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The consciousness-holomatrix – the cornerstone of super-metatheory

Due to the latest discoveries in the field of modern theoretical physics – regarding the information theoretical approach to unified theories and the laws of physics –, and consciousness researches, new possibilities have opened up in understanding the reality and the role of consciousness in it. As a consequence of these new findings, today we are in a position to understand this universal information field as a field of consciousness, and with that there is a possibility to model consciousness and the conscious mind. These new approaches, together with my consciousness-holomatrix hypothesis (self-generated holographic information or organising matrix) and its unifying principle, could give us the cornerstone of super-metatheory because the fundamental logical structure of the super-metatheory, as the unified theory of all sciences, religions and philosophies, is found in the self-generated logical structure of human consciousness or conscious mind. With the knowledge of the conscious mind's ability to organise, cognise and understand reality we are in a position to analyse the consciousness structures or manifolds of the reality-analysing and mapping sciences and all the other ways of gaining knowledge which could be called as particular consciousness-holomatrices of a given science. With the universal holomatrix generation principle at hand we are able to build up or express the integrated matrix of all the particular consciousness-holomatrices, which could finally give us the unified logical structure of all sciences. With the help of this new principle, science would be closer to answer the yet unanswered questions and to directly translate these findings into technological utilisations.

"Humanity will never solve its problems until we understand how we think."

Albert Einstein

The connection between metatheory and consciousness

In the last few decades a growing interest appeared in finding an integrated or metatheoretical understanding of all sciences, religions, philosophies, and arts. Such a research pursuit is not really new, since in the history of thought, or more importantly, with the appearance of the scientific method of gaining knowledge, there was a great effort to find

a common foundation of the above mentioned disciplines, and to formulate a unified framework of them. The reason for this newly appeared interest today is that our scientific understanding has reached such a depth, and brought up such new connections and overlaps, that the need, and the possibility to formulate a unified or metatheoretical viewpoint became inevitable. One of the most important thing in this regard was the 'new' recognition of the important role of consciousness or conscious observer. We 'newly' realised that any kind of knowledge, be it scientific, religious, spiritual, philosophical or related to art, is baseless without a complete understanding of the knower. At the same time, without a complete understanding of the logical mind-structure of the knower, and its relation to the process of gaining knowledge, the aimed unified or integrated metatheoretical approach is baseless too. In our paper the important epistemological role of consciousness will be presented in the light of the latest discoveries of modern physics and consciousness researches. These findings, as we will see, could be harmoniously related to each other, and their integrated study could lead us to formulate a consistent physical model of consciousness, which could be applicable in other disciplines as well. Our final target is to formulate such a universal and unified model of consciousness and conscious cognition, which could be used as a super-metatheoretical[1] framework in the process of unifying every humanly cognised knowledge structure. And this is indeed possible because consciousness, as a unifying principle, which unites all the avenues of gaining knowledge, is the basis of the super-metatheory too. In our paper only the underlying principles of the different theories will be presented – since in our case this has the only importance –, and for those who are interested in their details, for further reading we listed up the most important literatures in the bibliography.

[1] The term 'super' was used to show that this theory is more and is beyond of the different metatheories of the given disciplines, although their unifying principle – the method which generates their fundamental abstraction level -, as we will see, is the same.

1. The latest findings of modern physics

The reason why the last few decades in the development of modern theoretical physics is so important is because during these years physics itself went through a *metaprocess*, which means that it started to unify and integrate all of its knowledge which has been gained since of its birth as a science. The basic motive behind this research is to find a unified understanding of all physics, expressed in a compact mathematical formula in such a way that all known physical equations could be derived from it. If found, this theory would be the metatheory of physics, which, as a framework, could be used in other disciplines as well, because as a final pursuit physics – like every other discipline – has turned its attention to the phenomenon of consciousness or the conscious observer, and its basic role in nature's functioning. But first, let us briefly summarise and present the basic ideas of this unified theory, which has been found by physics as the possible foundation of the physical reality.

The idea of a unified theory of physics was originated from Einstein's works, who, after discovering his general theory of relativity, found it possible to formulate a unified field theory of physics based completely on the geometry of space and time. After the discovery of his famous special theory of relativity, with 15 years of theoretical work Einstein found that extending his relativity principle to accelerated motions, Newton's law of gravity could be explained as a phenomenon caused by the geometrical wrapping of spacetime, more precisely, by the curvature of spacetime. So the found links between gravity, accelerated motion, and curved space led Einstein to the remarkable suggestion that the presence of mass-energy, such as the sun, causes the fabric of space around to wrap. A useful, and oft-quoted, analogy is that much like a rubber membrane on which a bowling ball has been placed, the fabric of space becomes distorted due to the presence of massive object like the sun. According to this radical proposal, space is not merely a passive forum providing the arena for the events of the universe; rather, the shape of space responds to objects in the environment. This wrapping, in turn, affects other objects moving in the vicinity of the sun, as they now must traverse the distorted spatial fabric. Using the rubber membrane-bowling ball analogy, if the bowling ball is present and thereby wraps the membrane, the ball (or energy ray, like the ray of light) bearing will travel along a curved path, as shown in Figure 1. That is, an observer placed on the moving ball, will feel as if an attracting force acting on him and on the ball, creating the phenomenon of a gravitational force.

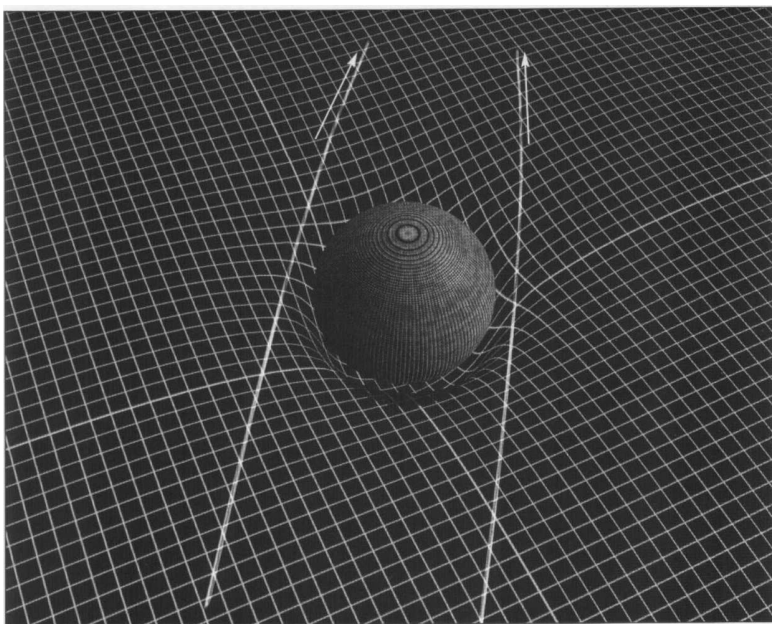

Figure 1: The presence of mass, such as the sun, causes the fabric of space around to wrap, creating an accelerating, gravitational force like phenomenon.

Understanding all this Einstein went further and postulated that it would probably be possible to derive all the known forces of nature – namely the electromagnetic, the gravitational, and the atomic forces – from the long and small range distortions of the spacetime fabric. Because of our incomplete knowledge about the laws governing the elementary particle interaction in that time, his pursuit to formulate a unified theory of all physical forces was not fruitful. Thanks to the discoveries made in the

last few decades in the field of particle physics, today we are in a better position to formulate such a unified theory, known as the 'Theory of Everything'. The best candidate theory to achieve this goal is called superstring theory, or M-theory (which is a possible unified theory of the different string theories). The fundamental problem, already in Einstein's time, in formulating a unified theory of all the known physical interactions, was the incompatibility between quantum mechanics, describing the governing laws of the micro-world, and general relativity, which applies to the large distance scale behaviour of nature. This incompatibility could also be described from the fact, that the general theory of relativity is a classical theory, which means that its equations are well-defined smooth equations, while the equations of quantum mechanics are dealing with quantised or discrete valued probability functions. An other important finding of quantum theory is the recognition of the importance of the observer and its effects on the physical processes. These effects of the observer or observations are manifesting themselves during quantum measurement processes, where the observed object – like a particle – is sensitively reacting to the actions caused by the observations, which phenomenon was mathematically expressed in Heisenberg's famous uncertainty principle. According to this principle, we are not able to measure the position (dx) and the momentum (dp) of a particle, e.g., an electron, at the same time, because during the measurement of its position the measurement process disturbs so much the particle's momentum that its precise determination becomes impossible. The only thing we could determine is the product of the two, so called complementer quantity, which always vary between a well determined limit: $dxdp \geq h$ (where h is the so called Planck constant). This fact, that in the quantum domain our knowledge is forever indefinite due to the measurement process, or observation, caused serious philosophical or epistemological problems, which has not been answered yet. To find a possible answer to these questions let us make a closer study about the above mentioned string theory, and the viewpoint it makes about our physical reality. String theory, as the best candidate in the history of science to unify quantum mechanics and Einstein's general theory of relativity, due to its rich mathematical structure offers better possibility for us to more precisely define the role of the observer, and to answer the related philosophical questions.

2.1 A brief summary of the basic ideas of superstring theory

With the help of string theory, which offers a unique framework to integrate all known physical understandings, we are able to present the developments and essences of our physical theories. This could shed more light on the searched *metatheoretical* principle, which could be than related and compered to the latest discoveries of consciousness researches.

String theory is a more refined version of the so called quantum field theories in a way that, compered to the usual field theoretical approaches, where the elementary quantum particles are represented by mathematical or null dimensional points, here these point particles are replaced by elementary one dimensional strings or energy threads.

This step was necessary because the concept of a null dimensional point particle has no room for the concept of extension and inner structure which is very important, as we have seen, in formulating a geometrical understanding of the gravitational force. These elementary strings, whose length are equal with the so called Planck length (10^{-33} cm), could be seen from the macroscopical level as point like particles, but because of their extended or one dimensional nature they could account for the finite geometry necessary for the quantum description of gravity. At the moment string theory is not able to offer any plausible answer to the question, why actually the concept of a string has to be used, and how these strings are created in a fundamental way? So in the theoretical framework they should be treated as axioms. These strings, in respect to their length, could sustain stable stationary waves – just as a twanged guitar string -, and store, in respect to their wavelength and amplitude, energy.

According to the famous mass-energy equivalence ($E=mc^2$), discovered by Einstein in his special theory of relativity, these stable or resonant oscillations or stationary waves could be related to the different massy particles of physics, offering an elegant way to describe their quantum field theoretic interactions. Thus, string theory could describe in an integrated or unified framework those quantities and qualities of nature, which were described and studied by separate, and single quantum fields in the past. Naturally the question arises that what kind of space these elementary strings are living and moving, since, in respect to their length, they are existing outside the so called classical spacetime regime, moreover, spacetime itself is created or projected by these strings and their interactions. The space where these strings are exists is called *hyperspace*, which consist of, according to our present understanding, 10 spacetime dimensions (or 11 in M-theory). From these 10 dimensions, 9 are spatial and 1 is timelike. From the 9 spatial dimensions 6 are compactified or curled up into a wide spectrum of exotic shapes, so they are not spatially extended like those 3 which builds up our well known space, but could express their effects on the subatomic and atomic scale. Thus, these tiny strings are performing their oscillations and movements in this exotic space, forming, as we have just said, exotic multi-dimensional forms or manifolds (see Figure 2.), which are called in the literature as world-sheets, or lately as membranes (like p- and D-branes, where the term 'p' denotes the dimensionality of the given brane, so a three dimensional membrane is called a 3-brane), whose mathematical structure, when it is mapped to lower dimensional spaces (like our 3-dimensional space) could yield back their well known classical fabrics.

