in coherent scientific thought. This is because it would include not only the observer, but the observer's world creative view in a way that shows physical laws also operate effectively in the qualitative dominion (e.g. rather than only in a physical quantitative field. Using the quantized paradigm shift, it may be possible to understand, for instance, how unobservable energy can be generated from the vacuum and other experimental data that are not explainable by conventional hypothesis of traditional science. Finally the quantization into different levels of 4D space-time opens up a new realm of experience in a way that was not possible in the unified conception of space-time.

Beyond entanglement  
simultaneous processing  
of a new "form" of information



Creating a new Quantum Physical conception of space-time levels significantly changed the way computer technology is used and perceived. Despite the immense practical achievements in creating faster Q. Computers, able to operate in parallel simultaneous delocalized areas of information, we need to understand that in the state of unstable entanglement, the multi-states cloud the information energy so that it can be processed only through a probabilistic domain. Conversely, after slowing down from unstable entanglement to the *Energy of Information level*, ( $I$ ) in the fundamental informational state, calculations can be made in terms of pure (or virtual) Information Energy and hence can be transmitted through tele-transportation. This is because it may not need to be converted back to a photonic or matter-based space-time format of E/M interaction. In the entangled mixed state of wave-particles, the transmission of information cannot be instantaneous, because of the limits of the speed of light in the Euclidean universe, while the simultaneous information-processing, at the "Q.bit Level" of space-time, can be made by means of parallel states in a non-probabilistic manner. Computing in this .Q.Bit.Level permits us to understand the nature of Information Energy. In fact, while the result of the operation  $(0 + 1)$ , handled by the normal information processing of conventional computers gives a 50% probability of obtaining (0) or (1), the Entangled State  $(|0\rangle + |1\rangle)$  when slowed down to the fundamental informational Q.Bit Level, generates four parallel combinations of Q. Bits. The result of computing, this way is to obtain the parallel multiple state, named **(11,01,10,00)**. Two of them are symmetric (**11 and 00**) and the other two are anti-symmetric (**01,10**). This is an important difference because the boundary condition of symmetric configuration of pure information do not permit any folding activity through tunnelling interaction. This is because the symmetry forbids any polarization of the symmetric states ( $i_1, i_2, i_3, i_4$ ) of pure information. Nevertheless, the anti-symmetric field (**01,10**) can be folded, passing through to a transition zone where can be skipped up to the second level of Euclidean space-time, and can possibly interact between energy and matter belonging to the same level of Euclidean space-time. This consideration implies that quantum computing can be useful to speed up pure virtual information processing, to simultaneously transfer pure information energy, that is only partially transformed into physical phenomena working in Euclidean space-time. To understand the previous considerations in simple words, you can think of a test with a switch and a light bulb; so that in order to ignite the light you will have to push ON (e.g. **(01)**-state transition) and to close the light you need to push OFF (e.g. **(10)**-state transition). Nevertheless, in the case that you push twice ON-ON (e.g. **(11)**-state transition) or OFF-OFF (e.g. **(00)**-state transition), you will obtain no interaction between energy and matter that allows you to ignite the light bulb. Anyway, both 00 and 11 states are effective information through which you can learn about light phenomena.

### BIO-QUANTUM COMPUTERS

The spitting in Informational and Physical Quantum levels of Space-Time can be imagined as a gateway to a new challenge in Bio-Computing, dropping down to the fundamental quantum existence of *virtual information*. One of these challenges will be to utilize the above concepts and rules of bio-quantum physics to develop Bio-Quantum Computers (8). In fact, DNA gene-communication can use both: 1) the localised copy of genes and also can have 2) a simultaneous delocalized role in communicating gene information. In fact DNA, as a nano-biotechnology, can utilize two functions to communicate: 1) through transfer of quantitative localized information by near contact with RNAs to generate proteins, and 2) to diffuse qualitative information by means of working as an ANTENNA able to transmit at gene signals at a distance, using a system of quantum-teletransportation. This second method of gene information by means of simultaneous transmission is necessary to activate the co-ordination of various living functions in the cell as well as for developing the complex cellular dynamical reproduction of forms, e.g to control the functional complex folding of DNA and proteins, and to co-organize the metabolic functionality until the programmed apoptosis of the cell. (9) Henceforth, following the above quantized space-time theory it is becoming evident that Bio-Computers could be made from organic materials using DNA.

The historical background to understand the possibility of developing Bio-Computers using the structure of DNA, has its roots in the late 1950s with the hypothesis of Nobel laureate Richard Feynman that first introduced the

concept of computing at a biological molecular level. Feynman's creative idea, was realised in 1994 when Leonard Adleman performed the first molecular-level computation using DNA. In contrast to conventional computers that operate through linear sequencing taking on one task at a time, the Alderman's preliminary experiment revealed the distinct advantage of the DNA approach in “*parallel processing*”, allowing DNA based computers to solve very complex problems quickly. Hence DNA can be considered as a nanotechnology material that will result in faster computing by enabling massively parallel computations. A recent version of a bio-molecular computer, (developed at the Technion-Israel Institute of Technology) - is mostly composed of DNA molecules and enzymes, as described in the March 2005 issue of the Journal of the American Chemical Society. Computations are carried out by processing the input (double-stranded DNA molecules) with the help of enzymes that cut and reassemble the DNA in a series of steps. The output is a new form of a slightly altered DNA molecule. Nowadays a better examining how organisms solve problems of “*bio-communication*” can lead to new methods of bio-computing. For this scope it will be necessary to deeply understand how cells and environment can interact by means of a dialogue at a distance and in real time among the various component of living systems. Anyway, the complexity and viability of DNA driven computations will be dependent on the difficulty to set up the experiments on “*bio-computers*”, since it will be of extreme importance to develop an open scientific-creative culture that will provide useful experimental guidance in the future “*Science of Quality*”. Hence, for implementing this contemporary challenge to raise the level of common thinking, it is not only necessary to establish a rational set of theories for a trans-disciplinary modern culture including science, art and humanities, but there is also a need to design new ways of visualizing a contemporary system reasoning to be more able to construct new insights into the qualitative relationship between physical realm and virtual reality.

Artists often look at the same object of changing concepts of quantitative-mechanical science, from different perspective and use different media to represent the same historical need to create a mental change to enhance the knowledge-based bio-economy.

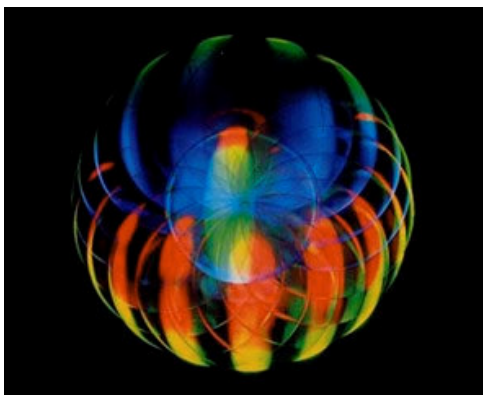
In any case there are many similarities between artist's and scientist's creative imagination, so that it is possible to share conceptual innovation between modern art and the science of quality. For instance, it can be seen through the common appreciation of “*entangled beauty*” (11) that works as a contemporaneous idea in science and in the art of natural systems evolution (12).

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***FLOWER- CAT = ENTANGLEMENT in ART***



*3D- Hologram : The Science of Beauty*

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