Boundaries

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Scientific Aspects

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From: edward grey <edwardgrey@lycos.co.uk>
Date: Thu Mar 20, 2003 2:54 pm
Subject: In memory of Bill Honig

The world needs people who are big enough to inspire other people and encourage them to do good work and not mind the competition , in fact are inspired by it. Perhaps something out to be set up in memory of Bill who encouraged me.

ANPA Proceedings Editorial Policy

ANPA has been criticised in the past - in particular by members of its own Advisory Board - for having no formal editorial policy for its Proceedings. This has been balanced by a feeling within ANPA that we should keep ourselves open to all viewpoints. In the last few years as editor I have tried to tighten things up in such a way as I felt would satisfy our critics whilst not compromising our own position. This has been partially successful although for some time I have felt that it is time that there was a formally stated policy. The following has been approved by the Executive Council, although it is open to feedback from all. By "the editor" is meant the Editor or (an) appropriate nominated Referee(s) (note the capital R!)

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{* added by KGB}

3. The editor should be satisfied that the paper is ***presented*** in such a way that the majority of the readership will understand the author's intentions. In particular ***it should be clear*** that the author has a correct understanding of the subject matter.

4. "Verbatim" reports will be accepted subject to the above three conditions only, regardless of whether the final draft is an accurate rendition of what was originally said. Other such reports are better submitted to the Newsletter.

5. Theories of any nature are acceptable material, provided they are compatible with the known facts, and provided they are deemed to be of interest to the readership. Theories of alternative, imaginary worlds are also acceptable, provided their nature is made clear.

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I would like to try to continue conformity of *style* for future issues of the Proceedings. Ideally I would like contributions to be submitted in International Journal of General Systems format (I have some copies of their Notes for Authors) or similar - **LOOK AT MY PAPER IN A RECENT ISSUE OF THE PROCEEDINGS FOR AN EXAMPLE.**

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If English is not your first language try to keep the paper short.

The copy date for the ANPA2002 Proceedings is January 1st 2003. The issue will go to print on April 1st 2003. This will be adhered to rigidly this year.

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FOR EDITORIAL ADDRESS SEE THE PENULTIMATE PARAGRAPH

WHAT IS PHILOSOPHY OF NATURE?

A VERY SHORT PROPOSAL

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Nature usually means an unknown structure to be approximated by a succession of theoretical models in connection with constants of nature. The aim of physics as the most fundamental and universal science consists in reducing these constants to a single dimensionless quantity no more explainable. Furthermore nature is the object of a cultural experience of a non-technical environment – this experience could be realized in looking at a specific scenery as a landscape, for example.

The philosophical concept of nature refers to the "naturalness" of nature consisting in its *autarkeia* (Democritos, in: Diels/Kranz 1952, Vol.II, 68B176). In this – provisional – sense nature is the one which cannot be destroyed in principle – nature preserves itself, and can be characterized shortly as a lawful connection of transformations of energy (and matter). Nature preserves itself through these transformations building up and destroying *local structures* but conserving its "continuous" *stability and simplicity.* That seems to be the meaning of Newton's comment: in his Principia: "...nec à Naturae analogiâ recendum est, cùm ea simplex esse soleat & sibi semper consona." (Regulae Philosophandi, Regula III, comment)

But what about the so called "complexification" of nature resulting in complex structures and (individual) forms (up to contents of thought and norms) being unstable and precarious? That's the central question of philosophy of nature: *How is it possible that nature does let emerge forms being in this sense "non-natural"*? (For example: How emerged "validity" of thoughts out of (inter-) actions of dimension E×t?) How come this "self-transcendence" of nature?

So philosophy of nature searches for a metaphysical principle *not* referring to an *élan vital,* for example, but *explaining* some sort of a "*fourth law of thermodynamics*" as a desideratum to describe complexification. A *prélude* runs as follows: "The fundamental dynamical principle is that the universe evolves in such a way as to maximize its variety." (L.Smolin, in: Conceptual Problems of Quantum Gravity (Ashtekar/Stachel 1991, p.277)) For this proposal thermodynamics in a broader sense is fundamental. The puzzle has to be solved by philosophy of nature that nature changes to a "non-natural" area.

This note started as a communication that I sent to Lou Kauffman together with comments added by him as well as comments subsequently added by Clive Kilmister. It is thus a composite from these three writers though it has been compiled by me, using reported speech and quotations.

The note explores the possibility of identifying the *signal* in the hierarchy with the photon.

Ted Bastin, 12/3/03

The Photon

At ANPA in August 02 I said "There is another major change in outlook that we have to make which is hardly separable from that reinvention of classical concepts that is demanded by our view of the physical variable. One naturally needs to have a physical picture of the particles of high energy physics: Now what could we mean by a physical picture which does not presuppose the spatial continuum? One might assume that thinking of this sort would take the form of abstract groups and such algebraic devices, which in themselves could not have physical consequences. Do we mean that? Not bloody likely. In the foregoing discussion I have spoken as though changes in –say- groups are at once things going on in the world. They happen in real time. This is the brutal face of the process view. Thus I contemplate atomic structures built up of combinatorial motions that are in every way real, and underlie and indeed dictate the dimensional shape of the spatialized phenomenon."

I had long tried to get comments of any sort when expounding views like this, since they appear to fly in the face of accepted logical categorization, but with no success. Yet I didn't believe the hearers were accepting a word of it. At that meeting I was delighted to have got clear enough to provoke vigorous objections. At that point Lou stepped in in my support with a statement that was, I think, clearer than mine.

Lou: "What did I say?"

I wish I had recorded it. I think the main point at issue was whether some central aspect of an algebraic structure could be singled out from the rest of it because it was **the same as** something happening in the world, so that that aspect was shared and in common. On this view there would be parts of the mathematical context which would not be relevant and could be ignored without vitiating this use of the algebra.

Now Clive and I have been trying to put together arguments that combine particle properties with the simplest starting point of special

relativity (within the constructive approach, naturally). This leads us to a startling tentative conclusion (Clive's actually) which seems to be along the same lines as those of the paragraph above, but to take things further. We wonder if you will find it reasonable (not logically absurd).

Our object is to put the high energy entities into the elementary relativity constructive build-up. Since both sides are constructive this synthesis amounts to a unification, though the two are complementary in the sense that it is convenient to think that one can work at either in abstraction from the other

We inject a separation of spatial separation from time separation where initially they are undifferentiated.

Lou: "I know you are about to do K-calculus so will comment here. In K-calculus we have $t_2 = t + x$ and $t_1 = t - x$. t_1 and t_2 are times of transmission and reception. In the beginning there are only times! Then space and time are constructed from the above equations. This is a point of view that explains how in the beginning there is no difference between space and time."

This comment says more sharply what I meant to say . I would only suggest that when we have no distinction between space and time then the better word to use is 'time'. (Rather in the spirit of 'In the beginning was the Word')

Following Clive we can say that the initial step is to use what by analogy with the continuum picture we shall call the 'advanced and retarded' times, $t + x$, $t - x$. We are talking about certain events, or, in process terms 'elements', and the crucial first thing is that there be two kinds of them. If we look forward to the orthodox continuum picture these would be called transmission and reception events.

We get these two kinds of events by embedding them in a geometry with observers O signaling to O' at time t_1, and the signal reaching O' at time t_2'. (t_2' because it is O's clock that measures it.) The ratio t_2/t_1 is a constant = k, say, because it is determined entirely by the relative velocity, v, between O and O'. Then let the signal be reflected at O' (at time t_2') and received at time t_3 (on O's clock of course). Then since $t_3/t_2' = k$ as well, we get $t_3 = k(kt_1) = k^2t_1$. Kilmister has developed this approach following Milne and Bondi, who called it the k-calculus.

By definition O assigns time and space coordinates in the reflection event at O'as

$$t = \tfrac{1}{2}(t_3 + t1)$$
$$x = \tfrac{1}{2}(t_3 - t1)$$

Thus we ger back to the advanced and retarded time which we used as our break-in point, and we see the foregoing as just a way of wrapping up the algebraic structure in spatial concepts.

The relative velocity $V = x/t = (t_3 - t_1)/)t_3 + t_1) = (k^2 - 1)/k^2 + 1)$ and from this we get by algebra the Lorentz transformation of t into t_2'.

$$t = t_2'.1/\sqrt{(1 - V^2)}$$

Lou: "Note the symmetry of the Lorentz transformation in the k-calculus where $t_2', t_1' = kt_2, 1/kt_1$".

Clive: "This simplicity of the LT in terms of the k-calculus is worth noting in the 1D case and arises from the fact that the k-calculus constructed space from time, but in the general 3D case some more thinking is needed ideally, to get an equal simplicity there."

Lou: "Can't we think about transmission and reception in the discrete? The concept is the distinction between actors and actants. In the beginning there is no distinction between an actor and an actant. All actions are from itself to itself. The distinction of "other" arises in the course of patterns of action" I, for one, am happy with that gloss on the discrete beginning..

Clive now points out that the nature of dimensionality becomes important because we treat it quite differently in the hierarchy algebra. He says: "I am having some second thoughts here. It is true that the k-calculus constructs time and space from two different kinds of time, but the $x = ½.(t_2 - t_1)$ *should* be a number, t, but $½.(t_2 + t_1)$ should be an element of the hierarchy –in order that (in some way about which I am not quite clear) it will in due course give rise to level change. And *that* means that we can't in the general case be concerned with $½.(t_2 + t_1)$ and $½.(t_2 - t_1)$, but with some functions, say

$s(t_2,t_1)$ = a number

$d(t_2,t_1)$ = an element of the CH.

(s, d to remind us it was sum and difference in the restricted 1-D case).

Inertial frames.

Clive: "I think, but I am not sure, that the k being the same for t_3/t_2' as for t_2'/t_1 is neither more nor less than saying that both observers are at rest *in inertial frames.* This is because, as Galileo noticed, two inertial frames are completely equivalent. That O, O' are moving uniformly relatively, means that both k's are constant: but I think they must both be inertial for the k's to be equal."

I can't put diagrams, so let's just say that the spatial description would consist of a straight O line and an intersecting O' line with t_1 and t_3 on O, and t_2 on O' with signals going t_1 to t_2 and t_2 to t_3.

A second question, usually neglected by the k-calculus people, is: how does O know that the signal received is the one he sent, reflected at O'? In the continuum case signals could be modulated, and this is probably what the k-calculus people had in mind. In the process view this becomes the requirement that certain elements in the sequence are *pairwise* related. Such a relationship will then need a different

discrimination signal from the one signalling identity. It is interesting that the aspect version of the hierarchy provides exactly this at the lowest level, where the quaternion group replaces the quadratic group of the original CH

Lou: "...in practice we know..(which signal...) from context. In the beginning there is no context to guide us. I could imagine that the arbitrary choices made at that beginning end up determining the curious properties of the later more stable world.

Clive differs from Lou. "The 'in practice' evidence, from radar, is: modulate! Surely context does not come in at all? If you do have context, my 'pairwise' is not needed."

I presume Lou would say that 'context' covers modulation. Why be specific about modulation? Wouldn't *any* property of context require pairwise relation and therefore the non-commutativity? I recall that at this stage, on Clive's own showing, we have not settled the matter of dimensionality so it seems unreasonable to strain at the small camel of modulation.

The use of advance/retard does not imply our having a range of values for x, t and the usual continuum use of those symbols may be misleading unless we realize that to begin with they are merely ciphers; the choice of those ciphers being to foreshadow the use that will be made of them. To be able to think of their having a changing value to describe motion, or indeed there being more than one of them, we have to use considerably increased structure. This is done in the second step of Clive's form of Milne/Bondi which gets to the Lorentz transformations. The increase in complexity necessary to do this consists in the two observers getting reflection events independent of the former ones. The third 'observer' of Kilmister/Milne/Bondi is a way of extending the conceptual framework to give individuality to the 'observation'. I think that the question whether we have a set or an ordered sequence is answered by the constructive principle, and that is universal. They are ordered in the order in which they were constructed. There are some loose ends to be tied up here about how to make the process more complex, but we assume that will be possible.