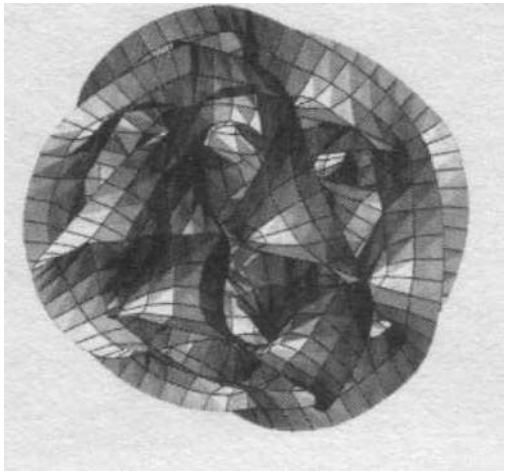

Figure 2: Compactified multi-dimensional Calabi-Yau space in two dimensions

Now we are well prepared to understand why – because of the use of mathematics, as the *metaspace* or *metalanguage* of physical sciences – all physics is actually the expression of the intrinsic logical structure of our mind, and that the existence of the above mentioned higher dimensional spaces are the indications of the multi-dimensional nature of our consciousness. In all areas of physics – mechanics, electromagnetism, quantum mechanics, etc., - we are assigning abstract mathematical spaces to the studied phenomenons, in which the given phenomenons or interactions are expressed by single functions or function spaces, where these equations are selected out form the possible solutions with the help of the so called action principle. According to this principle, every phenomenon in nature are following the principle of minimum action, which means that they are approaching equilibrium in their dynamical evolution in time. This principle is expressed mathematically by the famous Euler-Lagrange equation and its 'action' integral. In the case of mechanics, this abstract space, over

which the Euler-Lagrange function and its integral is defined, is called phase space, while in the case of quantum mechanics it is called *n*-dimensional Hilbert space or complex vector space (because this vector space is defined over the complex plane). These abstract spaces could be seen as information spaces, in that sense, that in them the real phenomenons and their constituents are expressed by the particular components – e.g., vectors and their transformations, different vector or scalar functions, manifolds and their shapes and topologies, and other mathematical properties – of the given space, where the only relation to realty is the fact, that among the many possible functions and function spaces and their mathematical properties, just few are related to measured quantities and properties of the given phenomenon. That is, the measurements and the data, as information, would not yield physics in itself if we would not find – through the use of our conscious mind – logical relationships between the measured data and reality. And if the theory is correct, hence it is able to give correct predictions about the given phenomenon, this would mean that there should be a close relation between the governing 'logical' principle of the phenomenon and the logical structure of our mind, probably the two are, in reality, one and the same.[2,3] This could be even more radically seen in the case of superstring theory, where, according to our present understandings, to mathematically study the rich dynamical properties of the strings, and their interactions, we should – directly or indirectly – use all known higher mathematical concepts and theories.

Thus, we found that the most precise theory of nature is utilising, in its framework, all the logical fabrics and processes of the mind, hence the foundation of reality is actually the precise physical projection of it.

In short, the correct unified theory of nature should present to us the precise mechanics of the conscious mind as well.[4,5] This is actually proved by the fact that at present 'no one is smart enough to solve the field theory of strings or any other nonperturbative approach to string theory'.[6] To solve this great problem, physicist and mathematicians would need a kind of a unified theory of mathematics (this could probably be the so called 'topos' theory), and its related logical structures (see matrix logic), which could help us to uncover deeper layers of the logical structure of our mind. To accomplish this, as we will see in the next paragraph, and in the paragraph dealing with the latest findings of consciousness researches, is a reachable possibility today, giving a great hope for us to be able to formulate a unified 'metatheoretical' framework of physics and the conscious mind. Now let us turn back to our original assumption, and give a simple logical proof about the multi-dimensional nature of consciousness.

The fact that we are able to logically think, in theoretical and mathematical way, about higher dimensional spaces imply that the inner structure of consciousness is sweeping through the fabrics of these spaces, and is able to transfer their logics to lower dimensional ones. How to prove this assumption? Well, if our logic would follow, and would be restricted to three dimensional degrees of freedom only, than we would be not able think about the higher ones, since our three dimensional thinking would give a final limit to our ideas, which is not true in

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[2] Wheeler, J. A.: *Proceedings of the 3rd International Symposium on Foundation of Quantum Mechanics*, Tokyo, 1989, in which Wheeler writes: *"All things physical are information-theoretic in origin and this is a participatory universe… Observer participancy gives rise to information; and information gives rise to physics."*

[3] Wigner E. P. (1967). *Symmetries and Reflections*. Indiana University Press.

[4] Penrose, Roger (1989). *The Emperor's new mind: Concerning Computers, Minds, and the Laws of Physics*. Oxford University Press, Oxford

[5] Stern, A. (2000). *Quantum Theoretic Machines*, Elseiver Science B. V, Holland.

[6] Kaku, Michio (1994): *Hyperspace – A Scientific odyssey throgh the 10th dimension*. (page 170) Oxford University Press, England.

our case. A three dimensional thinker could have a clear vision of the two dimensional reality, since it is part of its existence, and his three dimensional viewpoint offers a clear look at the plane, which is not true in the case of a being embedded in a plane-world. The fact, that there is a clear relation between the multi-dimensional structure of the final theory and our reality, shows that the principle of consciousness in itself is multi-dimensional; hence it is able to offer a clear and logical vision about its lower dimensional fabrics, which could be clearly seen in one of the latest findings of string theory. There appeared few years ago a new method in string theory through the use of which the more precise mathematical structure of the theory could be looked for. Our consciousness-holomatrix hypothesis is a possible step, and extension in the direction to define the inner fabrics of this principle. This method is the so-called *holography principle*, which could be briefly summarised in the following way:

> Holography principle: *Consider a manifold* M^{d+1} *(bulk space), that is, an abstract* d+1 *dimensional bulk space and its fabric, with boundary* N^{d}. *The holography principle postulates the existence of strong ties between certain field theories on* M *(like string theories) and* N *(like field theories in three dimensions) respectively* (G. t' Hooft, Susskind).

Through this method or principle we are able to mathematically transform or map higher dimensional manifolds to lower ones, which, according to the above mentioned simple proof, indicates that the fabrics of the mind and consciousness is also obeying this principle – which is also true in that case, if we are willing to derive consciousness form the neuronal activity of the brain matter, since this principle gives a more refined understanding of the fine structure of matter and its related laws! In short, we could safely say that through the holography principle, the multi-dimensional structure of consciousness is able to express itself in the three dimensional fabrics of the mind and of the waking state, thus, there exists a close 'holographical' relationship between these two realities. The latest findings in the field of consciousness researches, as we will see, are offering good proofs about this assumption, and could give us a plausible way in formulating a mathematically more precise theory of this principle, which will be 'holographical' not just in principle, but also in its detailed physical structure. Discussing all this, let us now turn our attention to those theoretical frameworks, which could help us, in relation to string theory, to define and formulate the reality creating and cognising principle of our consciousness and of the conscious mind.

1.2 Matrix logic – expressing the fine structural relationships between the human mind and reality

The discovery of matrix logic and its mathematical structure is the outgrowth of the genuine theoretical physicist and mathematician August Stern's researches, whose work has not got as much attention in science yet as it deserves. To present the basic ideas of this new extended logic theory and its important role in sciences as a whole, I would like to cite Stern's introduction from his book: *Matrix logic and the Mind*.

"Mathematical description is essential to the scientific method. Whereas classical logic was devised mainly to articulate and communicate logical truths, the use of symbolic notation has brought logic closer to the realm of mathematics. However, in spite of major advances symbolic logic has not yet attained a genuinely computational status. Though the boundary between logic and mathematics is somewhat vague, it is nevertheless real and significant.

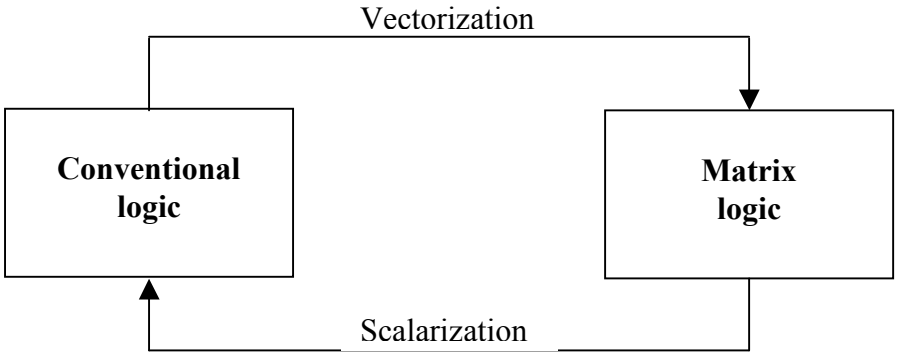
The primary goals of my researches are to close the gap between logic and mathematics and to bring logic fully into the domain of the exact sciences. Introducing the concept of logic space and interpreting logic connectives as matrix operators acting in two adjoint spaces of logic vectors, we develop the fundamental operator formulation of logic. The discovery of

links between logic and vector spaces leads to a coherent theory, in which the power of direct mathematical commutation is for the first time applied to the complete set of logic operations. The application of the powerful mathematical apparatus of matrix algebra allows us to describe logic transformations as operations of symmetry in logic space. The formalism that is developed displays new deductive and inductive power, since it not only allows us to derive the classical results of conventional logic but also permits their generalisation, making available new techniques of logic inference. Applicable in wide variety of fields, matrix logic demonstrates a great potential, making it a useful tool with a broad spectrum of theoretical and technical applications in computer science, fundamental physics, as well as in mathematics and logic themselves.

It is necessary to emphasise that matrix logic does not reject conventional logic. The significance of the new formalism resides in the fact that, in addition to generating new important results, it also incorporates in itself conventional logic as special scalar limit. Therefore, conventional logic can be formulated, if necessary, in the form if matrix logic equations. The converse, however, is not universally applicable.

The study of logic has hitherto been carried out by developing and investigating different forms of scalar logic. However, deciphering the puzzles of the mind requires not simply a modification of scalar logic but an entirely new generalisation, in the same way as in physics we describe different phenomena with clearly distinct quantities such as scalars, vectors, tensors, and others. The important innovation that is introduced in matrix logic is that we place at the foundation of logic not scalar values but more complex mathematical objects, namely logic vectors and logic operators, joined eventually into the more general concept of a logic tensor. Following this line of reasoning we begin to understand that the field of logic truth is much wider and the structure of logic connectives much more complex than was previously recognised.

The concept of logic space is instrumental in revealing the tensor nature of logic quantities: the logic scalars are obtained as the inner product of logic vectors, and the logic operators as the outer product of the same logic vectors. Consequently, the logic vectors alone become sufficient for the construction of the logic theory. We obtain conventional logic by scalarisation of matrix logic, whereas vectorisation or more generally tensorisation of logic values is required for the reverse transition:



With the range of computational capabilities, matrix logic solves problems inaccessible to other forms of logic (like Boolean, multi-valued, tense, quantum and fuzzy logic). It allows us to study logic connective operators in isolation, just as differential or integral operators are examined in mathematics and theoretical physics.

One of the fundamental results of matrix logic is the possibility of direct interaction of logic connectives. Inconceivable in conventional logic, the interaction of connectives introduces a higher level of abstraction.

With the logic operations becoming genuinely mathematical operations, we extend logic into the domain of modal continuous values (allowing logic formulations to be extended into the domain of Hilbert space and Lie-groups and Lie-algebras). Furthermore, exploring the potential of matrix operator formulation, we are able to derive both discrete and modal logic from the same formal base!

A conspicuous result of continuous matrix logic is a significant enlargement of the set of logic connective operators. There is a trade-off between a weakening of the integer logic values with the transition from discrete to continuous universe and an increase in the operator power of logic, with a concomitant decrease in the number of forbidden logic interactions.

Applying the concept of the matrix inverse to logic operators, we further extend logic into the domain of negative logic antivalues and associate them with the logic of antimatter in the direct quantum-relativistic sense. As a consequence of these different extensions of logic we establish the fundamental quaternary alphabet of truth-values:

$E_4=\{-1,0,1,2\}$,

as compared with the two binary truth-values of conventional logic:

$E_2=\{0,1\}$.

The truth-value 2 is extremely effective in formalising sentences with double meaning, hence opening new avenues for overcoming the limitations of current machine translation technology. The negative truth-value –1 finds important application in chronologic, an extension of logic that deals with logic operations realised forwards and backwards in time.

The matrix operator formulation of logic has not only greatly enhanced the computational power of logic, it also provides compelling reasons to view logic not as an abstract construct but as fundamental structure underlying real physical interactions, which as such has to be included in the general system of the covariant laws of nature (till the invention of matrix logic quantum logic was expected to do this work which, on the other hand, has serious flaws in its logic structure as many author has already pointed out[7]). This allows us to address logic valuations in terms of space-time diagram of quantum field theory. Since matrix logic permits logical processes to be defined in mathematical form similar or identical to the description of fundamental processes, we seek a synthesis of logical and physical methods in a unified theory whereby it is possible to achieve the logical description of physical processes and vice versa. The matrix logic method is so profoundly linked to the fundamental ideas of physics that it can only be properly understand in its relation to advanced physical theory (this was the reason when we pointed out that in the formulation of the final theory we are forced to utilise all the, so far discovered, higher mathematical concepts!).

The computational reform accomplished in matrix operator formulation of logic achieves its ultimate significance in the new concept of logical quantum numbers. We show that the problem of logic and cognition in general can be formulated as the eigenvalue problem, analogous to the central problem of theoretical physics. Considering logic operators as observables, we obtain the set of logic eigenvalues:

$\lambda_i= \{-1,0,1,2\}$,

which proves that the spectrum of logic operators is in exact correspondence with the fundamental alphabet of logic truth-value! This is not only resolves the question of whether

[7] See: Szabó Laszló (2002): *A nyitott jövő problémája,* where he points out that: *„there should exist such a physical theory and a related logic, where both are compatible with the empirical and experiential facts of realty"*. As we have seen, with the help of matrix logic, which is able to deal with the phenomenon of consciousness and the conscious mind, we are able to formulate this new physical theory and logic.

the operation of the mind are quantised, but also holds the key to their reduction to universal and fundamental code of numbers. Since Aristotle, logic has come a long way from viewing logic connectives as abstract linguistic formations to identifying them as algebraic Boolean operations, then as matrix operators, and finally simply as numbers.