Lou: "Sounds good but I am beginning to get a little lost."

I have got vague and repetitive. I note that at several points Lou accepts in general the notion of a developing context. I am still nervous over this –thinking that most people will think it mad and therefore I keep on pushing it again in a confusingly repetitive way..

Thus I wrote: having now a language rich enough to give individuality to 'the event', we have imported particle and interacting

photon as a packaged deal. Not even in the most classical thinking do they suppose that the photon has meaning apart from an interaction, so we are not breaking new ground yet. There is the further question whether we can ever speak of a given photon's taking part in more than one interaction- building up its individuality gradually, as it were. We shall consider that later and separately. If we can associate rest mass with the interacting particle then we can at the same time say that velocity entails momentum and get the Lorentz form for momentum. To associate the scaling constant c with the velocity of the photon is only a *facon de parler* which causes no trouble. Similarly the question whether the photon has mass or not is only a convention to be settled when we introduce rest-mass. We adhere to the convention that it is zero. **Clive conjectures that the photon is imported into the theory at an early stage in the hierarchy algebra when it is necessary to define a signal which is symbolized by zero or 0.**

Lou: "Something is missing here but I can't put my finger on it. Perhaps it is just that spatial location is not a concept at the beginning and so the discrete nature of the photon or any other particle is by necessity non-local. Yet we are speaking about the photon in an all-too-classical way."

This is the prevailing language, and there is no doubt that it represents somehow a fundamental reality. The search for a better alternative language is what we are all engaged upon. *Related comment.* Joseph (Bastin) advises starting –surprisingly- with the gamma ray when thinking about the degree of classical continuity of particles. He is always handling situations where there is a *concatenation* of effects (high energy processes) which can be ascribed to just one gamma ray.

The need for a signal arises in the procedure of testing a putative new element to see whether or not it has already occurred. If, in fact, the element is not really new then this fact must be noted by a symbol which we call a *signal.* The signal cannot be an element, and we are free to take it as unique (that is to say we do not need more than one). The signal is the first appearance of an underlying asymmetry which already becomes familiar when we consider the different parts played in the discrimination algebra by the 0 and by the 1 respectively.. The need for a signal follows from our having to have something 'recognized at once'. That is to say, something that does not need a discrimination operation to determine whether or not one has it –thus getting into an infinite regress.

Lou: "The need for a signal arises concurrently with the concept of the spatial/temporal separation of observers."

Clive comments: "It is not a coincidence that we have chosen the word *signal* for two apparently different entities: (1) for a situation where

two entities are recognized as the same, and (2) light signals between observers. But this needs elaborating quite a lot

Lou: "The signal is a signal for an observer where an observer is someone/something that can *halt* and make a decision about a process. Note that we are now verging on viewing the process itself as a kind of generalized Turing machine, and the structure of the observer looking like the halting problem for such machines. I think this is not an accident but rather a fundamental relationship between quantum uncertainty and computational uncertainty."

I agree. I have been arguing though that there is a sort of parallelism or difference of method –one way going toward the relativity observer and the other to the logic of discreteness. It is the fact that both are necessary together that provides our solution to the quantum gravity problem at its origin.

Clive: "Yes, but I welcome Lou's insight in seeing an analogy between the process signalling its decision and the halting problem. Of course the halting problem is unsolvable."

Switch to the particle aspect.

Now we switch to the complementary particle picture. If we go the particle way we do not have momentum or fields defined spatially. We have the step-by-step generation of mass, but no continuous distribution of mass since that is the domain of the field aspect that inspires our account of special relativity. Our view makes it possible to incorporate the most elementary entities into the defining stages of special relativity and that needs a photon. You couldn't have a massive particle as in classical special relativity because that would already entail the whole of the Lorentz transformation with relations of mass and velocity built in.

We now have a variety of bits and pieces which we have to try to put together to get a plausible rewriting of the standard model, but for the moment we need only be clear about the very first steps. Mass is the key since it is a scalar. Following Rowlands and Cullerne we associate mass and charge through the coupling constant alpha = e^2/hc, since mass appears in the action h. R&C have a combinatorial theory in which charge is progressively excluded to get a progression to the experimental value of alpha. They get their underlying algebra which makes the whole thing work by a generalization of Dirac's equation. We have the hierarchy which does a corresponding job.

This generation of rest mass fits with the experimental fact that the value of alpha falls as the energy increases. So far we have no meaning for energy but this is where we shall look to find it. The job of relating it to momentum in the relativity framework has not been done but does not

seem all that far off. Staying at the particle end for the moment we note that the value unity for alpha is associated in the standard model with the strong interaction Is this just a meaningless coincidence? If it is more, then it suggests that the circumstances of the strong interaction do not produce much in the way of field as that term is normally understood, and that we may well say there is no spatial meaning at all. That would fit with its being the first stage of the observer build-up. We seem to get a sort of complementarity of different pictures which appear according as we work spatially or not. Is the spatialized aspect essentially electromagnetic (or perhaps weak or perhaps gravitational)? As far as I can see it is entirely to our advantage in this special context that our general presentation of dimension structure compels us to discard the spatial reference of the x, y, z of the Pauli matrices. We need only the combinatorics of the group theory and this position explains why we insist on abstract groups with multiplication tables.

Lou: "This is important"

Our three and seven may well be just as good as or better than the three and eight (or is it ten?) of the standard model.

There are numerous quarks recognized nowadays but there seem to be three as the basis. Our next step into the standard model is to identify these with the three dcsubsets at hierarchy level 2. People are likely to say that this whole proposal is preposterous because a quark is a *thing*, whereas a matrix is, well, a matrix, and can only *describe* something about things. To set these matters straight takes us to the heart of our philosophy, and it has been implicit in what has gone before. We have always argued that entities created and forming a new level are in fact ontologically the same as the ones we started with. This principle is what this note is centrally about, and the extreme case of it is our identification of the inevitable *signal* in the algebra with the photon. We are saying that not only has there to be a place for some thing in the algebra having those properties but also that there has to be something corresponding in the world. Moreover we argue that the peculiar limits to our descriptive power about the photon can be seen in the algebraic symbol.

Lou: "Well the problem is you do not imagine matrix algebra going on in the world in the same way that we do it on paper. So it behooves us to try to imagine just how it is related to world. There are mathematical examples that give us a hint. For example the number of walks of length k from one vertex of a graph to another vertex of that graph is given by an entry in the k-th power of the incidence matrix of the graph. I do not imagine that the graph knows about the matrices, but still that incidence matrix 'is' the graph and its kth power 'is' the walks on the graph. Note how the graph seems to be more 'physical' than its incidence matrix. This has to do with the fact that we can actually make physical models of the

graph and that such physical models use more than just the abstract graphical structure. How do these remarks apply near the beginning when there 'is' no extra physical structure?"

I think this 'beginning' is not merely reminiscent of the Big Bang. It IS the Big Bang and it sets the bounds on what one can correctly say about that phenomenon.

This leaves me with a lot to learn about graphs etc. However one thing comes up which takes me back to the beginning of this note. True we do not imagine the world working at matrices with pen and paper. However from the early days after Parker-Rhodes when one wondered where the matrix idea came from I was always stimulated by the argument that the 'weaving' operation in the matrix multiplication treated all the elements of each of the two constructing vectors on exactly the same footing. 'Indifferently' is how I put it. 'Indifference' is used vitally in the hierarchy structure to justify the giving of physical significance to a mathematical feature in which change of order would import no arbitrary changes of structure that would have spurious physical interpretation. I jumped to the conclusion that this argument was sufficient to narrow the search for mathematical structure to 'matrix'. This may be slap-happy, but I still want to say that there must be something which has this attribute of the matrix in common with the world. Moreover, since we are talking about construction and therefore primitive dynamics, it would be reasonable to say that the matrix operations are what happens in the world.

One concept is central but has eluded us. Energy. No way shows up to define it in the classical manner from the dynamics of the particle (and therefore at our relativity end). We have mentioned it already at the particle end in connection with the coupling constants. However any definition from that quarter does not seem likely to link up with the classical concept in any obvious way, and the fact that we have a familiar word is likely just to mislead us. A fundamental puzzle of a constructive approach must be the tenuous hold on *objectivity* that it provides. At every stage of construction the reliability with which we can hold onto that construction in the face of constructions that have gone a different way is always limited and varies greatly. Let us say that the greater the chaos the greater the energy available. Conversely low energy means a good degree of fixity. We know from the quantum uncertainty whose special form is the Heisenberg principle that we cannot push this stability all the way. This idea really comes to this:- in a process theory, time arises from the process, and we have used this basis to define space. Jumping now to the continuum, from just t you get to (t, t') and $t^2 - t'^2$ is an invariant (s^2). Now Heisenberg *ought* somehow to link ΔE and Δt, and so get to E.

Lou: "the Heisenberg *ought* somehow to link E and t, and so to get to E. But E = hv should give us a hint!!"

Yes.

The Tower of Turtles

or: the seeming 'paradox' of reductionism, which isn't

or: about objects which are not even intended to be entities

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Abstract. In this paper I will discuss the philosophical topic of emergence and reduction(ism). The motivation behind that is to try to overcome an inherent vagueness of the reductionist program which most obstinately shows up at the *primordial* emergence, namely that of the intended elementary ontological structure(s) of the universe itself. I propose that for overcoming the alleged nearly paradoxical situation of reductionism with respect to *primordial* emergence one has to put the attached problems in a rigorously emergence-theoretical perspective. Thus I will also come to some uncommon ontological results, e.g. the postulate of objects which are no intended entities (and no mere ideas or fictitious concepts either) and by this to the postulate that the most fundamental physical structure(s) have to be seen as being emergent from a rigorously non-physical, i.e. an entirely mathematical structure.

> Physica ergo ... desinit in geometriam, nec ante ullum phaenomenon penitus in corporibus intelligemus, quam ex primis figurae motusque ideis derivamus.*

Introduction: The Tower of Turtles or the Pitfall of Reductionism - as we knew it

In his - characteristically multifaceted and wide ranging - essay 'It from Bit' John A.Wheeler postulates four great No's as guidelines for a future foundation of physics. Citing William James he puts the first of the great No's the following way:

> " "No tower of turtles," advised William James. Existence is not a globe supported by an elephant, supported by a turtle, supported by yet another turtle, and so on. In other words, no infinite regress."[1]

* G.W.Leibniz, Dissertatio exoterica de statu praesenti et incrementis novissimis deque usu geometriae, in: G.W.Leibniz, Mathematische Schriften, (ed. C.J.Gerhardt), Bd.VII p 325); (Physics namely ... fades away into geometry, and we won't know any phenomenon deeply in its corporeal construction as long as we haven't derived it from the first principles of geometrical figures and of motion.)

This great No stated by Wheeler is of course a veto against reductionism. And it probably had been mainly motivated by the anticipation of a presumed potentially disastrous final outcome of the reductionist project carried to the extremes of a suspected inevitable shipwreck or sort of paradox. That seeming paradox of reductionism is expected to arise from the presumed fact that the reductionist project possibly could not terminate. And this - if it would turn out to be a justified presumption - would indeed look like a sort of paradox for it is undoubtedly and explicitly (by its proponents) the very idea and aim of the reductionist project to exactly come to the point of terminating, i.e. to discover the fundamentum inconcussum of physics or rather of the entire nature.

In this talk I will try to show that the real problem which leads to the presumption of such a paradoxical end of the reductionist project is not one of reductionism itself but rather one of a seemingly obvious but nevertheless unjustifiable tacit interpretation of reductionism, namely that of an ontological charge[2] of reductionism taken for granted not only by its proponents but by its opponents as well.