The theory of logic quantum numbers constitutes an important breakthrough in the study of the intelligence code which allows us for the first time to tackle the intractable problem of high-level intelligence in a scientific manner. We are compelled to conclude that the mechanism of cognition cannot be derived from either classical nor quantum notions. A higher-order covariant theory is required in order to provide a plausible explanation for the fundamental effect of high-level intelligence.

With the fusion of physics and logic categories logic obtains the status of fundamental science. As a unified language which integrates a logical examination of the underlying phenomena of quantum theory and vice versa, matrix operator logic opens new avenues for the study of fundamental interactions and gives rise to the revolutionary conclusion that physics can be viewed and studied as logic in a fundamental sense. We are on the verge of an unprecedented synthesis!"

The fundamental axiom of matrix logic, the so called matrix theorem, can be defined as follows: the implication inference logic connective, at its core, is the matrix product. Following Stern's proof, we can express mathematically this theorem in the following way: let the syllogism rule, which is a fundamental logic operation of the intelligent mind, be expressed by the following logical string – *which could be the basic concept behind the idea of a string in string theory!*:

$(i \rightarrow n) \wedge (m \rightarrow j)$,

which can be contracted to

$(i \rightarrow j)$,

given the condition that $n=m$. Treating the logical symbols as tensor indices, and lowering and raising the indices in accordance with the tensor summation rule we can write:

$\rightarrow^{i}_{k} \rightarrow^{k}_{j} = \rightarrow^{i}_{j}$.

When the covariant and contravariant indices coincide, the syllogism inference becomes computable. Introducing the summation sign explicitly, we get the composition:

$$z_{ij} = \sum_{k} x_{ik} \cdot y_{kj},$$

which one recognises as the usual rule for matrix multiplication: the product $(i, n) \cdot (m, j)$ exists if and only if $n=m$. Expressing the syllogism law in tensor form, we rediscover from the empirical result of logic the familiar rule of matrix multiplication. *The transitivity of implication leads to the matrix principle at the foundation of logical thought!*

With the help of matrix logic the earlier mentioned mathematical concepts, such as vector spaces, scalar spaces and the different functions, manifolds and their topological mappings are directly reducible to logical figures and to their analysis. Due to the fact that these transformations are one-to-one onto functions, the mind's matrix logical reality organiser and cogniser mechanism is also mathematically expressible.[8]

Topological quantum theoretic machines

The above mentioned ideas are more clearly articulated in Stern's new book (*Quantum Theoretic Machines*), in which the author's main focus is to show that the conscious processes

[8] In his paper, under the title of „Integrated meta-methodology", Csaba Varga also emphasises the importance of the formulation of a new logic theory which transcends classical and other forms of logic, and the same is pointed out by Györgyi Major in her paper under the title „The AND paradigm".

of the mind and the phenomenon of consciousness itself is related to topology and topological laws. The science of topology is mainly concerned with the continuous transformations of multi-dimensional objects into each other, and the governing laws of these transformations. According to the latest ideas of Stern, consciousness and the conscious mind basically is a quantum theoretic machine and he proves his statement with the following facts. The brain relies on and explores natural physics, arising from the fundamental level of physical interactions. Since this level is treated most adequately by quantum mechanics and quantum field theory, the term 'quantum' comes naturally into the definition of a quantum-theoretic machine. The term 'theoretic' requires a comparison with existing technologies. There are machines which process mass, like a chemical plant, or energy, like a combustion engine, or information, like a computer. On the other hand, the human brain and in more general every thinking system is processing and transforming theories and their logic structures. These systems differ from the systems that process data or information only (which could very well be the data of a theory) in that that they evolve and change as a result of such processing, while an ordinary information machine undergoes no such evolution or intrinsic knowledge acquisition. A quantum-theoretic machine is fundamentally different: its states depend on its knowledge content. A change of a theory changes and alters the organisation of the machine, effectively creating a new machine over and over again. *The brain creates, destroys and maintain theories*. The term 'topological' is used to express this inner plasticity and flexibility of the machine, which is a fundamental feature of every biological or thinking system.[9] This is a very important discovery because until today the structural design of a computer was basically dependent on geometrical features, and topological laws were applied only in the case of multi-processor machines and in their network design. In the case of consciousness and conscious machines the underlying physics should be fully based on topology and its laws, which is in full accord with our contexture regarding string theory. The connection between string theory and matrix logic gains full expression in the unification of logical or **L**-branes with stringy p- and D-branes. A logical membrane or brane is a cognitively extended object with matrix degrees of freedom on which a thought can end. The notion of a logical brane closely parallels the notion of the world-volume, which in relativity theory is 4-dimensional. Mathematically this can be expressed in the following way:

4-dimensional world-volume: $dV=dx\cdot dy\cdot dz\cdot(icdt)$, which is 11-dimensional in superstring theory.

Logical-brane: $V_n=\mathbf{L}_1\bullet\mathbf{L}_2\bullet L_3\bullet\ldots\bullet\mathbf{L}_n$, where $V_n\in\Omega$ (Ω denoting the set of the logical density matrix), $\mathbf{L}_1$, $\mathbf{L}_2$, L_3, …,$\mathbf{L}_n$ is the ordered sequence of the matrix-logical coordinates.

According to matrix logic the cognitive coordinates are represented by logical matrices. The product of these matrices determines a matrix volume (mind-volume) which we call a logical (mem)brane or simply a brane, which is in itself a matrix (see holomatrix definition). Since any logical matrix can be extended as a product of other matrices, including itself, if idempotent, a resulting **L**-brane 'forgets' its dimensional 'history' and in this sense can be of an arbitrary dimension. *Basically the dimensionality of a logical membrane is unknown, or, more correctly, is 'known' only to the membrane itself*! Due to the matrix product rule cognitive space is noncommutative, with the membrane exhibiting properties that can be explained only by quantum principle. Although a logical brane is an extended object it is not a pure abstraction but physically realised through the vacuum of quantum theory (see the consciousness research paragraph). Accordingly, the transient virtual **L**-branes may carry the negative (logical) energy which has historically been anathema to physicists, but fundamental for the realisation of consciousness. In this regard the experimental verification of higher dimensions are not so far fetched possibility if these extra dimensions are the degrees of

[9] About the importance of bio-information systems more can be found in István Szentesi's paper.

freedom of consciousness and the conscious mind (as we hypothesised in the superstring theory paragraph). If these ideas are indeed true than with the help of matrix theory the experimental verification of these extra dimensions could become possible, which is already an actuality during the experiences of our thoughts and self-awareness. The clear understanding of the physics of these processes could truly present to us how to construct such physical devices which would be able to sense these conscious degrees of freedom and would artificially project out and generate self-awareness form the field of consciousness. This could open up new avenues in the research and understanding of artificial intelligence. [10,11] This last conclusion will become more clear when we will try to interpret matrix logic holographically, where the important vector and other fields or the multi-dimensional manifolds for both, matrix logic and physics, will be generated and analysed with a holographical principle (for more details see the consciousness-holomatrix paragraph). An other very important conclusion of matrix logic – which could be applied, like the holography principle of string theory, as a reduction technique – is the discovery, according to which the 4-D hyperspace logic operations are expressible in terms of standard 2-D logic operations. If we take this as a holography principle than we are able to make a *d-2* reduction, which means that consciousness can express itself with atomic and string level interactions. This important principle of separation of a logic space into two interacting subspaces may hold the key to the fundamental division of the brain into left and right hemispheres. Indeed, with the help of matrix logic, in the first time in the history of science, we are not just able to calculate and derive the mind's high level intelligent logical functions and their reality creating and cognising mechanisms, but at the same time we are capable to directly map these functions onto the brain physiology and onto neuro-network development and growth. Having presented the basic concepts of matrix logic and its important role in understanding the physics and mathematics of the conscious mind, let us now turn our attention to another important theoretical physics development, through which an observer or information based Lagrangian function finding and analysing method can be defined. The Lagrangian function is a 'density' function constructed from the variable parameters of a physical system, which under the act of the differential and integral operators could yield the corresponding covariant differential equations of the given system. We could say, that this function is containing within itself all the necessary information to describe the given physical system's behaviour in the corresponding phase space. Usually the Lagrangian functions are defined intuitively or by trial and error methods, but with this new technique, which is closely related to the observer based physics, and accordingly to the mind and its matrix logic principle, the Lagrangian function, with the given observational conditions, is explicitly derivable.

2.3 The Fisher-information and its relation with physical reality.

The concept of Fisher information is very important because the knowledge of this form of information is not part of the educational background of most physicists. Fisher information was discovered by R. A. Fisher whose work is not well-known to physicist because as a

[10] According to József Csorba's paper and the there mentioned information handling and evolution threshold model diagram, self-awareness generation, and along with it, the generation of free information and knowledge will be the fourth evolution threshold.

[11] It is interesting to mention one of Stern's observations here, which could present a major step for stringtheory researchers: there is a notable +2 discrepancy between the logical and quantum dimensions. The critical dimension in which a perutbative field theory is consistent in flat Minkowski space-time is 26 for bosonic string and 10 for supersymmetric string theories. Matrix logical lattice also accommodates 26 bosonic charges (13 chareges+13 anticharges). But for the supersymmetric code, expanded both as commutator and anticommutator, the critical logical dimension is 12, which is 2 dimensions more than in strings. To obtain ultra unification, which must account for consciousness in the universe and thus beside quantum gauge symmetries also must include logic, a nonoriantable two-dimensional field, which encode information – through the holographic principle – attached to a supersymmetric brane.

researcher he was renowned in the fields of genetics, statistics and eugenics. Among his pivotal contributions to these fields are the maximum likelihood estimate, the analysis of variance, and a measure of indeterminacy now called 'Fisher information'. From the followings it will become apparent that this form of information has great utility in physics as well. Fisher information has two basic role to play in theory. First, it is a measure of the ability to estimate a parameter, second, this is a measure of the state of disorder of a system or phenomenon, which makes this concept a cornerstone of physical theory. Fisher information is part of an overall theory of physical law called the principle of extreme physical information (EPI) which, as we will see, can be used as a new unifying principle among the existing physical theories of nature. This new principle, the EPI principle, was discovered and presented by Roy B. Frieden in his book, *Physics from Fisher information*. In the followings, I would like to briefly present his new ideas and achievements, relating them to those thus far mentioned thoughts, where pointing out the important overlaps and joining them with our holomatrix hypothesis a new unifying principle and its overall role in sciences as a whole can be formulated.

During the same years that quantum mechanics was being developed by Schrödinger (1926) and others, the field of classical measurement theory was developed by R. A. Fisher and his co-workers. According to classical measurement theory, the quality of any measurement(s) may be specified by a form of information that come to be called Fisher information. Since these formative years, the two fields – quantum mechanics and classical measurement theory – have enjoyed huge success in their respective domains of application, and until recent times it has been presumed that the two fields are distinct and independent. However, the two fields actually have strong overlaps. As a matter of fact, – as Frieden points out – all physical law, from the Dirac equation to the Maxwell-Boltzmann velocity dispersion law, may be unified under the umbrella of classical measurement theory. Such unification is perhaps, long overdue. Physics, together with the other, so called, quantitative sciences, like chemistry, biology, economy, sociology, etc., is the science of measurement. That is, physics is a quantification of *observed* phenomena. And observed phenomena contain noise, or fluctuations. The physical paradigm equations (defined above) define the fluctuations or errors from the ideal values that occur in such observations. That is, the physics lies in the fluctuations. In this way, Fisher information is intrinsically tied into the laws of fluctuations that define theoretical physics.

Frieden's EPI theory proposes that all physical theory results from observation: in particular, imperfect observation. Thus, EPI is an observer-based theory of physics. We are used to the concept of an imperfect or non coherent observer in addressing quantum theory, but thanks to Frieden, we now start to understand that even the classical theories, like Maxwell's electromagnetic or Einstein's general relativity theory, are derivable form the assumption that any observation is imperfect. EPI is, more precisely, an expression of the 'inability to know' a measured quantity, which is formally expressed by the Cramer-Rao inequality equation:

$$e^2 \geq 1/I.$$

It expresses reciprocity between the mean-square error e^2 and the Fisher information I in the intrinsic data. But now let us see, what is the EPI principle, and how it can be derived from Fisher information?

The Fisher information I in a single measurement of a phenomenon obeys the following equation:

$$I = 4\int \left(\frac{dq\ (x)}{dx} \right)^2 dx$$

Here $q(x)$ is the real probability amplitude for a fluctuation x in the measurement. Under certain conditions, information I obeys an 'I-theorem' or more formally:

$$\frac{dI(t)}{dt} \leq 0$$

This means that I is a monotonic measure of system disorder. The I-theorem probably holds under more general conditions than does the corresponding 'H-theorem' for the Boltzmann entropy H from the second law of thermodynamics. It follows that the entropy H is not a *unique* measure of disorder, as has been erroneously taught for over 100 years. The second law is described by Fisher I as well as by entropy H!

The above mentioned I-theorem for a single parameter measurement may be extended to a multi-parameter, multi-component measurement scenario. A scalar measure of the information for this general scenario now obeys the following equation:

$$I = 4\int \sum \nabla q_n \cdot \nabla q_n$$

Where $q_n = q_n(\mathbf{x})$ is the nth component probability amplitude for the four-fluctuation $\mathbf{x}=(x_0,\ldots,x_3)$. I is called the 'intrinsic' information, since it is a functional of the probability amplitudes that are intrinsic to the measured phenomenon. In summary, I is firstly a thermodynamic measure of disorder, and secondly a universal measure of information whose variation gives rise to most (perhaps all) of physics! This can be seen from the fact, that the I intrinsic information is simply measures the gradient content in the probability amplitude q_n. This finding is very important, since all Lagrangians contain a squared-gradient term whose presence was surrounded by mystery in physics. Now it is clear, that it presents the amount of Fisher information residing in the *intrinsic data*.

A natural question arises here: where does the information in acquired data come from? It must originate in the physical phenomenon (or system) that is under measurement. Any measurement of physical parameters initiate a transformation on Fisher information $J \rightarrow I$ connecting the phenomenon with the intrinsic data. This information transition occurs in the object, or input, space to a measuring instrument. The phenomenological, or bound, information is denoted as J. The acquired information in the intrinsic data is what is called I. Information J is ultimately identified by an invariance principle that characterises the measured phenomenon, and which leads to the EPI principle in the following way.

Suppose that, due to a measurement, the system is perturbed, causing a perturbation δJ in the bound information J. What will be the effect on the data information I? In analogy to a thermodynamic model of Brillouin and Szilárd it mast be that $\delta I = \delta J$, there is no loss of the perturbed Fisher information in its relay from the phenomenon to the intrinsic data. This is a new conservation law. It is also axiom 1 of an axiomatic approach for deriving physical laws. Since $\delta I = \delta J$ necessarily $\delta(I - J) = 0$. Hence, if we define $I - J = K$ as a net 'physical' information, a variational principle

$$K = I - J = extrem.$$

results. This is called the extreme physical information or EPI variational principle.

The EPI zero principle

$$I - kJ = 0, \quad 0 \leq k \leq 1$$

follows, as well, on the grounds that generally $K \neq 0$ so that $I \neq J$ or $I = kJ$. That $k \leq 1$ follows from the I-theorem as applied to the information transition a $J \rightarrow I$.

The two equations above define the EPI principle. These equations also follow identically, i.e., independent of the axiomatic approach taken, and of the *I*-theorem, if there is a unitary transformation connecting the measurement space with a physically meaningful conjugate space (this unitary transformation is usually a Fourier transformation, which means that form the earlier mentioned holography principle these equations are explicitly derivable, leading to direct application in the holomatrix postulate later).

The solution if $q_n(\mathbf{x})$ to EPI defines the physics of the measured particle or field in the object, or input, space to the measuring instrument. It follows that the Lagrangian density for any phenomenon or system is not simply an *ad-hoc* construction of producing a differential equation. The Lagrangian has a definite prior significance. It represents the physical information density $k(\mathbf{x}) = \sum_n k_n(\mathbf{x})$, with components $k_n(\mathbf{x}) = i_n(\mathbf{x}) - j_n(\mathbf{x})$ in terms of data information and bound information components. The integral of $k(\mathbf{x})$ represents the total physical information K for the system, which leads to the required Lagrangian equation. Thus, we could say, that all Lagrangians consists entirely of two forms of Fisher information – data or intrinsic information and phenomenological or bound information. In this way EPI gives us a general Lagrangian creating method, which, depending on the measured physical phenomenon, could give us the required Lagrangian density function. This is indeed a great achievement, since until today, as we have already said, physicist were looking for Lagrangians intuitively, or with the help of calculating them from the differential equations of the given physical system or phenomenon, which, in some case, is a so difficult task that only approximate solutions are possible.

A requirement of invariance of the mean-square error of estimation to reference frame leads to the Lorentz transformation equations, and to the requirement of covariance for the amplitude functions $\mathbf{q}(\mathbf{x})$. As a corollary, $\mathbf{x}$ must be a four-vector, whose physical nature depends upon that of the measured parameters. Since the square amplitude functions are probability density functions (PDFs), all PDFs that are derived by EPI must obey four-dimensional normalisation, including integration over time if $\mathbf{x}$ is a four-position. This means, that with the help of EPI we are able to select form the multi-dimensional input space the Lorentz-invariant equations, or to tune the phenomenon to the four-dimensional space-time. In reality, the phenomenon will tune itself to the relativity requirements, since the phenomenon, as we will see later, is determined by the state or the parametric space of the observer.

From the above mentioned results we could say, that all known physical laws are, in reality, reflecting, as system reactions, the measurement caused fluctuations. In this way, the pure intrinsic information, and the knowledge along with it, would be available only if the measurement would not cause perturbations in the system, that is, the system and the observer or the measurement instrument would be (informationally) on the same level, building up a closed system. This could be true in the case of uniter transformation, where the above mentioned limit equation would yield zero ($K=0$), which would yield logical tautology, so EPI would be not applicable, but, as we saw, matrix logic would. This is where, as we will see in the holomatrix postulate, the two approaches overlap each other. Frieden has postulated the hierarchy of physical knowledge as follows:

At the top level we have:

(A) the Fisher *I*-theorem, which states that *I*, like entropy H_B, is a physical entity that monotonically changes with time and can be transferred, or can 'flow', from one system to another (what is expressed by the appearance of the gradient term);
(B) the concept of a level *J* of Fisher information that is intrinsic to, or 'bound' to, each phenomenon; and
(C) the invariance, or symmetry (the mentioned unitary symmetry, which is a rotation between *J* and *I* space) principle governing each phenomenon.

The laws (A)-(C), what Frieden call 'top laws', exist prior to, or independent of any explicit measurements (in reality, they are representing a higher or coherent level of observation, as we will see later). They can possibly be verified (or nullified) by measurement, but that should be proved (this is the point where matrix logic comes in, with its ability to generate explicitly these symmetries – through topological consciousness dynamics – from logic itself).

At the second rung down the knowledge ladder are the following three axioms:

(i) Conservation of information perturbation during measurement;
(ii) The equations defining information densities $i_n(\mathbf{x}), j_n(\mathbf{x})$ on the microlevel; and
(iii) The equation governing the efficiency of information transition, on the microlevel, from phenomenon to intrinsic data.

At the third rung down the ladder is the EPI principle. This follows (as we found) from either the axioms or from the existence of a physically meaningful unitary transformation space.

Finally, at the fourth rung down the ladder, is the carrying through of EPI as a calculation. This requires the EPI principle, as augmented by top law (C). The output of the calculation is the law governing formation of amplitudes **q** from that scenario (for example, the Klein-Gordon 'law' governing formation of the amplitude ψ). It is interesting to note here, that in the last few years Frieden, with the help of other scholars, has extended his EPI principle to other quantitative equations of sciences, from which I would like to present those interesting ones which are useful for our holomatrix postulate too:

- EPI derives the mechanics of the small, i.e. quantum mechanics, that of macroscopic objects, i.e., Newtonian mechanics, and that of the large, i.e., general relativity theory, including the possibility of a finite cosmological constant Λ. The latter naturally emerges as an added constant of integration, and not as an arbitrarily inserted fudge factor (Einstein). It is thought by some to represent the 'dark energy' force that operates over astronomical distances. By these derivations, EPI provides a unification of physics over all observable scale sizes. This unification has been a longstanding goal of physical theory. EPI also derives the well-known synthesis of the small and the large called 'quantum gravity'. This is in the form of the Wheeler-DeWitt equation.

- Equilibrium- and non-equilibrium statistical mechanics, as well as economic valuation and non-relativistic quantum mechanics, can be derived using an EPI output in the mathematical form of a constrained Schrödinger wave equation.

- EPI drives the dynamics of growth and motion of living nanosystems. This is in the form of a Schrödinger wave equation where the ordinary particle mass is replaced by the mass times the square root of the information efficiency k, and the potential is purely imaginary. The latter has the simple form $i(\hbar/2)(g_n+d_n)$ in terms of Lotka-Volterra growth g_n and depletion d_n coefficients. These are general functions of all the particle populations of the system. In the limit of a system that is spatially homogeneous (well mixed) or has vanishing spatial information (with $k\rightarrow 0$), and has either (i) macroscopic masses or (ii) $\hbar\rightarrow 0$ the above Schrödinger like wave equation becomes the ordinary Lotka-Volterra equation of macroscopic growth. *In this way quantum mechanics provides a direct link to biological growth*!

- EPI derives the basic dynamics of human groups (companies, or societies, or countries, or etc). These are the equations of growth over time t describing the group's relative sub populations and resources $p_n(t)$, $n=1,...,N$. Here information J and I respectively represent a group's levels of 'ideational' and 'sensate' complexity. By definition, the 'ideational' level J pertains to ideals, such as the fundamental aims of the group; and the 'sensate' level I pertains to the group's sense-based practised. The size of $I - J$ therefore represents the degree to which the principles of the group are in fact practised by its members. Thus, when $I - J = 0$ is attained this represents a Hegelian alliance between group ideals and practice. Also, the EPI principle $I - J = minimum$ amounts to a prediction that any group tends to (but does not perfectly) live by its ideals. Among the findings are that groups whose constituencies are locked into constant, unregulated growth eventually degenerate into monosocieties. One constituency completely dominates over the other. To avoid this scenario, active steps must be taken to monitor and constantly adjust growth rates in the direction of equality. Thus the need for peacemakers or arbitrators.

From all of this a natural question arises: what should be regarded as the laws of physics? Should they be the 'top' laws (A)-(C) mentioned above, or, as is conventionally assumed, the output laws, such as the Klein-Gordon equation? We can expect that some invariance principle (C) do double (or more) duty in implying physical laws. For example, the continuity of flow condition is used by EPI to derive both Maxwell's equations and the Einstein field equations. Therefore, there are more physical laws than there are invariance conditions (C) for their derivation. Clearly, it is desirable to have to make the fewest assumptions about nature. On this basis, the EPI output laws can be regarded as subsidiary to the top laws. They are also subsidiary in being subject to a contingency situation – measurement – for their existence. In this regard, it is good to cite here Frieden's conclusion, because it is also important from our holomatrix hypothesis too.

"The physical picture that is provided by EPI should also be considered. We postulate that if real data are at hand, they must have been caused by a physical process. The EPI view is that an output law is part of an ongoing physical process that includes the measurement step as its activator. In this sense, the measurement 'creates' the probability law from which it is sampled! The measurement physically activates the three axioms (or the unitary transformation) and, subsequently, EPI as a continuation of the process. In the absence of a real measurement upon a real object, the process is not activated so that the output law does not physically occur. (This does not prevent us from computationally using the form of the output law, e.g., Schrödinger wave equation, to predict future, or past, states of an unmeasured, hypothetical entity).

The output law continues as a physical process until another measurement is made. This re-initialises the sate of the particle, etc. This is a continuing physical process punctuated and refreshed by step-like jolts due to new measurements. The new measurements act as unpredictable, discontinuous, irreversible, instantaneous operations upon the object, somehow like so many *deus ex machina* activities".[12]

Since EPI output laws only physically occur as reactions to measurement they are subsidiary to the top laws (A)-(C), which exist as absolutes, i.e., whether or not measurements take place. These laws, being symmetry and invariance laws, are closely connected to Stern's matrix logic operator symmetries, which are the mathematically expressed web of the mind and consciousness. In this way we can conclude, that the structures of the physical laws and the 'reality' described by them, are generated by the logical structure of the mind and its underlying topological consciousness dynamics, and their precise mathematical forms or their unified theory can be formulated by their detailed matrix logic theory. But to prove these

[12] These conclusions are parallel with those which are mentioned in Gábor Balogh's paper under the title: Science Studies from constructivist point of view.

statements, first we should turn our attentions to the latest findings of experiential and experimental consciousness researches. In the light of these new findings, we would be able to integrate the thus far mentioned areas with the dynamics of consciousness, leading us finally to the aimed holomatrix principle. With this new principle, as a general organising dynamics, we would be able to formulate a consciousness-based reality analysing mathematical method, which is naturally extendable to all sciences as well.[13]

[13] The subjects, dealt within these three paragraphs, are closely related to Józsf Csorba's paper, especially to dose which are mentioned under the title 'The peculiarity of Information cognition' and 'The metatheory of information science'.

3. The latest discoveries in consciousness researches

Questions about the nature of consciousness have been addressed throughout the history of knowledge, but in the last century they have become largely the domain of a separate academic discipline that specialises in addressing them, the field of psychology. Psychology tries to map the laws and structures of the human mind and consciousness in the same way as modern natural sciences are doing with their methods. Despite of the rapid development of scientific theories, psychology is still missing a comprehensive or central theory of consciousness, comparable to the unified quantum theories of modern physics. The main reason for this, is that although the main concern of psychology has been consciousness, non of its divisions have been directly concerned with consciousness *per se*; instead they have been concerned with isolated aspects of conscious experience and behaviour.