The following argumentation will bring me again in my usual position namely between at least two stools because I will argue fervently in favour of the reductionist project of which being against is probably the defining denominator of nearly all alternative natural philosophies but by arguing *for* reductionism I will also fervently argue *against* an essential reductionist belief namely that reductionism is about finding or uncovering increasingly lower or deeper *levels of nature*, made of *physical entities*, by means of a method of reductionist abstraction which is closely associated with a sort of practice of somehow dividing or separating the *physical entities* of higher levels of nature into physical entities of respectively lower levels. The problem with that belief is twofold. The first aspect relates to the ontological hypostasis which is implied in that belief. This will be a main topic of this paper. The other aspect, which is deeply intertwined with the first, is that that mentioned reductionist belief doesn't take the concept of emergence serious, but rather substitutes - even if referring to concepts like 'level' - emergence by ideas similar to a sequence of varying or extending configurations of fundamental entities, by that also implying that all the laws of nature found in more complex levels or systems would already be preformatively inherent in such a most elementary level of fundamental entities. That is not the case. And the erroneous nature of the reductionist belief will obviously become most apparent when the most innate nature of those fundamental entities - namely their 'being entities' itself - will come into question, and instead the attribute of objects to become intendable entities will turn out to just be an emergent property.[3]

It is exactly that reductionist belief which I regard to be the mentioned unjustifiable tacit interpretation of reductionism or its ontological charge. My argument in this respect is - as some might already expect - not specifically against reductionism but in general against the assumption that any scientific theory would be about or would refer to any existing entities. On the contrary I hold that physics in particular as well as science in general neither is nor ever was about any *actually existing entities* but always was and is about *intelligible objects*, and that the genuine scientific endeavour was and is the endeavour of *objectivation*, i.e. the

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[1] J.A.Wheeler; It from Bit, in: J.A.Wheeler, At Home in the Universe, Woodbury 1994, 295-311, p 300; cf. also: J.A.Wheeler, Information, Physics, Quantum: The search for links, in: W.H.Zurek (ed.), Complexity, Entropy and the Physics of Information, Redwood City 1990, 3-28, p 8

[2] In fact it is not a proper ontological charge but rather an epistemological charge which then yields an ontological hypostasis. But exactly that 'mechanism' of confusing epistemological presuppositions with ontological conclusions is notoriously unfathomable for the holders of that respective epistemological conviction, to which I refer, namely realists.

[3] My attitude towards reductionism then can be summarised as follows: 'Reductionism is essentially right as a scientific method, but reductionism is seriously wrong by not taking emergence (and *its* ontological implications) into account.'

creation of the intelligible objects of scientific theories.[4] (A creation which then of course has to differ essentially from the creations of such artists which happen to be no scientists.) Yet the deep belief that the opposite of my argument would be the case is of course much more common amongst the rather standard reductionists than the ontologically less correct alternatives.

1 Triumph and imminent fall of reductionism

In his book 'Dreams of a Final Theory'[5] Steven Weinberg fervently praised reductionism.[6] But he did so for explicitly the opposite reason for which I would chime in his 'Two Cheers for Reductionism'.[7] This becomes quite clear when he stresses

> "the distinction ... between reductionism as a general prescription for progress in science, which is not my view, and reductionism as a statement of the order of nature, which I think is simply true."[8]

So Weinberg - as many other physicists - is a reductionist for a somewhat peculiar reason. Namely the very reason that reductionism seems to perfectly blend with epistemological realism et vice versa. Such convictions then sometimes lead to questionable conceptions, one of which is certainly the idea of reductionism being a statement of the order of nature.
It is quite clear what Weinberg means by his statement, namely that he sees nature as build up on increasingly more complex levels being based on the most universal structure of the least complex one. But it is hard to understand what, if any, significance such an insight might have beyond the context of scientific explanations. Yet fortunately Weinberg actually knows better than he said, and sometimes he also says it better

> "Our scientific discoveries are not independent isolated facts; one scientific generalization finds it explanation in another, which is itself explained by yet another. By tracing these arrows of explanation back toward their source we have discovered a striking convergent pattern – perhaps the deepest thing we have yet learned about the universe."[9]

Here the recursive structure underlying the progress of scientific explanation - which is for a good part just reductionism at work - is clearly pointed out. But again Weinberg's realist convictions are also mingled in not only when he speaks of 'discoveries' but - more significantly - when he speaks of 'tracing *back* the arrows of explanation toward their *source*' instead of thinking of them as *being directed toward their goal of ultimate convergence (or ultimate explanation)*.[10] But the most significant amalgamation of his methodological and his epistemological convictions occurs nearly invisible in that quotation, namely when he speaks about 'scientific generalization'. 'Scientific generalization' is just another word for 'abstraction'. And it is the method of abstraction - most closely related with reductionism - from which the realist connotations of reductionism mainly stem. Therefore abstraction is recognised - by most advocates of reductionism - as being the true

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[4] I discussed this topic of the difference of 'actually existing entities' and 'intelligible objects' and the relevance of this difference for the history and philosophy of science extensively in: D.Kurth, Actual Existence and Factual Objectivation, in: Movements, Philosophical Aspects of ANPA 23 (Proceedings of ANPA 23), Arleta D. Ford (ed.), London 2002
[5] St.Weinberg, Dreams of a Final Theory, New York 1992
[6] Ibid. pp 51-64
[7] Ibid.
[8] Ibid. p 54
[9] Ibid. p 19
[10] Since hardly any yet undiscovered fundamental physical *structure* can be seen as being the source of scientific explanations but instead the original *source* of scientific explanations had been a most elementary proper scientific *theory* (perhaps the Theory of Planetary Motion of Hipparchos). A fundamental physical structure however might have always tacitly been the ultimate goal of subsequently improving explanations in the history of scientific theories.

essence of their approach. My question here is not if this view is justified but if it grasps the whole truth of the endeavour of scientific imagination and its progress.
Weinberg then deserves thanks for making unmistakably clear what in his view is *not* the essence of reductionism

> " ... by elementary particle physics being more fundamental I do not mean that it is more mathematically profound or that it is more needed for progress in other fields or anything else but only that it is *closer to the point of convergence of all our arrows of explanation* (italics by me, D.K.). "[11]

> "Mathematics itself is never the explanation of anything – it is only the means by which we use one set of facts to explain another, and the language in which we express our explanations." [12]

In the realist reductionists view mathematics cannot ever be more than a means for scientific explanations and their progress because in their view scientific explanations are not - in a very strong sense of that word - creative.[13] And conclusively abstraction cannot ever be - in that very strong sense - a genuinely creative act but in the end just another way of reduction. And who would deny that reducing complexity is after all a method of leaving particular secondary qualities out of account and instead of pointing out respectively more general underlying properties of whatsoever objects in question, i.e. such a reduction is a method which seems to nearly perfectly translate into - abstraction.
Now, what should be so horribly wrong with all that realist reductionism? Besides that it is based on indefensible epistemological assumptions and besides that it is inconsistent with the actual history of science which can definitely not be described as a process in which some originally coarse depiction asymptotically comes ever closer to a perfect representation of something out there realist reductionism leads - as ever more inescapably as its dreams of a final theory would come nearer to fulfilment - into the seeming paradox so graphically described by J.A. Wheeler as the *tower of turtles*.
And it does so not for being reductionist but for being *realist* reductionist. It does so for restraining scientific explanation and imagination to a way of detection or discovery, it does so for dismissing the very essence of abstraction, namely the mathematical theories, as mere means, which as such never could play a role in constituting genuine objects of their own right. In short it does so for linking the objects of science to physical existence, i.e. it does so for treating these objects entirely and exclusively as entities.
And - as Wheeler hinted at - there cannot ever be anything as a first entity, a first appearance of physical existence which didn't emerge from something preceding. As long as by dogmatic presupposition that something preceding only has to be conceived as another physically existing entity one inevitably gets a seemingly paradoxical infinite regress, the tower of turtles. An infinite regress as such is obviously *not* a paradox, but in the special case of realist reductionism it very well becomes somewhat paradoxical because the final dream or envisioned end of realist reductionism is just to terminate, and by its very presuppositions realist reductionism ensures that it will not and cannot terminate.

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[11] Ibid. p 55, cf. also p 32
[12] Ibid. p 56
[13] Of course also realist reductionists do not say that scientist are not creative people, but that creativity is just a feature of their respective personal intellectual capacity. Yet realist reductionist probably would not see the objectivations of scientific theories as being genuinely creations of scientific imagination but rather as the result of a detectional endeavour, i.e. as discoveries. After all a realist reductionist is expected to be - a realist.

2 Aspects of theoretical imagination: reductionist abstraction versus creative objectivation

A so-called scientific realism like the one which St. Weinberg propagates must not necessarily solely or even primarily stem from ordinary epistemological convictions but is in many cases rather founded upon a certain view of how science - or in particular scientific progress - allegedly works, namely the view that it works by ever increasing abstraction.[14]
Abstraction after all is the very essence and method of reductionism. Therefore rather sophisticated reductionists are convinced that it was by the means of abstraction that their predecessors came by starting from the most common appearances and phenomena step by step closer to the increasingly deeper and less obvious underlying levels of increasingly more universal laws of nature and by that conviction ourdays reductionists also get - even if only as a by-product - a comfortable epistemological position, namely that of scientific realism.
The question is not if this reductionist view of abstraction as the predominant scientific method is correct or not because it is certainly correct in a sense. The question - in my view - is if it is sufficient. Does scientific imagination really works by abstraction - more or less - exclusively?
The question of abstraction as a method of reduction and a certain uneasiness related to a purely methodological or formal understanding of that notion of reduction were central topics in the philosophical endeavours of Edmund Husserl.
Husserl in particular emphasised a distinction between an epistemic attitude which he called 'Wesensschau' (which could be translated as 'view (or vision) of the essence') in contrast to ordinary (formal) abstraction. One of many paraphrases he used to explain what he meant by 'Wesensschau' was 'ideation'[15].
Yet then one can also see in the work of Husserl how to eventually miss the point of which really makes the difference between abstraction on the one hand and what I will call 'objectivation' on the other. In the end Husserl explained the way how his 'Wesensschau' would work as 'eidetische Reduktion (eidetic reduction)'[16]. And thus he missed the point since as any form of reduction also eidetische Reduktion inevitably comes dangerously close to what is essentially meant by the very notion of abstraction. In my view the way how Husserl explained eidetische Reduktion just shows that - despite explicit denials by Husserl - it has to be understood as just a somewhat refined and modified version of proper abstraction. The reason for that dangerously close relation of reduction and abstraction is that any abstraction simply is a kind of reduction.
It is probably most common in the form of reducing a more complex phenomenon to a more elementary underlying structure or in the form of reducing special or particular appearances to comparably more general or universal structures (or laws). These are typical examples of abstraction as carried out by the method of reduction.
Yet it should also be noted that on the other hand not any reduction must necessarily be rated as abstraction as for example in such cases when a complex system is described by a few critical parameters which are themselves just ordinary elements of the description of that very system and not elements of an underlying structure.
Another serious shortcoming of Husserl's phenomenological approach then was that the intentional act which is at the core of his concept of Wesensschau was meant to be directed on

[14] A comparably far less sophisticated realism had in the past been founded on the rather ridiculous assumption that science would work based on so called induction.
[15] Cf. E.Husserl, Ideen zu einer reinen Phänomenologie und phänomenologischen Philosophie, Tübingen 1980 p 42/43
[16] Cf. E.Husserl, Ideen ... p 108 ff

something *given* to that act. By this idea the phenomenological project finally derailed and ended in the usual antinomies of epistemology. The entire presumption of something *given* to the mind as a precondition of thought then had later been impressively refuted by a famous critic of Wilfried Sellars.[17]

And now we can make the proper distinction between abstraction on the one hand and objectivation on the other which matters for our task of overcoming the fatal inconsistencies of the reductionist project which are partly caused by the epistemological preoccupation of most of its protagonists.