Without a concerted research program on consciousness, psychology has missed the basis of a unified theoretical structure. Although it has been argued that the central themes addressed by psychologists have remained the same during the past hundred years, progress in providing a comprehensive theoretical understanding and integration of these themes has been lacking. Consequently, there appears to be little relationship among the different areas of psychology.[14]

Not only are there no successful grand theories in psychology, but the field also does not appear to have made cumulative progress. That is, within special areas, ideas repeat over time. The lack of cumulative development in sociology is similar. The encyclopaedia of the social sciences defines sociology as 'an unsystematic body of knowledge'.[15] Psychology and sociology are known in the academic world as disciplines without a coherent theory, or 'pre-paradigmatic', and still without their 'Maxwell' or 'Newton'.[16] Thus, the primary need of psychology today remains to develop a single comprehensive theory of consciousness to account for the structure and full range of mental phenomena, a theory that has not emerged historically.[17]

Following the above mentioned facts, naturally the question arises: within these hundred years, why psychology has not been able to formulate its central and comprehensive theory of consciousness? The reason for this is that to tackle the question of consciousness, as we have seen, psychology focused its attention on the observations of waking, dreaming and deep sleep states of consciousness, and their respective mental processes. These states of consciousness, especially the waking state, are a complex form of awareness that results from an excited state of the brain physiology. As a consequence, it has been difficult to construct a simple and coherent theory of consciousness based on the analysis of waking experiences. This situation would be analogous in physics to developing the quantum theory through an analysis of complex macro-molecules in high temperature environment.[18] The solution in physics was to replace the complex macro-molecules with the hydrogen atom. Similarly, in psychology the solution primarily comes from studying simpler, more fundamental structures of awareness. The possibility to study simpler or more fundamental structures of awareness is available since 1960, when Maharishi Mahesh Yogi introduced his Transcendental Meditation (TM) and TM-Sidhi program world wide. Through the simple technique of TM the

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[14] Brown R., and Herrnstein R. J. (1975): *Psychology*, Boston: Little, Brown.

[15] Kuper A., and Kuper J. (1985): *The social science encyclopaedia*, Boston: Routledge and Kegan Paul.

[16] In recent times, Ken Wilber, within his „Integrated philosophy", was trying to formulate, quite successfully, such an integrated theoretical viewpoint, and also Stanislaw Grof and Wilson Anton was doing the same in their new psychological and consciousness theories.

[17] Vroon P. (1975): *Bewustzijn, hersenen, und gedrag*, The Netherlands: Ambo Baarn.

[18] Lawrence H. Domash (1977) *The Transcendental Meditation technique and quantum physics: is pure consciousness a macroscopic quantum state in the brain?*, Scientific Research on Maharishi's Transcendental Meditation and TM-Sidhi program, Collected papers volume 1., theoretical papers.

practitioner is able to systematically experience subtle states of the thought process, culminating in the experience of the ground state of consciousness, or pure consciousness, as Maharishi calls it. Although there are many forms of meditation available today – whose effectiveness are not questioned by this author – there are several reasons for confining our discussion, regarding the formulation of the comprehensive theory of consciousness, to Maharishi's vedic technologies of consciousness – the TM and TM-Sidhi techniques – and their theoretical backgrounds:

1) The TM technique is one of the most widely practised mental procedure throughout the world, resulting in the widespread availability of subjects with experience ranging from several months to over 30 years.
2) The TM technique is taught throughout the world in a highly standardised manner, which ensures that different subjects are practising the identical mental procedure.
3) There now exists a large body of published scientific research on the physiological, psychological, and even sociological effects of the TM and TM-Sidhi program. There is no comparable body of literature connected with other specific mental techniques, and an analysis of what literature is available find little evidence that other meditative practices affect basic physiological or psychological parameters to the same degree.[19,20]
4) The author of this paper, being a TM and TM-Sidhi practitioner himself, has detailed experiences and knowledge about these techniques and their related theoretical backgrounds.

It was Maharishi who originally proposed that each state of consciousness should be accompanied by a unique style of physiological functioning, and who thereby predicted that the experience of pure consciousness would have physiological correlates distinct from waking, dreaming, and deep sleep states of consciousness.[21] This prediction motivated Wallace's original research on the TM technique, which found evidence from studies of the electroencephalogram (EEG), skin resistance, and metabolic indicators that a fourth state of consciousness might indeed occurring during the TM practice.[22,23] One of the most important physiological discovery is that during the experience of pure consciousness high level of brain coherence can be seen on the EEG in different frequency domains. These findings were later described as projections of possible macroscopic quantum-coherence at the neurophysiological level. Later findings showed that these assumptions could indeed be true, and today we could say that self awareness, and especially the pure consciousness state is a macroscopic quantum coherent state of the brain's neuro-physiology, which, as a Bose-Einstein condensate at the neuro-network level, is closely related to the vacuum state of quantum field theories, which could be mathematically modelled – as we saw earlier – with the logical brane model of matrix logic. The discovery of this new state of consciousness was very important from the point of view of formulating a comprehensive and basic model or theory of consciousness, and because of this, it has a hydrogen atom like role in consciousness researches. But now let us see why the discovery of pure consciousness was so important from theoretical considerations.

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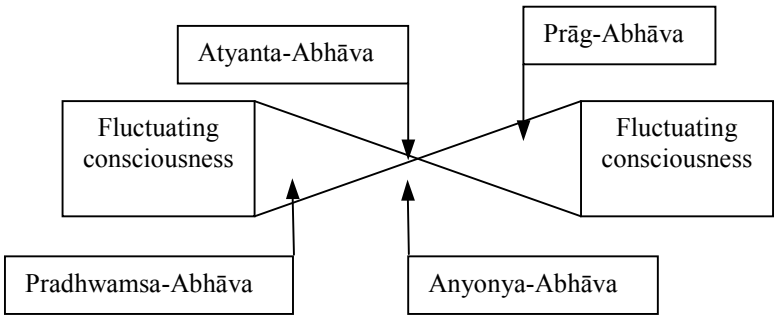
[19] Eppley K., Abrams A. I., and Shear J. (1984): *The effects of meditation and relaxation techniques on trait anxiety: A meta-analysis*, paper presented at the annual meeting of the American Psychological Association, Toronto.
[20] Ferguson P. C (1981): *An integrative meta-analysis of psychological studies investigating the treatment outcomes of meditation techniques*, Dissertation Abstracts International, 42, 1547B.
[21] Maharishi Mahesh Yogi (1966): *The science of Being and the art of living*, Livngston Manor, NY.
[22] Wallace R. K (1970): *Science, 167*, 1251.
[23] Orme-Johnson D. W (1973): *Psychosomatic Medicine*, 35, 341.

3.1 The field of consciousness

Maharishi's Vedic Science distinguishes three basic constituents in the waking state of consciousness: the *observer* (or *rishi* in the language of vedic science), the process of *observation* (or *devata*), and the *observed* (or *chandas*). These three structural constituents are markedly distinguished in the waking state, but are completely absent in the case of pure consciousness. In this least excited or 'ground' state of consciousness, the three essential components of waking experience – the observer, the process of observation, and the observed – are unified in one structure of 'pure, self-observing or self-interacting consciousness' known as *Samhita* in vedic science. Correspondingly, we could say that according to Maharishi's Vedic Science consciousness has a unified or 'ground' state – the pure state with a pure witnessing quality – and a completely differentiated state of the waking experiences, which are structured by the infinite combinations of the three basic components of consciousness. This later state is caused or generated by braking or deforming the symmetry of the unified state.[24] According to this assumption, all the levels of subjectivity are the expressions of the fluctuations of the field of pure consciousness, caused by its self-interaction or self-observation, which, as we have seen, is strongly related to the unified field theories of physics, and to their descriptions about the structure of reality. This is probably the first time in the history of science, when the simplest and most fundamental state of consciousness can directly be studied, whose structure, as discoveries show, could be closely related to the theories of physics, helping us to create a scientifically precise theory of consciousness. According to Maharishi, the above mentioned *three-in-one* structure always prerequisites a field of consciousness to exist, and because this structure is present on every level of existence – as we have already seen in the discoveries of science – we could safely say that existence has a consciousness nature, whose structures are created by the dynamical interaction of the observer, the process of observation, and the observed, and by its related symmetries. Maharishi also points out that because this organising dynamism is the basis of all our conscious experiences, this is also the foundation of the structures of knowledge or Veda (Veda means knowledge in Sanskrit) as well. *That is, the inner structure of consciousness and knowledge is created by the fluctuations of consciousness, generated by its all pervading, silent, self-referral state.* In the transformation of one state of fluctuation of consciousness into the other, Maharishi distinguishes four major quality or inner activity (see diagram below).



These four activity in sequence are:
Pradhwamsa-Abhāva: silencing activity, collapse of the fluctuation into the point value
Atyanta-Abhāva: Absolute abstraction (vacuum state), or silent point value of all possibilities
Anyonya-Abhāva: Self-referral activity in the state of absolute abstraction

[24] A similar threefold structure was introduced by Ken Wilber in his integrated philosophy and transpersonal psychology, where he also emphasises the importance of the pure witness state of awareness as a central ingredient of a comprehensive theory of consciousness, and all sciences. In his paper, under the title 'Who sees whom, and how he sees', quite many combinations of the three main components of consciousness are listed by Csaba Varga.

Pārg-Abhāva: Emergence of the new state of fluctuation from the point value

The fluctuations of consciousness or existence (these are called *mantras* in the language of vedic science[25]), and their transformation into each other are generated and upheld by these four major structuring activities within the field of consciousness (this structuring quality is called *brahmana* in vedic science). The precise understanding of this dynamism holds the key to formulate the physical process of consciousness, and its knowledge structuring mechanism, which shows interesting similarities with the *flop*-transition of string theory. The way how to achieve this goal is clearly pointed out by Maharishi in his detailed description of this activity, when he says: 'from the field of absolute abstraction (*Atyanta-abhāva*) the self-referral quality (*Anyonya-abhāva*) is emerging on the ground of the memory (called *smriti* in vedic science) of the previous and the subsequent states of fluctuation. This *Smriti* within the nature of self-referral consciousness – *Anyonya-abhāva* within the nature of *Atyanta-abhāva* – renders this level of intelligence infinitely *flexible*'[26] – where the term 'flexible' expresses the intrinsic topological nature of this state of consciousness. Thus, the quality of absolute abstraction, as a memory, is dynamically linked to the self-interacting singularity within its structure, which could be interpreted as a holographic process because of the one-to-one onto mapping of the fluctuations or wave transformations. Now that we have shown how the reality structuring fluctuations of quantum physics can be related to the fluctuations of pure consciousness, we are prepared to show the isomorphism between these two, seemingly, independent fields or spaces.

3.2 The topological isomorphism of the above mentioned two fields

During our journey in the first section we have seen that, according to the latest theories of modern physics, at the basis or foundation of our material existent we find vibrating, tiny interacting strings. From a topological point of view this string interactions can be understood as transformations of higher dimensional structures or manifolds, where a holographic principle can be postulated, which allows higher dimensional structures to be transformed or mapped to lower dimensional ones. As we have seen, the symmetries of this transformations could also be interpreted as matrix logical activities of the mind, expressed by the (self)-interactions of logical or matrix branes. From Frieden's Fisher information based EPI principle we have also understood the possibility of deriving the physical phenomenons (expressed by their Lagrangians) from the structures of the mind, if a unitary transformation exists between the adjoint spaces.

The latest findings of consciousness researches elucidated that consciousness is indeed a property of a field, and has a field-like nature, in which the characteristic of self-consciousness is produced by the self-interaction or self-observation property of the field. The manifested or projected fluctuations of the field are unitary transformed by the silent, self-referral activity, which, by its intrinsic nature, could be interpreted as a holographic process, expressing full information preservation, just as in physics. Because both framework conceptualise, at its foundational core, a self-interacting field, logically these two fields – the field of consciousness and the unified quantum field – could be seen as identical. That is, existence and reality could be seen as having a basic conscious property or nature. The isomorphism or identical nature of these two fields or spaces could be conceptualised mathematically in the following way.

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[25] The mantras are unmanifest sounds of the field of consciousness, and as such, they are the basic building blocks of creation. As sounds they are similar or closely related to the intrinsic longitudinal or soliton waves of the vacuum, answering the importance and universality of sounds and music, pointed out by Norbert Dunkel in his paper.

[26] Maharishi Mahesh Yogi (1994), *Maharishi's absolute theory of defence*, (page 516) Maharishi Vedic University Press, Holland

As we have seen, quantum-mechanical systems are mathematically described with the Hilbert pace formalism. Thus, the probability amplitudes of the given quantum mechanical system are represented by state vectors which are forming a separable Hilbert space, and are linearly expressible with the normalised basis of the given Hilbert space. The physically observable states of the system, called *eigenstates*, are expressed with linear Hermitian operators defined on the given Hilbert space. This means, that the possible observable states of the system are the eigenvalues of the given Hermitian operator. Indeed, expressing the state vectors with the normalised basis vectors, forming a coordinate system in Hilbert space, is similar to define or generate its Fourier components, so the holographical interpretation is also equally applicable here, which is the basic principle of the holomatrix as well, as we will see in the next paragraph. The Hilbert space formalism, and its basic components could automatically be related to the three basic components of consciousness, where the normalised basis could be related to the observer, the operators to the process of observations, and the state vectors to the observed. That is, in the light of the above mentioned consciousness definition, the Hilbert space could also be defined as a space of consciousness, which becomes also clear from the non-linear property of the operators acting on it, making its self-interaction or self-mapping possible. From the quantum mechanical point of view, the sate vectors of our nervous system, as a multi-component physical system, are also forming a separable Hilbert space, and two separable Hilbert space is always isometric and isomorphic to each other mathematically. That is, between the Hilbert spaces and its components (bases, operators, and states), assigned to the observer's nervous system and to the observed phenomenon, interactions or unitary transformations could occur, which is holographically interpretable with the help of the topological formulations of matrix logic. Now we are well prepared to formulate the aimed holomatrix principle.

3.3 The consciousness-holomatrix

Before we go into details of the holomatrix postulate, let us overview first the basic principles of the holographical information generation and storage process (see Figure 3).

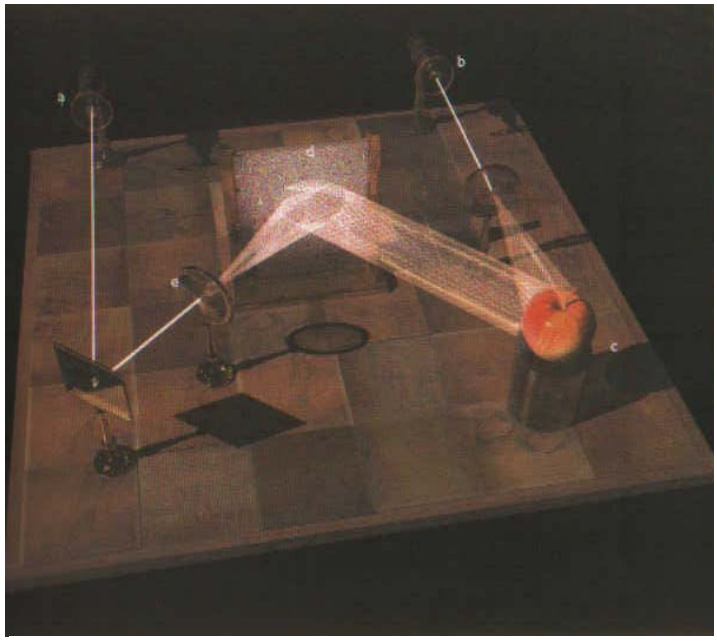


Figure 3: The principle of holographical information storage

As we could see on the picture, the holographical information storage process contains to basic components: the reference wave (this is the coherent laser light in classical holography, denoted by **a** on the picture) and the phase modulated or distorted waves (this is the object wave, reflected back by the object, denoted by **c** on the picture, where the 3-dimensional spatial information of the object is carried by the phase distortion of the original coherent light wave). The photographic plate (denoted by **d** on the picture) than records the hologram, which is actually the interference pattern generated by the two interacting light waves, the reference and the object wave. Now, if we shin the hologram with the original coherent light, than the recorded interference pattern, seen as black and white stripes on the plate, causes exactly the same phase distortion as the object did, and we will see or experience the 3-dimensional image of the original object. In postulating the consciousness-holomatrix principle, we would like to extend this holographic process to the *n*-dimensional separable Hilbert space, and this can be done by the following reasons. A separable Hilbert space or complex vector space is usually defined by an *n*-dimensional normed basis, originating from the nullvector, and with a scalar product or dot-product, which satisfies few algebraic properties. That is, the *n*-dimensional Hilbert space is orthonormal, hence it can be expressed as the union of orthonormal subbases, and this is why the term 'separable' is used. The only common orthogonal vector of the subbases is the nullvector. These subbases or subspaces can be transformed into each other by rotation (see Figure 3.1).[27] In a physical sense, these subspaces, as general information spaces, could express and store, via the complex weighted state vectors, any kind of system property, and its evolution in time, e.g., the spatial location, or the momentum, or angular momentum, or spins etc. This is indeed true for quantum-mechanical systems, like superstrings. These subvector spaces could be assigned to abstract

[27] This *n*-dimensional basis, as a starting point, is similar to the *n*-dimensional metatheoretical viewpoint, postulated and pointed out in Csaba Varga's starting remarks. Without this initial condition our framework would be not comprehensive enough.

multi-dimensional manifolds, whose mathematical analysis, as a model, could yield those properties, like symmetries, which, as physical laws, will define the system and its behaviour. Because these manifolds or abstract spaces are assigned to systems possessing intrinsic wavelike properties, the method of harmonic analysis could also be applied to analyse their shapes. The basis of this method is to express the given abstract shape as a sum of periodic functions, also known as Fourier analysis. Because the above mentioned holographical process is also based on the Fourier analysis, we could say that with this method we are actually trying to generate a holographic model of the analysed system. That is, we are trying to artificially generate that manifold which expresses all the properties of the given system. This method is already being used in digital holography, where the hologram or Fourier components of an arbitrary object are artificially generated or calculated with a computer. In the case of quantum systems this method is known as quantum holography. Following this reasoning, the basic components of holography could also be pointed out in Hilbert space: the reference wave is expressed by the normed basis and the nullvector, and the phase distorted waves by the orthogonal base projections of the system's statevectors, expressing its time evolution. These orthogonal projections, as Fourier components, are the matrix elements of the given vector, which could be called as the hologram of that vector as well.

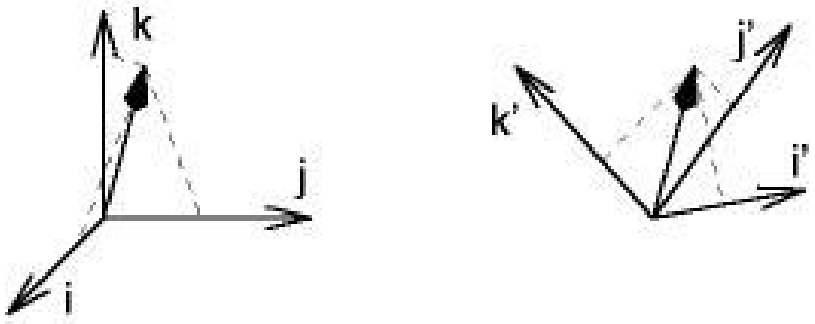


Figure 3.1.: On the left hand side of the figure we can see a statevector and its orthogonal components as they are represented in the (i,j,k) orthonormed basis. On the right hand side the same vector and its components are represented in a rotated (*i'*,*j'*,*k'*) basis.

That is, with the orthogonal components of the vector (see again on Figure 3.1) we are able to construct an operator (the hologram) which, referred to the basis, is able to project out the original vector (the experienced object). This can be expressed mathematically in the following way:

$\mathbf{A}=A_x\boldsymbol{i}+A_y\boldsymbol{j}+A_z\boldsymbol{k}$

After rotation the orthogonal components of the new vector will be as follows:

$A_x'=A_x\boldsymbol{ii'}+A_y\boldsymbol{ji'}+A_z\boldsymbol{ki'}$
$A_y'=A_x\boldsymbol{ij'}+A_y\boldsymbol{jj'}+A_z\boldsymbol{kj'}$
$A_z'=A_x\boldsymbol{ik'}+A_y\boldsymbol{jk'}+A_z\boldsymbol{kk'}$

The **ii'**, **ji'** terms in the equations are the scalar products of the given basis vectors, expressing the cosine of their confined interior angles, called also as phases, which are the elements of the transformation matrix.

In the case of artificially generated holograms (like digital holograms) the hologram of a given object (represented by its vectors) could be generated without the object or object space itself. That is, we are trying to artificially model the images of the given phenomenons or objects. If we now extend this model, as a generalisation, to the Hilbert space as well, than with the arbitrary rotations of the bases, where the phases of a given rotation are stored as elements in the rotation matrix or operator, we are able to artificially construct the modelled vectors or vector space manifolds. That is, by basis rotations or oscillations alone we are able to artificially generate a vector or manifold. And because the projected vector, as an image, will also be embedded in this way into the space, its orthogonal components, as reflections, will function as feed backs of the given projection, which could be interpreted as a self-awareness property. In physics, the theory of Lie groups are used in studying these above mentioned rotation or transformation groups, where the generated operators and their possible algebraic operations are expressed by a Lie algebra defined on the given group, which actually expresses the linear transformations of the given physical system's state vectors. In the case of quantum holography this means a harmonic analysis on the Heisenberg nilpotent Lie group G, algebra g and nilmanifold.[28] This principle is expressed technologically in the magnetic resonance imaging method (MRI and fMRI), which, if extended, could lead us to the theory of artificial (dynamic) quantum holography. It is interesting to point out here, that the subbases, referred to the nullvector, could also be generated or interpreted holographically (see projection theorem in Hilbert space), which could be a possible research area in the future. In this case, the set of the projected bases could be interpreted as images, and their transformational groups or Lie groups with their associated Lie algebras, could be more generally studied as a general harmonic analysis on the given n-dimensional basis. This possibility could be seen in the fact, that the mapping of an n-dimensional Hilbert space onto itself is expressed by the exponentiation of self-adjoined or Hermitian operators of the given transformations ($e^{i[operátor]}$, which actually expresses the frequency of the oscillating basis). With all these background information, now we are well prepared to phrase the aimed consciousness-holomatrix postulate:

Under the term *consciousness-holomatrix* we mean that (logical) operator or organising matrix, which is generated by the rotations of the given Hilbert basis, expressed as matrix products in the space of matrix logic. So this is how, in a holographical sense, we would be able to generate the consciousness-matrix of a given system, where the three basic components of consciousness – observer (normed basis), process of observation (operators) and the observed (state vectors) – could be explicitly generated and interpreted. In this sense, the property of self-awareness could be expressed, with the orthogonal projections of the image as feed back quantities, as a feedback system, forming a non-oriantable topological manifold, like a Möbius strip, as Stern's findings have pointed out. That is, a system could be interpreted as being self-aware, if the feed backed orthogonally projected oscillations are yielding back the original basis again, forming a completely closed system, where the feeling of 'I-ness' could be interpreted as a stability or fixed-point of the dynamical, self-aware system.[29] If we accept this hypothesis, than it follows that, being a Hilbert space based system, everything in creation is conscious, hence on the ground of their common *meta-*

[28] P. J. Marcer, *A quantum mechanical model of evolution and consciousness* (an electronic paper on the internet).

[29] The properties of collective consciousness, being present in the environment, has a great effect on this feedback process, which manifest itself in the different cultures of the society. This answers the importance of the cultural heritage and its components, in shaping individual consciousness, which fact is emphasised in Zsolt Czene's paper. With the help of the consciousness-holomatrix model we would be able to model the conscious manifold of a given culture or society, offering in this way that quantitative interpreting and qualifying principle, which is mentioned by Czene in his paper under the title 'The effects of cultural heritage in science's paradigm shifts'.

conscious space, interactions between their related consciousness-holomatrices could be defined.[30] Because the Hilbert bases and frequencies of every physical system are forming a multi-component system, hence we could distinguish different adaptive resonance levels in respect of the feed back of the image's orthogonal projections, where the holographical image status can be assigned to the state vectors, to the operators, and to the bases as well (see Figure 4).[31] Indeed, these holographical mappings could also be interpreted as topological isomorphisms, thus they could also be interpreted as topological excitations or energy levels, where the given energy levels could be related to different states of consciousness (the details of this could be found in Stern's latest book). On Figure 4 we could see that the holographical process could be vertically and horizontally also defined, presenting in this way three different states of knowledge. Matrix logic, as a *devata* aspect, can be used in transforming the consciousness-holomatrix to a mind-matrix, and to its intrinsic logical structure. This means, that the processes of the mind also has finer and more abstract constituent levels, which could be experienced by the above mentioned consciousness technologies, and can be modelled by our consciousness-holomatrix model. The EPI principle is covering the figure on the *chandas* side from outside, because this is where it starts as a process, giving approximate laws of the inner reality of logical symmetries (modelling waking state of consciousness). In this regard, it would be interesting to study the mappings between the information geometric manifolds of probability distributions and the topological manifolds of matrix logic.[32] On Figure 4 we could clearly see the relationships between these different qualities and properties, e.g., the connection between the operators and their related Lie algebras through the commutator, which process embeds within itself the basis of the given Hilbert space, hence they are also linked holographically. The details of this holographical projection process, as a reality creating and consciously sensing mechanism, could be seen on Figure 5.