Abstraction is essentially a method of generalisation or of explaining a class of phenomena by reducing it to a set of essential properties which then can be explained by a theory of another class of phenomena of an underlying structure related to the original class of phenomena in question in short: abstraction works by reducing a class of phenomena to another class of phenomena the later being respectively invariant to the various manifestations and appearances of the original one. Therefore abstraction is essentially reductionist and directed on something presumed to be *given* to the act of abstraction (this later condition of course implies that the *given* in question also exists independently from that very act of abstraction).

In contrast to that *objectivation* is first of all meant to be *creative*. Yet with a certain difference to that notion of creativity as it is used in the cases of artists or inventors. Objectivation is creative but only under the very strict rules of rigorous theoretical justifiability.[18] This justifiability has to do as well with corroboration by evidence as with coherence with respect to the possible embedding of the results of objectivation in the entirety of accepted theoretical knowledge, i.e. with intertheoretical relations. In the case of the seeming paradox of reductionism or the foundation of an ultimate theory there will hardly be any evidence available for a long time which could serve to select between competing candidates. So the work of selection will probably have to be done mainly by considerations concerning coherence.

Yet notwithstanding the importance of such aspects of justification there are also the even more important aspects of what has traditionally be called 'the logic of discovery'. Since I do not believe in the common understanding of the notion of discovery as such I will rather speak of a 'logic of conceptual or theoretical creation'.[19]

Creative objectivation then is based like Husserl's Wesensschau on intentionality. But objectivation also essentially transcends intentionality, since intentionality had been thought to be directed on something *given in advance* to the respective act of intending. Yet instead objectivation also partly *creates* the intended object at first. That difference has to do with

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[17] Cf. W.Sellars, Empiricism and the Philosophy of Mind, in: W.Sellars, Science, Perception and Reality, London 1963, pp. 127-196; Sellars' critic of 'the myth of the given' - so stolidly uphold by the sense-data theorists of his time - culminates when he comes to the conclusion that the proponent of that myth "confuses his own creative enrichment of the framework of empirical knowledge, with an analysis of knowledge as it was. He construes as *data* the particulars and arrays of particulars which he has come to be able to observe, and believes them to be antecedent objects of knowledge which have somehow been in the framework from the beginning. It is in the very act of *taking* that he speaks of the *given*.", ibid. p 195.

In our case of the theoretical imagination or objectivation the mentioned 'creative enrichment' plays an even bigger role than in the case of ordinary perception and cognition which are the focus of Sellars' consideration in 'Empiricism and the Philosophy of Mind'.

[18] For a deeper look into what is meant here by 'objectivation' and 'justifiability' cf. D.Kurth, Actual Existence and Factual Objectivation, in: Movements, Philosophical Aspects of ANPA 23 (Proceedings of ANPA 23), Arleta D. Ford (ed.), London 2002

19 Using a rather traditional 'continental' terminology one could call this concept of creative objectivation as being about bringing something immanent transcendent into appearance. This 'something immanent transcendent' being the results of objectivation i.e. the objects of theories seen as being intelligibly yet not independently (of the acts of objectivating) existing.

the fact that objectivation is a genuinely theoretical attitude and not a practical one. By 'creation' I do not in any sense mean something like 'invention' but rather something similar to 'bringing into appearance', with a connotation changing somewhat between 'unveiling' and 'revealing'. The best metaphor - to my knowledge - for that aspect of creativity of theoretical objectivation is the description of a sculptors work (which had been in particular related to Michelangelo) as a work of liberating the already inward statue of the veiling marble.

The seeming paradox of reductionism illustrated by J.A.Wheeler as a tower of turtles or infinite regress will only as long seem to be paradoxical as one assumes that the objects allegedly discovered by iterated reductionist abstractions are taken to be something *given* in advance or to be (intended) entities, i.e. as long as these objects are thought of to possibly exist physically.

Thus it should become obvious that this seeming paradox of reductionism isn't necessarily a paradox of reductionism as such in the first row but it certainly is a paradox of a reductionism with a certain epistemological flavour, i.e. a realist reductionism, a reductionism which pretends to uncover its objects by iterated reductionist abstraction till it finally would come to that abstractively anticipated "point of convergence of all our arrows of explanation" and then would come to an end, would come to rest, would come to terminate.

The seeming paradox then is that there is no end, no rest and no termination. And that there cannot and will not be any such thing. At least not if we interpret 'termination' generously as 'final reference'. Because that seeming paradox works only as a paradox as long as we take the objects (which become infinitely subdivided in a sense) as (intended) entities. Thus it is not the infinite regress as such which makes that restless shrinking so unsympathetic but the fact that we interpret the infinite regress as something which seems somehow comparable to a 'shrinking of size' i.e. as physical process involving physical entities.

What I really want to stress by this is that (possible) *physical existence itself* is - as temperature, colour, life and thought and many other properties of complex entities - just an *emergent property*.

I.e. an emergent property of objects which together with this property (of being possibly physically existent) emerge up from an underlying level of pre-physical objects which nevertheless should be as clearly presentable as theoretical objects always should be but which should not even possibly be intended to be entities. (Potentially ascribable) *physical existence itself should therefore be thought as being emergent* together with some certain kind of objects, namely as a new property of these particular probably rather primordial objects which themselves then would emerge from logically preceding objects which simply would lack this property (of bearing potentially ascribable physical existence).

I.e. I will try to make a clear distinction between the ordinary objects of physical theories which I would regard to be objects which are intended to be entities or at least to stand in a particular established relationship to such intended entities and - in contrast to those - another kind of objects which are not (and could not even) be intended to be entities at all.

Concerning the mentioned ordinary objects which are intended to be entities a realist would say they simply *are* entities whereas I would say they are objects the theoretical significance of which is corroborated by evidence. That is obviously an epistemological distinction which somewhat matters but it is not the kind of distinction I try to point out here specifically.[20]

[20] Cf. D.Kurth, Actual Existence and Factual Objectivation, loc.cit.

What matters here is that by restricting our concept of objects to such ordinary objects which could be intended to be entities (or which could be characterised by properties which are - in the broadest possible sense - related to physical existence) one cannot - in my view - overcome the seeming paradox of reductionism.
The reason for this is that the - in my view - overwhelmingly successful project of reductionism anyway cannot come to an end, cannot come to rest and cannot terminate in any ordinary sense of these words. In particular it cannot terminate by discovering a particular kind of fundamental physical entities which may be describable as a particle or as any other kind of physical entity like for example a quantized discrete part of space, since any of such fundamental entities will only be a demarcation of our respective actual theoretical capabilities and not the unveiling of a unshakeable fundament of nature.
Now let me just make a cautionary remark: such unshakeable fundament of nature, even build of proper entities is not *logically* excluded, but it would need an additional ironclad corroboration to prove such claim of just being the latest atomon. Such a corroboration would have to be - in my view - at first a proof of rigid selfconsistency. But - and now comes the really hard nut to crack - it would also have to prove an effective exclusion of any possible alternative with comparable selfconsistency. That of course is not a very fair burden for such a proof but that lack of fairness is directly due to the fact that (physical) existence simply doesn't follow from logical or mathematical consistency as such.[21] Therefore it is no wonder that since now we had and have a nice supply of alternative selfconsistent candidates (e.g. holistic approaches, the bootstrap program etc.) to choose between.
The alternative I will suggest is different: The reductionist project can only be successfully completed if it doesn't come to such an expected proper end, if it doesn't come to rest and if it doesn't terminate - at least not in the usual way, i.e. by presenting the latest fundamental entity. Instead it would have to show that fundamental entities might very well be fundamental entities but that there is something more fundamental than any entity, i.e. that *there is something more fundamental than physical existence and that physical existence itself emerges from that level beneath.*
Trying to be consistent with my previous terminology and my epistemological or rather anti-epistemological convictions I will call these pre-physical objects 'objects which are not intended to be entities'. The reason for that longwinded name is that I'm convinced that no theoretical object represents an extra-theoretical entity anyway. But I would agree that these comparably normal objects of theories are in many cases undoubtedly *intended* to somehow represent or even be equivalent to existing entities. The new pre-physical objects here in question however couldn't even possibly be intended to be or to represent entities.
And thus I come to the following statements or postulates:

(physical) existence as such is emergent from and supervenient
on a deeper (mê)ontological level

at which this level has to be seen not only as pre-physical but also as pre-natal, i.e. not exactly trans-cending nature but rather de-scending it. From this I tend to draw the conclusion that

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[21] To make that point clear in advance I have to stress that the proposal I will make in the following and in particular in the corresponding more formal paper "The Topos of Emergence" (see the "The Scientific Aspects of ANPA 24") differs essentially from such approaches which rely primarily on selfconsistency and are opposed to the reductionist approach. Just in the opposite to the convictions of the proponents of such approaches I am convinced that one has to follow the lead shown by the reductionist program and just at the very end of it to go a step further. Simply because otherwise there never would be such 'very end'. But then I have to admit that of course my proposal can also justifiably be confronted with similar questions of selfconsistency as well as exclusivity, as it will be the case for any theoretical construct which can not effectively be corroborated by evidence anymore.

> (physical) existence itself is rather an accidental property related to such an underlying level, i.e. that (physical) existence is contingency (in the same sense in which live is a contingent phenomenon in the perspective of ordinary physics).

Concerning the tower of turtles (or the seeming paradox of reductionism) an infinite regress then might turn out to be rather a part of the solution than the problem.

3 The Mêontology of primordial emergence: objects which are not intended entities

After all these epistemological preludes the question may arise how such an object which doesn't have a physical existence and which shouldn't even be intended to be an entity then should be thought of.

At first let me distinguish between some different kinds of objects which are no entities.

Undoubtedly not an entity is something pretended to be a correlate of a logical contradiction like for example a square circle but it also should better not called an object but instead rather regarded to be a misuse of language. Anything like this is of course of no relevance for our question.

Also of no interest for us are fictitious concepts which are not correlates of logical contradictions but are trivially excluded by simple theoretical premises like for example an iron cage which contains the whole universe. Such a nonsense thing would anyway rather be imagined as an pseudo-entity than as an object.

The same holds for merely fictional things or figures of literature like centaurs, Cyclopes, unicorns etc. such things are fictional entities which do not and can not exist in the context of the biological evolution on the earth but which very well could exist in accordance to physical principles. Again such things are fictitious or fictional entities but not objects in the sense we are interested in.

Of more interest than all the previous things are objects which had been postulated by definitely given up ('empirical') theories like for example the phlogiston and the ether. Now we know that nothing exists which could be regarded to be a correlate of these objects. But this doesn't mean that these objects had not been intended to be entities, they obviously had so just like so many other conceptual objects of other theories. So this is also nothing what we are looking for.