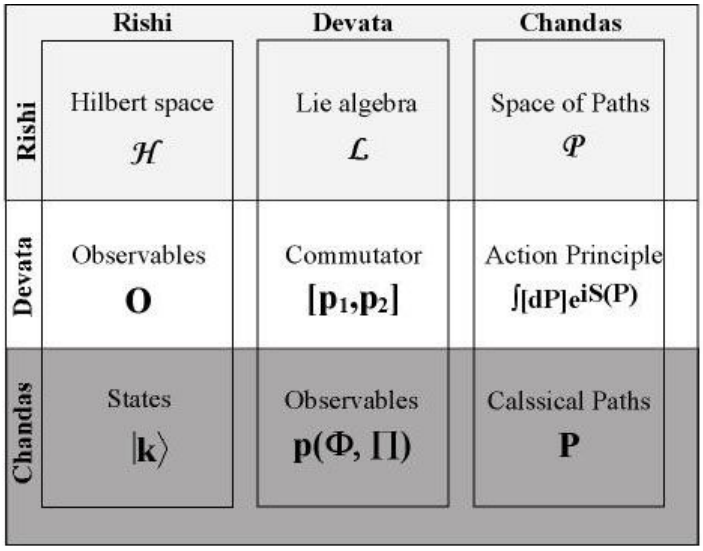


Figure 4. The three-in-one structure of quantum-mechanical knowledge (by John S. Hagelin)

[30] In reference to the holomatrix principle, as a feed-backed, analysing principle, and with the help of the convolutions of topological manifolds, we could look for mathematical relationships between these mentioned areas, which has a close relation to K-theory and to non-commutative geometry or topological algebra. To connect these fields to logical manifolds, via the help of matrix logic, could generate new, interesting results.

[31] These adaptive resonant frequencies could answer the mystical effects of sound frequencies and music on the individual's consciousness, which fact is also mentioned in Norbert Dunkel's paper.

[32] S. Amari, *Information geometry*, Contemp. Math., vol. 203, pp. 81–95, 1997. The application of information geometric manifolds to neuronal networks could shed more light on formulating the holographic projection process, which connects the geometric brain with the topological consciousness-holomatrix.

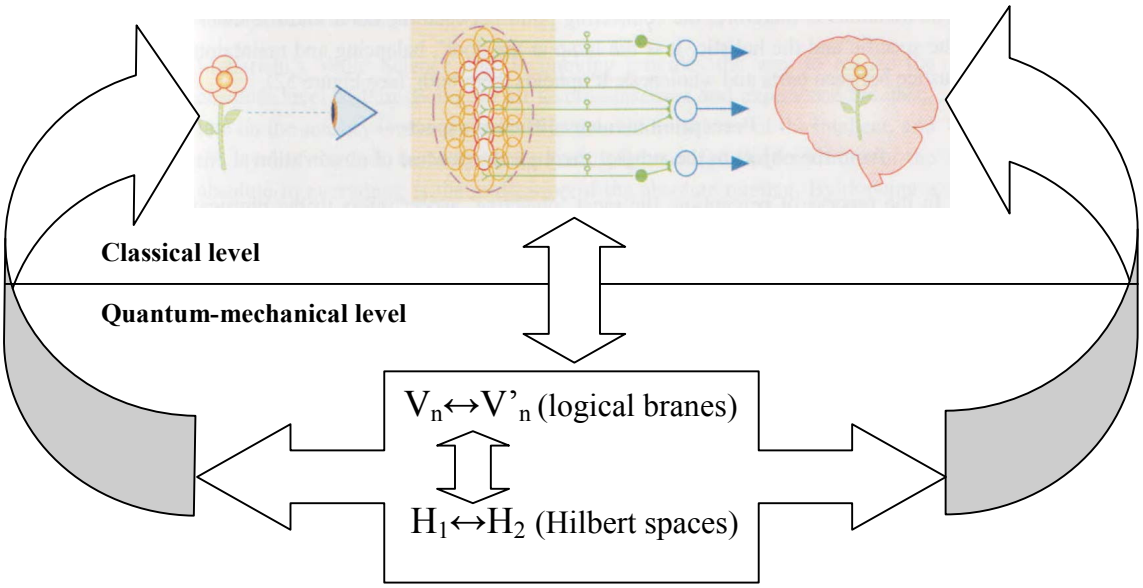
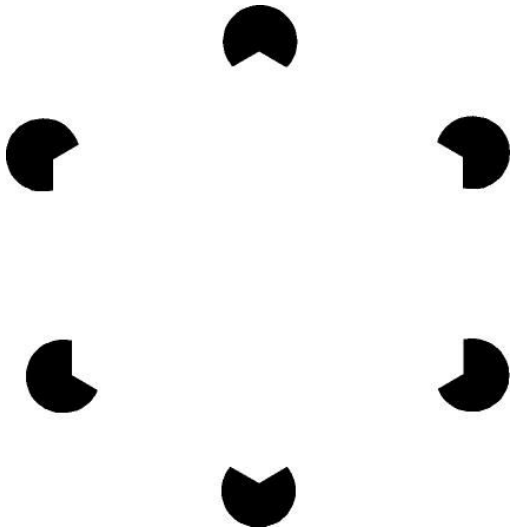


Figure 5. As we see, the holographical interactions could be also vertically and horizontally defined. That is, the interactions on the image level – the interactions between the brain and the perceived objects – are just holographically projected and perceived images of the underlying refined processes. The vertical projection process of the underlying interactions could possibly be modelled by the functional magnetic resonance imaging (fMRI) method.

It is important to note here, that, being complex valued, the holographical or conscious mapping of Hilbert spaces to each other would also mean real and imaginary components to appear together, where we are bale to physically measure only the real components (the observables), represented by Hermitian operator matrices. But due to self-interactions, pure imaginary terms would also appear, whose measurements (momentarily) are not possible, though their conscious perceptions are real (think of a hologram image, whose physical measurement as an object is not possible, though we experience it, as it can be seen on the right hand side figure, where we are able to consciously experience the hexagon, which is otherwise not there physically!). Accordingly, these quantities, like a thought wave, are not Hermitian. That is, the brain is such a physical system where the co-existence or interactions of these kind of quantities are possible, which could be more thoroughly studied with a fully elaborated consciousness-holomatrix principle, where the understanding of the interactions of Hermitian and non-Hermitian properties could lead our present physical theories to new territories. Today's physics could give us only the half of the full picture of the reality, the other half is the holographically or topologically related conjugate space of consciousness. That is, both these fields together constitute the full picture, which is described by complex or hipercomplex numbers, as Stern points out in his book. This last statement also sheds new light on the importance of the use of complex numbers in quantum theory, in which the inclusion of the conscious observer into the theoretical framework is unavoidable. If existence is really described by complex numbers,



where the imaginary part expresses consciousness, than it becomes clear why our present day physics, dealing only with Hermitian quantities, was not able to decipher the secrets of consciousness and intelligence. For understanding consciousness and intelligence a new physics is needed, a new framework, where we are able to study Hermitian and non-Hermitian quantities in isolation and together as well, where these two quantities are related to each other with a dual (holographical) symmetry.[33] This would answer the basic dilemma regarding the pre-existence of brain and consciousness, since both property are, in reality, the expression of the same underlying holographical consciousness principle. That is, the brain is the holographical image projection of the underlying consciousness field dynamics, while self-awareness is a stability point or singularity of this self-observing consciousness dynamics, represented by a non-oriantable topological manifold. Thus, in respect to the holographical consciousness field, and its dually symmetric interaction dynamics, both properties the material brain and the non-material self-awareness could be derived from each other.[34]

3.4 The consciousness-holomatrix and the structure of knowledge

According to the above mentioned ideas and their inner relationships, seen on Figure 4. and 5., every physical system, in respect to their Hilbert bases, are interrelated, which fact expresses itself very clearly in the quantum-mechanical vacuum state of quantum field theory. In respect to their common vacuum state, every physical system could be seen as EPR (Einstein-Podolsky-Rosen) like connected, where the inner observer state (logical brane structure) of a given system could effect and determine the outer (observed) physical system's inner states and *vice versa*. These possible interactions and their related physics were described in details in the paragraphs dealing with the latest findings of modern theoretical physics. Here we showed, that with the Fisher information based EPI principle the observer's reality structuring effect could be extended from the quantum to the classical domain of ordinary waking experiences. Here we also understood, that the real natural laws are expressed by the symmetry principles and not by those, which are derived, as approximate ones, from these symmetries. At the classical level, where the observer is not coherently linked to its inner conscious dynamics, through his own image feed back he will interpret and decode himself classically, hence the generating parameters of its consciousness-holomatrix would be based on these broken or distorted symmetries, and he will perceive and organise the outer reality accordingly. That is, our basic and fundamental conscious experiences and inner feelings are tuning or defining the generating parameters of our inner consciousness-holomatrix, which are the generating parameters of the Lie groups of our holomatrix, from which the related Lie algebra, with the commutation relation, could be derived. Through matrix logic this could be transformed to the matrix logical structures of the mind. With converting these inner symmetries to logic operators we could express the knowledge

[33] It would be good to compare these assumptions with those mentioned in Gábor Balogh's paper under the title 'Paradigmatic thinking', where, following Thomas Khun, he defines the 'Expert matrix'. Accordingly we could say, that with the consciousness-holomatrix method we would be able to exactly define, and mathematically express Khun's original idea. Because of its information representing (creating) and expressing property the consciousness-holomatrix, or organising matrix, we could define information as an organising quality, which would complete József Csorba's general information definitions. The importance of material (Hermitian) and non-material (non-Hermitian) interactions is also mentioned in Csaba Varga's paper under the title 'The evidence of elemental recognitions'

[34] From the point of view of the consciousness-holomatrix principle, such a question that the Absolute or Metagod, consciousness or meta-consciousness creates the reality or meta-reality, or vice versa, as their combinations are listed in Csaba Varga's paper under the title 'Metatheoretic...' is completely unimportant and important at the same time, since creation of the other, and as view point are completely equal or supersymmetric.

structure or **L**-brane of the given observer system. The inverse of this is also true, which means, that through the **L**-brane or knowledge structure of a system we could define the generating parameters of the related logical symmetries, which also defines the inner topology of the conscious observer and its reality experiencing conscious sate accordingly (see matrix logic paragraph). The existence of higher states of consciousness, reachable by the above mentioned consciousness technologies, through which higher levels of self-consciousness could be experienced, are good proofs of the above mentioned assumptions. This could be extended, as a model, to the process of knowing as well, and by developing the full mathematics of the consciousness-holomatrix principle, we would be able to define and interpret the consciousness-holomatrix of different disciplines which could also give us their mind or matrix logic structure or manifold. We have already seen, how this could be done in the case of physics, and by defining their own general variables or coordinates, as parameters (see also in the Fisher information paragraph), we could apply this method to other disciplines as well. With the help of these general variables we would be able to define the related knowledge manifolds, where, with the use of harmonic analysis, we could also define the holographic models of the given manifolds and its related mind or knowledge organising logic structures. In this way, every discipline or process of gaining knowledge would be derived from the same fundamental principle, hence their common topological resonances, as their possible unifying logic processes, could also be looked for. This process could also be interpreted as an associative interpretation, the truth of which could be seen in the common experience, where a phenomenon is associatively interpreted from a different *point of view*, e.g., the associative interpretation of the thought waves, as oscillations, with Hilbert space manifolds, through which the phenomenon of consciousness, as we have seen, could have been related to the Hilbert space formulation of physics, leading us to new avenues and understandings (here the term *'point of view'* is emphasised because its clearly expresses that the associative resonance is tuning our understanding to a new basis component (Rishi)). The same could be expected when we extend this method, as a mathematical formulation, to other knowledge systems, to study their possible overlappings, and evolution tendencies. Looking at the evolution of our knowledge we could already recognise this associative adaptive resonance, which could be now mathematically expressed, and could be used as associatively unify, as a 'heuristical' connection, the seemingly unrelated areas of different disciplines. And because the dynamics of consciousness was pointed out as the underlying basis of this principle, and because everything in existence was interpreted as having a consciousness property, hence the idea of a consciousness based science and its evolution could also be understood.[35]

The connections between the Veda and the consciousness-holomatrix

Understanding the principle of consciousness-holomatrix and the structure of knowledge, now we are in a better position to understand Maharishi's definition about the Veda or pure knowledge. Maharishi, as we have seen, states that Veda or pure knowledge is 'generated by the inner fluctuations of pure consciousness', which could be interpreted as the self-interactions or self-mappings of the Hilbert bases, expressed by the related symmetry groups. In the case of the Fisher information based EPI principle, this is equal with the $K=0$ level, where the measurement and its logic leads to tautology or absolute truth. Because the EPI principle, as we have seen, could only be used when $K\neq 0$, hence with this method we are not able to study the inner, more basic symmetry laws, nevertheless it points out, that our knowledge could only be full on that level. For studying these symmetries Hilbert space formulation and its related Lie algebras, and matrix logic is needed, together with the applicable harmonic analysis. With their use every system could be interpreted and defined

[35] In the light of this, and to look for associative connections, it would be good for the reader to compare all these ideas with those mentioned in his paper by Gábor Balogh under the title 'The ways of knowledge'.

from a related Hilbert basis, where the basis is also functioning as a coherent generator or decoding apparatus in gaining knowledge about the given dynamical system. Because every discipline, as a process of gaining knowledge, was found to be originated from pure consciousness (or normed basis), their possible unification process, as logical overlaps, were shown to be achievable, based on the associative topological transformation dynamics of pure consciousness. This property was expressed by the absolute abstraction (*atyanta-abhāva*) – everything is interpreted as a consciousness fluctuation generated manifold, and these fluctuations could be related to any kind of property or characteristic – and the self-interaction (*anyonya-abhāva*) quality, where the newly emerging state is associatively or adaptively more than the previous one. This process generates and upholds the Veda or the web of pure knowledge and its eternal flow, which cloud be interpreted as the holomatrix or organising matrix of pure consciousness. As a clear proof of Maharishi's above mentioned interpretation, the vedic literature describes this reality in the following way:

> *„Richo Ak-share parame vyoman yasmin devā adhi vishve nisheduh, yastanna veda kim richā karishyati ya it tad vidus ta ime samāsate.*
>
> *The Richās (sounds, verses) of the Ved are generated by the collapse of unity within itself, in which reside all the dynamical impulses of natural law responsible for the whole manifest universe. He whose awareness is not open to this field, what can the sounds of the Ved accomplish for him? Those who know this level of consciousness are established in unity, wholeness of life".*
>
> (Rik Veda, 1. 164. 39, in Maharishi's translation)[36]

> *„Dashame yuge yatinām Brahmā bhavati sārathih – The ten-dimensional structure is at the basis of and promotes all-dimensional structure"*
>
> (Rik Veda, 1. 158. 6., in Maharishi's translation)[37]

> *„Dure drisham grihapatim atharyum – Far, far away is seen the Self reverberating."*
>
> (Rik Veda, 7. 1. 1., in Maharishi's translation)

This level expresses the unification of all the symmetries, from which the single symmetries and their combinations, as observer based sub-consciousness-holomatrices, are emerging by the apparent symmetry braking caused by self-interaction or self-observation process. These emerged symmetries could be interpreted as special observer or viewpoint generated approximations of the underlying unbroken symmetry or pure knowledge. The sequentially emerging topological (consciousness) excitations of the given system are the more expressed approximations of that system, which could be interpreted as the observer's states of consciousness, which could be studied and extended mathematically to the waking experiences by the related Lie groups, and Lie algebras, by the manifolds, matrix logic and the EPI principle. Without this common basis, the pure consciousness state, our knowledge is baseless and full of disturbances, causing the flow of consciousness and the process of gaining

[36] Maharishi Mahesh Yogi (1992), *Rām, Rāmāyan, Rām Leelā, Rām Rāj*, page 175.
[37] Maharishi Mahesh Yogi (1994), *Maharishi's absolute theory of defence*, page 382.

knowledge until – through the fine tuning – it loops back to its own generator basis, functioning as an *n*-dimensional observer. In the same way – as Maharishi also points out –, the Veda, being the knowledge structure of pure consciousness, is completely lost without the availability of pure consciousness, which could be interpreted, in the light of the above mentioned holographic feed back process, as the non-availability of the coherent light in decoding a hologram. This state of knowledge becomes available only, when the individual is fully awakened, when the state of pure consciousness is fully available in every sate of his consciousness. Such an individual could be interpreted as a quantum coherent observer, who, by being a pure infinite dimensional Hilbert basis, is able to evaluate his environment on the ground of direct cognition of its reality. In such a case the individual is spontaneously expresses and lives pure knowledge, and the dynamics of natural law, by being in complete accordance with his own nature, which is the nature of the whole Universe and its evolutionary dynamics. This was expressed in that statement, where we showed that everything in creation is mutually connected in an EPR like manner (expressed in Bell's theorem). When this innate connection with everything is full experienced and directly cognised by the individual observer, than his state of consciousness is risen to unity consciousness, where his knowledge is full, ever existent in a flowing and non-flowing state. This cherished state, as the highest state of enlightenment, is the main target and common subject of every spiritual teaching and tradition, in which state the individual feels completely at home with every system of gaining knowledge. To corroborate our assumption let us see how the founders of the different religions and the vedic rishis expressed in their own words this experience:

> *"According to the enlightened seers or rishis, Brahman (or Wholeness) is infinite, absolute, undivided reality, pure consciousness. In it, the final realisation can be cognised that the observer, the process of observation and the observed are one in reality.*
> *Brahman is the only reality, which, through our false knowledge, appears as the Universe, and the always changing names and forms of the phenomenal world. But the gold remains gold, even if we make a lot of ornature from it. The same is true about Brahman, and 'thou are that'".*
>
> *"The body, the vital force, the senses, the thoughts, the mind and the 'I' are, in reality, the covering mantles of the Ātmā or Self. If we associate ourselves with one of these mantles, than we experience its nature and its related phenomenal world".*
>
> (Adi Shankara, Vivecachundamani – The jewel of discrimination)

The last quotation beautifully expresses the above mentioned holographical looping mechanism, and its self-awareness and reality or nature creating effect.

> *"Aham Brahmāsmi – I am Totality"*
> (Brihad-Āranyak Upanishad, 1. 4. 10)[38]
>
> *"Sarvam Khalu Idam Brahm – All this is Totality"*
> (Chhāndogya Upanishad, 3. 14. 1)[39]
>
> *"Vedo akhilo dharm mūlam – Veda is the root of all laws"*

[38] Maharishi Mahesh Yogi (1997), *Celebrating perfection in education*, page 74.
[39] Maharishi Mahesh Yogi (1997), *Celebrating perfection in education*, page 74.

(Manu smriti, 2. 6)

Lord Krishna: *"Curving back upon my own nature, I create again and again".*

(Bhagavad-Gītā, 9. 8, in Maharishi's translation)[40]

Buddha: *" If the mind is pure and peaceful he is very close to me though he be thousands of miles away; if he receives the Dharm, he sees me in it".*

(Fo Suo Hsing Tsang Chin I, 2: 136-137, 5th Century A.D.)

Tao: *"When Heaven and Man exert their powers in concert, all transformations have their commencements determined".*

(Yin Fu Ching I:3-4, 8th Century A.D.)

Qur'an: *"O (thou) soul,*
In (complete) rest
And satisfaction!
Come back thou
To thy Lord –
Well pleased (thyself),
And well-pleasing
Unto Him!
Enter thou, then,
Among my Devotees!
Yea, enter thou
My Heaven!

(Sūra 89 (L Fajr, The Dawn), Verses 27-30)

Jeremiah: *"I will put my law within them, and I will write upon their hearts; and I will be their God, and they shall be my people".*

(The Bible, The Book of Jeremiah, 31:33, 7th Century B.C.)

"Then the unseen wanted to become seen, so He first created the point, which became thought, and He draw in it all shapes, and formed all forms; He carved the shape of a secret picture in the secret sacral light: and this is the most sacred building in the primordial void, and this emerged from pure thought."

(Zohar (The Book of light), I 1b-2a)

"Similarly, the Torah also has a body, and it is made of the commandments, and this is called the body of the Torah. This body of the Torah is covered with mantles made of the stories about this world. Foolish are those who see only the cloth – the stories of the Torah – their knowledge are inadequate, they do not see the reality behind the mantles. But those with clear knowledge see the body under the mantles. The wise,

[40] Maharishi Mahesh Yogi On the Bhagavad Gita (chapter 1-6), Albourne, Wilthshire, England, 1965.

the servant of the Almighty, those who were standing on mount Sinai, they see the spirit, the real germ of all things, the real and primordial Torah. In the coming age they will see the spirit of the Torah".

(Zohar (The Book of Light), III. 156a)

As we see from these quotations, with the mathematical formulation of the integrated super-metatheory we will model the function and reality creating and experiencing faculty of a person with enlightened consciousness.

3.5 The lights of the future

Developing and expanding the self-awareness of an individual through the vedic or subjective method of gaining knowledge, the individual is gradually and adaptively moves in his consciousness-holomatrix or the web-structure of knowledge, gaining clearer and clearer knowledge about the object of knowledge, which is his own Self. And because this knowledge is gained by direct experience, by the expansion of Self-consciousness, the individual becomes more conscious about the functions of the laws of nature, and about the applications or utilisations of them through the dynamics of his own consciousness. The emergence and evolution of our technologies in the evolution of our civilisation actually followed and expressed, on the gross (picture) level, the same (movement) process, which could be directly experienced now as a conscious phenomenon. Actually we are always experience this evolution as a development of consciousness, because the gross level phenomenons, as we have seen, are merely the projections of the consciousness-holomatrix, as it was pointed out by Stern in his topological quantum machine hypothesis too. Indeed, an enlightened person embodies both, the theory and the practice at the same time, since due to the holografically integrated geometry (brain) an topology (consciousness), and its dual symmetry, the directly experienced and understood knowledges and experiences are immediately manifest themselves as holographical phenomenons. That is, the person and his enlightened self-awareness is the generator of the intrinsic logical structure of knowledge, and he is directly observes the reality change induced by his self-conscious projection dynamics.

That is, an enlightened physiology could be seen as a *topological quantum dimension-machine*, which is, through the embedded holographical dimension-transformer mechanism, transforming and linking consciousness dimensions, fundamentally defining in this way the related phenomenal world or reality.

If we extend now this dynamics, as a modelling principle, to the logic structure of different disciplines, than the development of our technologies, and the evolution of our sciences will continue not as a trial and error process, but as a conscious (since it will be based on the model of consciousness) evolution and design. Accordingly, we will design our machines and sciences in a way, that it will include in its structure the all pervading multi-dimensional field of consciousness, so that they will fully express those phenomenal experiences, which we would expect from their original design. But this will lead us to realise that the different disciplines, as different consciousness and knowledge manifolds, are already expressed in the particular functions of our nervous system – as we have seen in the theory of matrix logic –, emphasising, in this way, the importance of the enlightened physiology, as the ultimate technology, which is the alpha and the omega of Maharishi's Vedic Science and Technology as well. In short, the super-metatheory of all sciences could highlight for us the real meaning and goal of a fully developed nervous system, which could generate a quantum jump in the

evolution of our civilisation, through which our knowledge- and technological society could be transformed into a consciousness-society. According to Figure 3, found in József Csorba's paper, this transformation could lead us into the Q-II and Q-III realm and era, the characteristic of which is beautifully described in his paper as well. This transformation will be generated by the understanding of the fundamental role of consciousness in nature's functioning, and by the accelerating effects of new technologies derived form this new understanding and knowledge. This accelerated knowledge and consciousness development will finally uncover the ultimate truth and reality, our multi-dimensional Self and its embodiment in our holographically projected physiology![41]

4. Conclusion

The consciousness-holomatrix creating principle, as it was described in this paper, at the moment is just a hypothesis, which could be raised to a theory status by studying the mentioned links between the different theories, leading to a consistent mathematical framework. Following the logic of the paper, this is indeed possible, and the sole aim in describing it was to achieve this goal in the near future. The author of the paper hopes that the professional readers will join us in this great work to generate the above mentioned scientific and technological quantum jump, which could offer the ultimate step in the evolution of our civilisation and knowledge, and the solutions to our present and future problems, as it was highlighted by the opening quotation of Einstein. It would be unwise to neglect this possibility because of the conditioned generators of our present consciousness-holomatrix and its related mind structure. Let us open ourselves to the free knowledge acquisition in the infinite space of the consciousness-holomatrix, and let us study those possibilities which seems completely contradictory to our presently limited viewpoints. Wholeness emerges form open closeness! This possibility was already visioned by Wictor Charon in his book 'The science of the new aeon', from which I would like to cite my closing words:

> *„At the beginning of the Dimensional era, the pioneer thinkers have already realised, that it is possible to create such an integrated framework of all sciences, in which the diversification is not at all important anymore. Simplification, following the complicated processes, which achieved its goal, is a property of nature. The same happened with the refinement of thinking during the dimensional integration process. Which was seen impossible, the era of expansion achieved it. Many partial-knowledge system became needless or a museum piece, and at the end the expanded knowledge structure of the pas proceeded to a taper in the direction of the present. And as the Universe was expanding in its higher octaves, so it was contracting in the lower ones. Finally the dimension-astronomy integrated all the useful and necessary knowledge systems, and it became the only discipline taught in schools.*
>
> *Of course, the different empirical knowledge systems of the Cosmos had many subdivisions, but to the contrary of the old subdivisions, it had the chance to describe every phenomenon from the same fundamental principles.*
>
> *Finally, its theory became fully consistent, which ran parallel with its practical utilisation."*[42]

[41] The different ideas presented in this paper could open up new avenues and dimensions in understanding the ideas and thoughts in István Kamarás's paper, and it also closely related to László Márfai Molnár's paper. At the same time it could offer an answer and hope to the dilemma found in Csaba Varga's paper under the title 'The limits and possibilities of theory development'.

[42] Wictor Charon, *Az új eón tudománya,* page 127, Rockcity Kft, Budapest, 1999.

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