And then there is another class of objects which are neither fancy nor fictional nor given up and which - at least according to the majority of philosophers concerned with that subject - are also explicitly not intended to be possible physical existing entities. These objects are sometimes called mathematical objects, sometimes they are also called mathematical entities, but then there is rather something meant by 'entity' what we would call an object.[22]

But on the other hand most mathematical objects like groups, algebras, topologies or sets are rather that what sober realists like Weinberg take them to be, namely just elements of 'the language in which we express our explanations'. They are deeply amalgamated with the objects which couldn't sometimes even become characterised without the means of such mathematics. But the mathematical objects themselves are nevertheless not the same as the physical objects explained with their help and the latter couldn't simply be substituted by

[22] Speaking of 'mathematical entities' could somehow suggest at least tacitly an inclination towards the metamathematical position of Platonism. Then this would imply something like an intelligible existence of mathematical objects. In my view such a position might be defendable even without the obligation to become a sort of Platonist or dualist.

their mathematical counterparts. Agreeing to such conventional assessment of the role of mathematics in physical theories brings us in clear opposition to a sort of neohyperpythagoreanism which had been proposed by Max Tegmark in his paper 'Is "the theory of everything" merely the ultimate ensemble theory?'[23] This paper has undeniably the merit of directly addressing the peculiar question of the relation of mathematical and physical existence and insisting that the former is somehow prior to the later. The main thesis he tries to defend is

> "Everything that exists mathematically exists physically."[24]

In the end the apparent weakness of this argument is that it doesn't really try to overcome the peculiarity of the relation of mathematical and physical existence but instead proclaims that the problem, namely that mathematical existence is seen (by some) as being prior to physical existence (and that for this reason it seems that physical existence somehow would have to come from mathematical existence) would itself already be the solution.

But there are mathematical objects which do not exist, will not exist and in no possible universe ever can exist. One of these objects (and also the one which is the most relevant for our question of how to overcome the seeming paradox of reductionism by presenting an object which underlies the objects of intended physical existence but can itself not be intended to exist) is the continuum and the Euclidean point as described by continuum mathematics.[25]

But then there is also a further insurmountable deficiency of the continuum namely that it not only doesn't exist and cannot exist but that nothing what could ever be intended to exist or to be an entity could ever *arise* from the continuum. The continuum is - related to the question of any even most indirect physical or pre-physical significance - nothing but a fruitless abstraction and not an objectivation of an at least intelligibly existing object.

Yet to overcome the seeming paradox of reductionism one needs an object of at least such an indirect pre-physical significance, i.e. an object which itself cannot be intended to be an entity but from which objects can emerge which then could be intended to be possible primordial entities. And for such objects one would have to look - so to speak - in the closest neighbourhood of the points of the continuum, since that is the neighbourhood of the least complexity attachable to such pre-geometrical as well as pre-physical objects.

All this is nothing new, Bernhard Riemann and William Kingdon Clifford already tried to graft an as minimal as possible enriched structure upon the continuum to enable it to bear an elementary physical layer. Even though they didn't succeed Einstein later followed up this trail and he succeeded impressively to use a dynamical version of the continuum as a platform for GR. Yet this platform was neither a fundament nor a primordial physical structure but just a necessary mathematical abstraction, a - for that time - inevitable conceptual limitation at which the creative physical objectivation of GR eventually ceased into the absurdity of physical singularities.

Today the prevalent ideas how to overcome such absurdity are no more to try to enrich the continuum but to substitute it by a mathematical structure better apt to do the job. But such an idea had also been proposed nearly two centuries before Riemann and Clifford by Leibniz

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[23] M.Tegmark, Is "the theory of everything" merely the ultimate ensemble theory?, Annals of Physics, 270, 1-51 (1998)

[24] Ibid. p 1

[25] By saying that the continuum does not exist I of course do not mean that there do not exist things which have properties which can (and even must) be described by means of continuum mathematics for example such simple things like balls or cups. What I do mean is that there doesn't even possibly exist a physical structure which is in its most fine grained resolution equivalent to the intrinsic 'structure' of the continuum, namely the structure of the Real Numbers. I.e. actual infinity doesn't exist physically.

- and it might turn out that his idea was more to - so to speak - the point than the modern preoccupation with the discrete.

3.1 Punctum et Conatus: dynamical Leibniz-point objects

To be a bit more precise: Leibniz came to a slightly different point. Not to the point of Euclid and not to the point of the continuum but to a point of his own, for which reason I will call that point a Leibniz-point object. Let us see what he had to say about this point of his own in his Theoria Motus Abstracti

> „5) Punctum non est, cujus pars nulla est, nec cujus partes non consideratur; sed cujus extensio nulla est, seu cujus partes sunt indistantes ..." (Theoria Motus Abstracti, Fundamenta praedemonstrabilia, in: G.W.Leibniz, Mathematische Schriften, (ed. C.J.Gerhardt), Bd.VI p 68)
>
> *„5) A point is not something which has no part or the parts of which cannot be considered but something which has no extension or the parts of which are not distant ..."*

For a point having parts equals to having an internal structure. Even if there cannot be found any reference of Leibniz to a presumption of a physical reality of infinitesimals there can also be no doubt that exactly such a presumption is behind that quoted definition. This becomes even more obvious when one takes into account the very close relation of this definition of a point with the concept of an intrinsic minimal motion called conatus

> "6) Quietis ad motum non est ratio quae puncti ad spatium, sed quae nullius ad unum.
> 7) Motus est continuus seu nullis quietulis interruptus."(Theoria Motus Abstracti, Fundamenta praedemonstrabilia, in: G.W.Leibniz, Mathematische Schriften, (ed C.J.Gerhardt), Bd.VI p 68)
>
> *"6) The ratio of rest to motion is not like the ratio of a point to the space but like the ratio of zero to one.*
> *7) Motion is of a continuous nature, i.e. not interrupted by whatever small phases of rest."*

> "10) Conatus est ad motum ut punctum ad spatium, seu ut unum ad infinitum, est enim initium finisque motus." (Theoria Motus Abstracti, Fundamenta praedemonstrabilia, in: G.W.Leibniz, Mathematische Schriften, (ed. C.J.Gerhardt), Bd.VI p 68)
>
> *"10) A conatus is compared to motion like a point is compared to space or like (the number) one is compared to the infinite, for a conatus is the beginning and the end of a motion."*

Thus it is obvious that for Leibniz that infimum spatii which is the point as defined above and the infimum motus which is the conatus have to be seen as being rigorously copresent. This then implies a further vindication of his principle of excluded rest

> "... nulla est unquam quies vera in corporibus, nec a quiete aliud nasci potest quam quies;" (G.W.Leibniz, specimen dynamicum, pars II, in: Mathematische Schriften, (Hrsg. C.J.Gerhardt), Bd.VI p 252)
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> *"... there is never actual rest in material bodies, and nothing else can emerge from a state of rest than just merely rest [i.e. from a state of rest merely nothing can emerge, therefore it must be conceived as impossible that there ever will be or ever had been such a state of rest, D.K.]."*

After having heard these definitions and considerations of Leibniz one might get second thoughts, as for example:

a) how can anything what has no extension then have parts? And

b) if one would assume that there would be such postulated parts of a point, and if there is

also no state of rest whatsoever, are then these parts of a point themselves in some state of motion?

These questions even make some sense in the context of Leibniz' own considerations especially insofar as they relate to the principle of continuity of which Leibniz is known to have been a fervent proponent. Let us have a look at the principle of continuity as it has been put by Leibniz

> „Le moindre corpuscule est actuellement subdivisé à l'infini, et contient un monde de nouvelles creatures, dont l'Univers manqueroit, si ce corpuscule étoit un Atome, c'est à dire un corps tout d'une piece sans subdivison."
>
> *"The smallest corpuscle is actual infinitely divided; and it contains a world of new creatures, of which the universe would be devoid, if this corpuscle would be an atom, i.e. an entity consisting in one entirely indivisible piece."*
>
> (Streitschriften zwischen Leibniz und Clarke, Postscript zu Leibniz' viertem Schreiben, in: G.W.Leibniz, Die Philosophischen Schriften (ed. G.J.Gerhardt), Bd.VII, p 377/378)

Now it is on the one hand obvious that a point - let alone a part of a point - should - whatever it may be - not be taken for to be the same as a smallest corpuscle but then on the other hand points (as well as the conatus) as defined by Leibniz in his *Theoria Motus Abstracti* are at the infinitesimal level to which they are confined explicitly of an at least semi-physical nature and by that it would be probably impossible to tell them apart from such infinitesimal physical objects as the smallest corpuscles mentioned in the quoted version of the principle of continuity.
All his ideas about the concept of a not Euclidean point, the conatus, the principle of excluded rest and the principle of continuity show Leibniz as a radical dynamist who tries to found physics in an intrinsically dynamical structure, which would have again be indiscernible from the mathematical structure into which physics had to fade away at the level of the infinitesimal.

> „Physica ergo ... desinit in geometriam, nec ante ullum phaenomenon penitus in corporibus intelligemus, quam ex primis figurae motusque ideis derivamus."
>
> *"Physics namely ... fades away into geometry, and we won't know any phenomenon deeply in its corporeal construction as long as we haven't derived it from the first principles of geometrical figures and of motion."*
>
> (G.W.Leibniz, Dissertatio exoterica de statu praesenti et incrementis novissimis deque usu geometriae, in: G.W.Leibniz, Mathematische Schriften, (ed. C.J.Gerhardt), Bd.VII p 325)

Before we will have a look at if and how one might make some use of the hints we got from Leibniz for the purpose of putting the tower of turtles on a profound basis I would like to point to a puzzling difficulty concerning Leibniz' philosophy. In the quotations above Leibniz appears to be an uncompromising champion of the continuum principle as well as of a radical dynamism. That seems to stand in a striking contrast if not contradiction to his stand for relationalism for which he is also famous. An example of this relationalism is the definition of space he gave directed against Newton's definition of space as being an absolute sensorium dei.

> „Spatium est ordo rerum quae sunt simul."
>
> „Et hoc ... modo spatium fit ordo coexistentium phaenomenorum, ut tempus successivorum;" (Brief von Leibniz an des Bosses vom 16.06.1712, in: G.W.Leibniz, Die Philosophischen Schriften (ed. G.J.Gerhardt), Bd.II, p 450)
>
> *„In this way ... space becomes the order of the coexisting things as time becomes the order of the successively existing things"*

I wondered for a long time why that seeming contradiction didn't draw more attention to it because it obviously affects the very fundaments of Leibniz philosophy. Yet maybe it will turn out that just such a peculiar amalgamation of dynamism and relationalism might open up the way to putting the tower of turtles on a more profound basis by using modern mathematical means but still inspired by Leibniz' struggle for understanding of how the realm of mathematical objects had been in infinitely close contact with a world of emerging physical entities. This will be the topic of a related paper about 'The Topos of Emergence'.[26]
Here I just will summarise what might be called Leibniz' postulates for mathematical objects which could perhaps turn out to be a matrix for an emerging primordial physical layer. Such mathematical objects should have
a) an intrinsical structure (by Leibniz referred to as 'having parts'), but nevertheless it should
b) strictly be confined to an infinitesimal level (by Leibniz referred to as 'having no extension'). But then it also should be co-present with
c) some kind of an infinitesimal motion (by Leibniz called 'conatus'). This motion obviously cannot be thought as very small physical motion, because there cannot be a proper physical motion without extension. But there exist mathematical analogues of motion like morphisms, transformations and mappings which perhaps could serve as modern incarnations of 'conatus'. The mathematical structure in question should
d) also be able to be consistent with a non-vicious infinite regress (by Leibniz implied by the principle of continuity). And notwithstanding all the dynamism and continuity it should
e) also be apt to bear a relational structure as well.

A mathematical structure which would as well satisfy these conditions as also minutely connect to the most elementary physical level of the reductionist program then might be fit for providing a more profound basis for the tower of turtles. Such a mathematical structure then will - in my view - not be something obvious, it will not follow from such shallow wisdom as 'all physical existence is genuinely mathematical existence' or similar insights. And I'm also convinced that just these mathematical means which are used as *applied mathematics* in the respective areas of high energy physics are *not* the candidates for a mathematical structure from which a primordial physical structure first of all emerged.
But who has ever said that building a fundament for the tower of turtles would make no work?[27]

[26] Cf. D.Kurth, The Topos of Emergence, in: The Scientific Aspects of ANPA 24, Proceedings of ANPA 24
[27] A sketch of how I think that work should be started one can find in (as you probably already guessed): D.Kurth, The Topos of Emergence, loc.cit.

BETWEEN

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ABSTRACT

Rümke introduced the famous idea of Praecox-Gefühl. This idea is widely recognized and accepted in current psychopathology. Kimura's idea of 'Between' is also especially well-known. I discuss Kimura's idea connected with so-called Ki (or Chi in Chinese), that is atmosphere (or perhaps aura) between person and person. According to Kimura, there is a deep process between Ich and Du. It is also a process between internal and external worlds. This is able to expand this relationship to that between Ich and Welt. Key words of this article are following:

Key words: Praecox-Gefühl (Praecox-feeling), Ki (Chi in Chinese), Ich (I), Du (You), Welt (World) and Aida (Between).

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1. SHORT STORY AS AN INTRODUCTION

I was faced with my Shihan (master) holding our bamboo swords. It was a very short time for me. In a short time, the bamboo sword of my master was slowly moving. It was very slow. It ought to say it felt slow for me. Nevertheless, I could not avoid his sword. His bamboo sword hit my head strongly. I was absorbed by his strong aura. It felt to me that it had been a very brief match, but the spectators said my master and I had faced each other for about 10 minutes. But I felt it had happened in an instant.

I realized that I could not beat him the moment we began the match. Far from that, I knew that I could not move beyond the range of his sword. I was restrained by his mental power. This is his atmosphere or perhaps strong aura and it is called Ki. It is said that the Japanese sword fighting is a combat of Ki. Then, what is Ki? Is it a mysterious technique? The answer is 'no'. All people have Ki because this is the atmosphere or aura of human beings, though sometimes we may feel some aura from animals. In this short paper, I analyze this structure in terms of phenomenological psychopathology.

2. BETWEEN ICH AND DU

There are a lot of communication channels between us. If we cannot understand another person's language, we can still recognize his or her character. This way of grasping the essence of a character is more essential than normal language communication. There is a field between people beyond language. This field is called 'Between' by Bin Kimura [1]. His concept seems very similar to the idea of H. C. Rümke [2]. Rümke's idea is very natural. He named this idea Praecox-Gefühl [I]

[I] Rümke explained this idea as a bad feeling that a person wishes to convey

(Praecox-feeling) from his experience as a psychoanalyst. But their ideas are basically different. Rümke distinguished Ich and Du, then he concluded the idea of Praecox-Gefühl. But Kimura never distinguished Ich and Du, rather he claimed the same quality inside of them. That is to say, he claimed that they were parts of the same whole. Then what are the differences between Praecox-Gefühl and Aida—Between? In order to answer this question, let us first consider Rümke's viewpoint.

According to Rümke, the idea of Praecox-Gefühl is widely recognized in relationships between psychoanalyst and patient. It is an internal feeling that each person holds simultaneously when they meet. One is not able to give a clear account of it in words. It is beyond description in language. If we are faced with a person who suffers from some kind of mental disability, we always feel *an indefinable feeling*. This is because they block, or are blocked from this most important mental process for human beings which Rümke had named Praecox-Gefühl because of some mental disorder[3].

An outstanding psychoanalyst is able to make a patient's diagnosis at a glance, especially with schizophrenia. This phenomenon was well known empirically a long time ago. Rümke's idea is not limited to schizophrenia but to all mental disorders. Kimura, however, thought that it is most commonly observed in the cases of schizophrenia. The patient who suffers from schizophrenia is deprived of a way of understanding the relationship between Ich and Du. The analyst therefore feels an incomprehensible and strange feeling when he meets a patient. Then the analyst finds that the incomprehensible feeling is caused by schizophrenia. But on the other hand, Kimura emphasized that these incomprehensible feelings are not a consequence of psychological analyzing. That is to say, it is not that an incomprehensible feeling becomes comprehensible, but

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to another (in his case a patient suffering mental illness) but it is not able to close because of luck of instinctive feeling of approach of the patient. Consequently, the over confidence of the psychoanalyst is undermined.

that an incomprehensible feeling is identified by the analyst at a glance after first meeting the patient. In Kimura's terms, their atmosphere, that is their Ki, is already different, or more precisely, had already been damaged by their mental disorder. It is therefore impossible for them to make normal communication since we must share the same atmosphere in order to make normal communication. Of course they still have Ki, but their Ki had been changed from the normal situation.

Kimura said that a patient who suffers from a mental disorder is only damaged in their Ki not losing their Ki altogether (having lost Ki means to lose consciousness in Japanese), they are still conscious. Ki is different or Ki has changed from the normal situation (this means 'crazy' in Japanese). It is very difficult to communicate with a person whose Ki is completely different. That is to say, we can have no way of human understanding with them. But this is only common sense and does not contain some mysterious form of understanding. This is the field of human understanding between Ich and Du. We call the situation that cannot create this humanistic field between Ich and Du 'mental illness'.

There is a fundamental layer deep inside Ich that mediates Du. This area is neither Ich nor Du. Let me emphasize, this is not a physical area or a path between person and person. It is a pre-personal area, an archetypal area inside of our mind. We can communicate because we all have this archetypal area. Mentally ill patients have been damaged or changed in this area by their disease. Kimura named this area 'Aida' which means between. When we communicate we must share this field immediately.

3. SHORT STORY AS A PREPARATION OF CONCLUSION

I said to my master "I understand just a little bit". "Well, what do you understand then?" he asked. I replied "You know all my movements, where I will move and what I intend to do next". He said "Of course! Your atmosphere is clear and very easy for me to

comprehend!" "I will win the next match!" I said. "Well, you can't win....." he replied softly. "The reason is very simple, because you intend to win, but there is no enemy in front of you". That was his answer. It was quite a long time ago.

I was sitting alone in the temple with my sword at my left side. I was looking at the garden. In the next moment, a consciousness transfiguration took place. "I" was sitting in front of "me". A doppelgänger[II] had manifested. I closed my eyes. It was very silent..... The next moment, I felt an atmosphere of menace that is Satsu-Ki. I drew my sword, simultaneously opened my eyes, and swung my sword quickly. But nothing existed in front of me. It was Ku, meaning a vacuum. An atmosphere of menace was generated from inside my mind. Then, what did I cut? Perhaps I cut my mind. I cut deep inside of myself. It sounds paradoxical. But I understood "I" cut "me". The atmosphere of menace disappeared after I swung my sword. It went back to silence again.

There is a deep relationship between Ich and Welt too. If we go down deep inside of Ich, then we will see the most fundamental layer of the world as well as the most fundamental qualities—layer of Du as a pre-personal layer inside of Ich. This is also a pre-personal area, and this area of 'between' also mediates Ich and Welt.

4. BETWEEN ICH AND WELT—CONCLUSION AND THE BEGINNING

Ich easily becomes Du, and Du easily becomes Ich. That is to say, the internal and external are linked deep inside of us, so we

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[II] It means double body. We do not have an obvious explanation for the reason this phenomenon takes place. But it is said that an unconscious apparition manifests to the surface of consciousness. That is to say, it is a shadow of me.

can say the internal becomes external and the external becomes internal [4]. This is a process of creating the world, because the world is not only external: it is created by a process of mixing the internal and external. Then we call it the world. Why does the world have stability? One of the answers is that we share the area (this area is not physical space but some quality we can hold together) between mediated Ich and Welt deep inside of Ich as a non-personal and an archetypal area. If we lose the 'Aida'—between, then we lose our foundation, because it is possible to imagine this is a foundation of our existence as a human kind.

Kimura said that we have a deep process inside of Ich. This is the deepest internal mind that a specialized quality (personality of Ich) changes into an universal quality. That is pre-personal and archetypal area—'Aida', that was neither Ich nor Du. His word 'Aida' identified this universal area that mediates Ich and Du. It means that this pre-personal internal mind also mediates Ich and Welt, because according to Kimura we can see the universal quality between Ich and Du. It is a foundation of us.

It means that if we go deep inside of Ich we will reach the fundamental inside that is between Ich and Welt, as well as the relationship between Ich and Du. We do not have to restrict the concept of Du to a person but are also able to think of it more widely—that is Welt. It is worthwhile to think of the relationship between Ich and Welt, as well as the relationship between Ich and Du.

If we think this way, do we feel Praecox-Gefühl about the modern world? It is also possible to think of Welt as a theory of physics because our view of the world is affected by modern physics theory. If we feel an incomprehensible feeling when we face the world, is it caused from our disorder or the disorder of the world? Who will be a psychoanalyst between Ich and Welt?

Close your eyes if you hope to see.
You can see the world when you close your eyes.
Close your ears if you hope to hear the voice.
You can hear the voice of the world when you close your ears.
This is a beginning of everything.

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A NEW HYPOTHESIS CONCERNING THE EMERGENCE OF TIME

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The problem of (the emergence of) time in quantum cosmology is discussed conceptually. The proposed solutions are considered to be deceptive because the approximation methods are a-dynamical. An ontological dynamics for the emergence of time – a sort of timeless motion – could give a hint for the solution of the problem of time.

INDEX TERMS: Time, quantum cosmology, Wheeler-DeWitt-equation, random motion.

INTRODUCTION

The so called problem of (the emergence of) time is the central problem of quantum cosmology (and quantum gravity)[1]. Solving this problem paves the way for a complete theory of quantum gravity[2] which at the moment resembles more a patchwork than a coherently woven carpet. The -unsolved- 'problem of time' plays the same role in quantum cosmology as the 'principle of equivalence' (of acceleration and gravitational field) has in general relativity.[3] A unifying concept of time in quantum cosmology would lead us heuristically to a prospect to formulate a full theory of quantum gravity. The problem could be stated as follows[4]:
"1. the difficulty of finding an 'internal' time in classical general relativity; 2. the difficulty of finding a time 'buried' in the Wheeler-DeWitt equation; and 3. the difficulty of interpreting the Wheeler-DeWitt equation in a fundamentally timeless way, and accordingly treating time within our present-day theories, general relativity and quantum theory, as an approximate concept."
Shortly the problem consists in the (theoretical) fact that time in general relativity is an inherent dynamical quantity whereas in quantum theory (and special relativity) time has the status of a fixed background as a parameter 'externally' to the dynamics of the theory. Quantum cosmology as a partial ersatz for quantum gravity (applied to the universe a as whole[5]) gives us the Schrödinger-equation of the universe: $H^{op}\Psi=0$, which has no time parameter.

Out of this 'stationary state' various 'aspects of time' or 'times' emerge or could be 'extracted'. But notice that the problem of time and the problem of the emergence of time are not the same thing: the first item is a *quantum* problem and the second a problem of *classical* approximation.

Our aim in this short paper is not to solve the problem of time in quantum cosmology but to show a fundamental 'uncertainty' in the proposals which try to solve the problem. Additionally we give a hint to clear the uncertainty.

TIME *EMERGES* OUT OF TIMELESSNESS?

Does time exist? Definitely, because the scientist[6] confronted with the question "How long did you need to work out your theory that time does not exist?" is urged to answer "Approximately three months, I think", to give a very optimistic number.

Does time exist at the fundamental level? That's another question, and it sounds meaningful. As remarked above, the Wheeler-DeWitt-equation (WDW-equ.; the central equation of quantum cosmology) as a generalization of the Schrödinger-equation for quantized gravitation (with reservations) contains no time variable. It describes a stationary state of 3-geometries in superspace as well as the usual time-independent Schrödinger-equation describes stationary energy-states of an atom[7]. But what about time? The WDW-equ. can be characterized as a hyperbolic differential equation delivering some sort of oscillation. In this sense there seems to be a sort of motion in the kinetic term of the equation, and therefore a timelike variable is selected by the sign.[8] Yet we have to be careful. The so called "oscillation" has nothing to do with 'real motion' – it is a static state. There *would* be motion if one *could* interpret the ideal oscillation as a real one! But the model does not deliver such an interpretation. But in which way does time emerge in the framework of quantum cosmology?

Before our discussion of the emergence of time let us examine the fundamental threefold way of the problem of time in quantum cosmology.

Time in quantum cosmology derived
- ↗ 1. Time is presupposed
- → 2. Time is analytically
- ↘ 3. Time is approximated

Ad 1.: Time is presupposed in theories which merely accept a finitely constructible universe of discourse.[9] The central axiom of these theories goes as follows: *We are finite beings that live in the universe and are constrained to finite procedures.*[10] Time is 'produced' by the steps of the construction-procedure of the objects of the theory. One can concentrate on spin networks: Begin with an initial one W_0 (there may be many possible initial states), construct by a finite procedure a finite set of successor spin networks W_1^a associated with a quantum amplitude. In this procedure "each step takes a

certain amount of time"[11] – space is built in time out of spin nets. From this state space one gets – hopefully – a quantum space-time. But that's a problem of quantum gravity, not quantum cosmology in the sense of cosmogony.

The observable and constructible universe could be not a finite part of an *infinite universe* because in this case our experience of the (infinite) universe would be zero.[12] Furthermore cosmology as an empirical science would be impossible since the cosmological principle would not hold. (One could label this type of theories "endo-cosmology") But the constraint may be too strong. In physics the pendants of the formalists (in mathematics) gave us models to describe the universe as if we could have a point of view from the outside ("exo-cosmology"[13]). Of course it is a matter of choice. Everybody can restrict oneself as far as possible.

But the problem is a very deep one. To give an example: Cosmology must be based on facts. Facts presuppose irreversibility. But what about the state of the universe before radiation and matter had been separated? There exists no "black sky" for a particle to escape, and in this sense there would exist a *state* of the universe without *facts*! That's meaningless. In physics and in cosmology non-constructible facts are necessary. We have a theoretical projection of this state saying that there have to be facts. If there had not been facts, nothing had been happened and the 'state of facts' would have not been arisen. The state of facts must have been emerged out of facts.

Ad.2.: An analytical derivation of time out of the timeless ground state seems to be impossible. This impossibility depends partly on the mathematically intractability of the WDW-equ.[14] It is mathematically ill defined and could only be solved under very special and ideal circumstances. But even if an analytical solution were possible nothing would have been gained because a solution of this sort presupposes a solution of the so called "measurement problem " of quantum mechanics. An analytical solution would gave us a superposition of timeless universes (3-geometries) and no definite classical state. Therefore we come to point 3.

Ad 3. The approximation-methods in this proposal are essentially the WKB (Wentzel-Kramers-Brillouin) approximation and the Born-Oppenheimer approximation, in addition sometimes the concept of decoherence will be applied. Remember the equation $H^{op}\Psi=0$ which is obviously timeless. The essential idea to solve this equation by approximation consists in dividing a field, for example, in two subfields of different scale factors. The WDW-equ. includes matter fields in its explicit form $H^{op}\Psi[h_{ab}(x)^{15}, \varphi(x)^{16}]$ = [– metric on superspace (curved 3-metric + energy-momentum quantity) = 0, where the gravitational fields are (very) large compared to the other scales being non-gravitational fields. Because of the oscillatory form of the equation one has a 'slowly' varying amplitude (semiclassical) gravity) and a 'fast' phase (the other

fields). In fact one has to solve $\Psi(G, \varphi) \approx C[G]\, e^{S0[G]/\hbar(/2\pi)}\psi[G, \varphi]$, where C is a slowly varying amplitude. Now one has to expand the S in powers of the gravitational field[17] which gives the Hamilton-Jacobi equations for the field alone.[18] The solution of these equation delivers a set of spacetimes[19]. Now we get – like the rabbit out of the top hat – the trajectories of the 3-*G*'s which are nothing but a – time. It's really magic!

But where does the motion come from? In the usual Born-Oppenheimer approximation one has a 'slow' motion of the nucleus, for example, and a 'fast' motion for the electrons – in a sense one can neglect the motion of the nucleus because of its big mass in relation to the smaller masses of the electrons. The approximation referring to the WDW-equ. takes the gravitational field for the nucleus and the other fields for the electrons. In approximating a Schrödinger equation for a simple molecule one has no problems with motion and time because a classical background like a spacetime always exists. The point is the so called semiclassical treatment. Because of the equivalence of the Hamilton-Jacobi equations and the Einstein field equation one is able to 'simulate' an emergence of time. But nothing 'really' emerges! There is only a static stationary state at which one 'projects' a semiclassical 'field' via an expansion being a pure 'syntactic' method of calculation without 'semantic', *id est* ontological content. The expansion moves 'no thing' ontologically; the semiclassical regime will be statically put over the quantum fields described by an equation that includes an oscillation without motion. One gets a time only because the equivalence of the Hamilton-Jacobi equations and the Einstein field equations. So in a sense time emerges out of a calculation which is no process.[20]

But that's what we want! The emergence of time could not be a process in time. But what should it be if it is not a pure calculation? "The deceptive picture: Emergence is not a process in time"[21] looks too hopeless because of the implicitly drawn conclusion of Butterfield and Isham: If emergence is not a process in time, then is must be a timeless relation like reduction, approximation, or (in)commensurability of theories. The reduction of phenomenological thermodynamics to statistical thermodynamics (as an experiment) is a timeless relation between two theories as the reduction of natural numbers to set theory (and logic) (as an experiment, too) is not in time. In this sense the emergence of time is nothing but an intertheoretical relation between the theory of the ground state of the universe and the theory of classical (space-) time. But the question remains: How did the universe of discourse of the latter emerge out of the universe of discourse of the former?

ONTOLOGICAL EMERGENCE OF TIME

Let us have a new start, and let us see what conclusion follows from the two following premises:

1. (Space-) time is not fundamental; 2. Motion is fundamental.

Ad 1.: The thesis seems to be plausible because of the standard model of cosmology and because of some theoretical coherence of the quantum cosmology discussed above. A quantization of the gravitational field delivers *in the framework of the present theoretical patchwork* a fundamental equation with no time parameter (problem of time). This follows from the reparametrization invariance of the "patchwork". (Space and time have to be separated because of the Hamiltonian formulation of field theories, especially the gravitational field.) Furthermore there is a philosophical reason for premise 1. Physics in its history tried to reveal the depth structure of the universe to explain the phenomena. If there were a depth structure of space and time, we would understand better what space and time are. Perhaps the revealing of this deep structure is the only way for the understanding of space and time.

Ad 2.: Stasis or absolute rest is forbidden by the uncertainty principle of Heisenberg because a motionless entity has *exactly* velocity 0 being *exactly* at place a. *Probablement* the uncertainty principle will be conserved (and supplemented) in theories succeeding quantum mechanics[22] unifying the latter theory and general relativity, and so being full theories of the ground state of the universe. But there is another reason for 2. Stasis is absolutely stable. If the ground state of the universe would have been a motionless state, nothing had been happened. There would have been no reason for a motion to occur. Let us have a look at the problem from another point of view. Stasis is a state of absolute symmetry. If no inherent fluctuation is at work no breaking of the symmetry is possible. Everything would stay as it is and nothing would emerge[23].

From 1. and 2. follows:

3. There exists a timeless motion.

What does it mean? Let us first say something about the theoretical usefulness of the concept, and then utter some words on its meaning. If there exists a timeless motion, we could speak of the *precise ontological* emergence of time because time would have been emerged triggered by a timeless motion. The emergence of time would neither be a *process in time* nor a *timeless relation*. The physical meaning of such a motion could be symbolized for the time being as a motion of a photon from its own point of view. In the framework of special relativity movement on null-lines is very special – it 'happens' instantaneously

whilst from an external point of view distances will be traversed in a finite amount of time. In this sense one gets timeless motion in a conformal geometry. This representing of a timeless motion under a physical image shows that such a type of motion is at least coherent. Immediately we will present a speculative model of timeless motion being a little different from the one above. For this purpose we have to turn toward the concept of time.

Our ansatz consists in the hypothesis that time is a statistical quantity similar to temperature. In the twenties of the last century Norman Campbell made such a proposal.[24] Because of lack of space it is not possible to discuss his ideas in detail but let us have a look at the central thesis: "Briefly, the suggestion is that time is a statistical conception, significant only with regard to large aggregates of atoms; and that it is as meaningless to speak of the time interval between atomic events as of the temperature of an isolated molecule."[25] Because our interest is not restricted to quantum events in the universe we don't speak of atoms and molecules but of entities or events at the ground state of the universe. For our suggestion made here it is not necessary to specify these entities. One could call them loops, strings, partons, or whatever you want.

We propose that the state of these entities must be described mathematically as a sort of *white noise* for which the arrow of time is not defined. White noise consists of all different frequencies and is in some sense equivalent to Brownian motion. An electrodynamical example is white light which is made up of all colours, *id est* frequencies. But our model is a little bit more abstract. One should interpret the white noise as a sort of quantum noise being the sub-structure of space and time. String theoreticians know that for a non-perturbative theory the so called 'vibrations' of the strings are timeless motions exactly because they form the sub-structure of space-time. In a sense the *co-operation* of the fundamental entities, especially their 'event'-character ('vibrations'), build the organized structure of space-time (and matter). There is a state of disorder and incoherence 'before' the co-ordination of the vibrations organizes the order and the coherence of the state that lets 'immediately' emerge space and time. So we have a state of separate vibrations of frequencies of all sorts oscillating uncoupled. For this state no favoured direction of the oscillations and no angle between the oscillations are defined. The single and separate oscillation is not in time as well as a single particle is neither hot nor cold. The former behaves like an 'individual phenomenon' in the sense of Bohr – it has no timelike 'interior'. Wheeler called these 'events' "elementary quantum acts" demanding that physics has "to understand particles, fields, and spacetime as all built in the end on a still more intangible foundation, the higgledy-piggledy of billions upon billions of elementary acts of registration".[26]

There exists a close connection between Wheeler's and Campbell's ideas. For both the laws of nature are in some sense approximate, and so is the concept of time too. But a deeper connection appears: The derivation of quantum

mechanics from more fundamental principles depending explicitly or implicitly on the concept of time. Campbell's suggestion means strictly speaking that all quantum phenomena could be reduced to the 'axiom' that *time behaves like temperature*.[27] Wheeler's condensed proposal runs as follows: We need urgently "a derivation of the structure of quantum theory from the requirement that everything have a way to come into being."[28] Further on he says: "Explain time? Not without explaining existence. Explain existence? Not without explaining time. To uncover the deep and hidden connection between time and existence...is a task for the future."[29]

That's an exorbitant venture. All *we* can say is this. It is meaningless to ask for the frequency and the direction of a single vibration of the ground state described as white noise. There is no intrinsic time because the higgledy-piggledy of the ground-state-events gives them no licence to work as clocks – no definite frequency is defined. The number of the oscillations and their direction is uncertain; single oscillations are not identifiable, and so no direction of time exists. We think the oscillations produce time because we immediately project a parameter time on these events.

An operational access throws light on the problem. Simultaneity of events is restricted by c, maybe (the direction of) time is restricted by the Planck-length L_{Pl}: $([h/2\pi]G/c^3)^{1/2}$. There are some speculations that at the scale of 1.6×10^{-33} cm the notions of "before" and "after" lose their meaning[30] because of (quantum) fluctuations of the space-topology.[31] It sounds interesting but has no sense unless the concept of a timeless motion is accepted. If random fluctuations[32] occur at this level no time can be measured (in principle) on account of the higgledy-piggledy in the ground state – the motion there has no phase and rhythm. Yet without these characteristics time cannot pass if one characterizes "time" plausibly as "motion measurable in principle".[33] We have the (defective) intuition that time exists at this level as well as some people have the (also defective) intuition that there exists a naturally and unambiguously selected cosmic time permitting absolute simultaneity. ('Simultaneously with my writing this sentence at Alpha Centauri – exactly *now* – a protuberance is raising, and a little green man at the mars – exactly *now* – has the same intuition of the protuberance exploding – exactly *now*.)

Such a sort of random motion is anticipated cum grano salis by Hawking's extended uncertainty principle referring to particles from evaporating black holes. These particles are divided into two classes: the particles falling in the black hole and those coming out of it –a particle pair under consideration consists of a member of the first and of the second class, respectively. The particle falling in is unmeasurable in principle according to Hawking. The speed and the position of the particle coming out depends on the particle falling in - therefore the first one is in no definite state of motion at all. One can calculate

the probability of position or speed but there is no state consisting of the combination of these two quantities underlying the usual uncertainty principle. We are dealing with a pure random process.[34]

To continue our thoughts we have to follow in Hawking's steps. Assuming that every region in the universe is stuffed with tiny (virtual) black holes gives us a global state of random motion of particles. Now let us go on and make the space full of holes completely discrete. M. Requardt has gone to a lot of trouble referring to this problem but presupposes a sort of clock time in constructing a discrete space[35] formed out of cellular networks and random graphs. Here a very clear mathematical apparatus is built up to tackle the sub structure of the (continuous) space-time but the problem of time is missed.

We guess that time emerges when out of the random fluctuations of the fundamental entities (here unspecified) of the ground state an *order parameter* emerges meaning a *coupling* of the entities. At this point concepts of the theory of selforganization are brought into play. "In this process the individual and incoherent elementary fluctuations are expected to be reorganized in a macroscopic pattern (in the language of *synergetics* they become slaved..."[36] During the coupling one mode (of oscillation) becomes a sort of 'master mode' (order parameter) and the other oscillations have to dance to its tune. The paradigm of such an process of selforganization is the laser.[37] A laser filled with a few laser atoms like carbon dioxide produces produces white noise, *id est* normal incoherent light. If the laser will be filled up with more atoms it produces coherent laser light – the incoherent oscillations are slaved by one mode. We guess that the emergence of time resembles this process structurally. It is nothing but a linking or connecting of the oscillating entities of the ground state. Separate entities are not in time (as separate atoms are neither cold nor hot) – it is the self organizing process of linking together that produces time. One order parameter is selected and tunes the other ones organizing the direction of time. It is like tuning a radio: At first one has white noise and thereafter colored noise up to pure tones. Say "universe" instead of "radio" in order to be on the safe side.

Naturally these thoughts are very speculative and abstract but I hope they deserve a further elaboration, especially in the framework of a theory of emergence.

CONCLUSION

The description of the ontological emergence of time is defective without the assumption of a timeless motion. It is not time – which is not fundamental – but motion that runs like a red thread through the universe. A desideratum consists

in finding the (mathematical) description of the linking of the fundamental entities which have to be specified.

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[1] The literature is abundant; see for example: D.Giulini et al. *Decoherence and the Appearance of a Classical World in Quantum Theory*, Berlin etc. 1996; J.Butterfield and C.J.Isham: On the Emergence of Time in Quantum Gravity, in: *The Arguments of Time*, ed. J.Butterfield, Oxford 1999 and gr-qc/9901024 (v1 8Jan1999).

[2] C.Kiefer in: D.Giulini et al. *Decoherence and the Appearance of a Classical World in Quantum Theory*, Berlin etc. 1996.

[3] C.Kiefer in: D.Giulini et al. *Decoherence and the Appearance of a Classical World in Quantum Theory*, Berlin etc. 1996.

[4] J.Butterfield and C.J.Isham 1999 section 5.1 (after K.Kuchar: The Problem of Time in Quantum Geometrodynamics, in: *The Arguments of Time*, ed. J.Butterfield, Oxford 1999).

[5] Quantum gravity per se is not a cosmological theory as well as general relativity is not, too.

[6] J.Barbour *The End of Time*, London 1999.

[7] Naturally, there are probability-distributions of the respective states. Because of H=0 the WDW-equ. resembles a zero-energy Schrödinger equation. Confer for the problem C.Kiefer: Quantum Cosmology and the Emergence of a Classical World, gr-qc/9308025 (v1 23 Aug93).

[8] C.Kiefer: Der Zeitbegriff in der Quantengravitation, Philosophia naturalis 27 (1990), p.50.

[9] For example, S. Kauffman and L.Smolin: A Possible Solution For The Problem Of Time In Quantum Cosmology, http://www.edge.org/3rd_culture/smolin/smolin_p2.html; Th.Görnitz: On Connections between Abstract Quantum Theory and Space-Time-Structure, Part II: A Model of Cosmological Evolution; Intern.Journ.Theoret.Phys.28 (1989), pp.659-666. (For the Weizsäcker-Görnitz approach transitions into the non-denumerable regime are possible.) I must mention *cum grano salis* Clive Kilmister, Ted Bastin and Pierre Noyes as well as the early Roger Penrose, too.

[10] Here a famous debate on the foundations of mathematics revives in the foundation of physics!

[11] S. Kauffman and L.Smolin: A Possible Solution For The Problem Of Time In Quantum Cosmology, http://www.edge.org/3rd_culture/smolin/smolin_p2.html; p.1 of chapter: Can we do Physics without a constructible state space?

[12] Th.Görnitz, personal communication.

[13] The majority of quantum cosmological theories are „exo-cosmologies" and in this sense ‚formalistic' theories.

[14] See K.Kuchar: The Problem of Time in Quantum Geometrodynamics, in: *The Arguments of Time*, ed. J.Butterfield, Oxford 1999.

[15] 3-metric *G*.

[16] Matter fields (non-gravitational fields).

[17] or the Planck mass.

[18] For a detailed discussion and for solutions of equations see C.Kiefer in: D.Giulini et al. *Decoherence and the Appearance of a Classical World in Quantum Theory*, Berlin etc. 1996, and C.Kiefer: The Semiclassical Approximation to Quantum Gravity, gr-qc/9312015 (v1 9Dec93).

[19] These spacetimes are still quantum mechanically superposed – for this reason one must apply, for example, the method of decoherence, or content oneself with a selection of an Everett-world.

[20] It's just the same with decoherence, which in quantum cosmology is not a process in time, too; see J.Butterfield and C.J.Isham: On the Emergence of Time in Quantum Gravity, in: *The Arguments of Time*, ed. J.Butterfield, Oxford 1999, p.52 of gr-qc/9901024 (v1 8Jan1999).

Confer sections 5.4 – 5.5.3 for the same conclusion as mine. In the Hartle-Hawking approach the Lorentzian realm does not emerge out of the euclidean 'sphere' because there is no temporal relation between these manifolds. For the problem confer J.Butterfield and C.J.Isham 1999 and Qu. Smith: The Ontological Interpretation of the Wave Function of the Universe, The Monist 80 (1997), pp. 160-185.

[21] J.Butterfield and C.J.Isham 1999, p.56 of gr-qc/9901024 (v1 8Jan1999).

[22] See E.Witten: Reflections on the fate of spacetime, p.136, in: *Physics meets Philosophy at the Planck Scale,* ed.: C.Callender and N.Huggett, Cambridge (UK) 2001.

[23] „...nulla est unquam quies vera in corporibus, nec a quiete aliud nasci potest quam quies;..." G.W.Leibniz: Specimen dynamicum, pars II, in: Mathematische Schriften, Hildesheim 1962 (ed. C.J.Gerhardt), Vol.VI, p.252.

[24] N.Campbell: Time and Chance, The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science Vol.I (Seventh Series), January-June 1926, pp.1106-1117. In addition: N.Campbell: Atomic Structure, Nature No.2684, Vol. 107, April 7, 1921, p.170, and: Philosophical Foundations of Quantum Theory, Nature No.3004, Vol. 119, May 28, 1927, p.779. For a short discussion and for information about some contemporary articles similar to Campbell's work see: O.E.Rössler: Endophysics, Singapore 1998, chapter: Into the Same Rivers We Step and Step Not, We Are the Same and We Are Not: On the Origin of the Now, section 4. For interesting ideas having a remote similarity to Campbell's conception yet carried out at a more fundamental level, see J.A.Wheeler: The Elementary Quantum Act as Higgledy-Piggledy Building Mechanism, in: *Quantum Theory and the Structures of Time and Space*, Volume 4, ed. L.Castell and C.F.von Weizsäcker, München 1981, pp.27-30; S.Hitchcock: Quantum Clocks and the Origin of Time in Complex Systems, gr-qc/9902046 (v2 20Feb1999); M.Requardt: (Quantum) Space-Time as a Statistical Geometry of Lumps in Random Networks, gr-qc/9912059 (v1 15Dec1999).

[25] N.Campbell, Philosophical Foundations of Quantum Theory, Nature No.3004, Vol. 119, May 28, 1927, p.779.

[26] J.A.Wheeler: The Elementary Quantum Act as Higgledy-Piggledy Building Mechanism, in: *Quantum Theory and the Structures of Time and Space*, Volume 4, , ed. L.Castell and C.F.von Weizsäcker, München 1981, p.29. How comes the registration? Wheeler holds that "*[n]o phenomenon is a phenomenon until it is a registered phenomenon.*" (*loco citato* p.28.) Because this registration presupposes a classical apparatus Wheeler's *P*articipatory *A*nthropic *P*rinciple follows immediately. But the PAP solves no problems – it only states them.

[27] O.E.Rössler: Endophysics, Singapore 1998, chapter: Into the Same Rivers We Step and Step Not, We Are the Same and We Are Not: On the Origin of the Now, section 4

[28] J.A.Wheeler: The Elementary Quantum Act as Higgledy-Piggledy Building Mechnism, in: *Quantum Theory and the Structures of Time and Space*, Volume 4, , ed. L.Castell and C.F.von Weizsäcker, München 1981, pp.29-30.

[29] J.A.Wheeler: Hermann Weyl and the Unity of Knowledge, in: *At Home in the Universe*, Woodbury, NY 1994, p.191.

[30] as well as time disappears at the level of superspace, too. *Confer* for example J.A.Wheeler: Beyond the Black Hole, in: *At Home in the Universe*, Woodbury, NY 1994; pp.344-345 (footnote 75 *cum* literature).

[31] J.A.Wheeler: *Einsteins Vision*, Berlin-Heidelberg-New York 1968 (→Schwankungen in der Topologie).

[32] This is a very intricate concept because it shimmers sometimes classically and sometimes quantum like.

[33] In German: ‚getaktete Bewegung'. It resembles the respectable definion of Aristotle: „Time is the number or measure of motion" (*confer* for example *Physics* 219b2). The classical time

approximated by the calculations mentioned above is in a sense aristotelian; it runs as follows: „Time is the measurable change of 3-geometries".

[34] S.W. Hawking: Does God Play Dice?, http://www.hawking.org.uk/text/public/bot.html; for a more precise discussion, see: Particle creation by black holes, Comm.math.phys. 43 (1975) pp.199-220, and The Nature of Space and Time, chapters 2 and 3, http://www.hawking.org.uk/text/public/bot.html.

[35] M. Requardt and Sisir Roy: (Quantum) Space-Time as a Statistical Geometry of Fuzzy Lumps and the Connection with Random Metric Spaces, gr-qc/0011076 (v2 13Feb2001), p.4, or M. Requardt: Let's call it Nonlocal Quantum Physics, gr-qc/0006063 (v1 19Jun2000), p.11. He calls the clock time „non-physical", but it does'nt help. From this point of view his findings resemble the work of Smolin mentioned above.

[36] M.Requardt: (Quantum) Space-Time as a Statistical Geometry of Lumps in Random Networks, gr-qc/9912059 (v1 15Dec1999), p.16. *Confer* M. Requardt: Let's call it Nonlocal Quantum Physics, gr-qc/0006063 (v1 19Jun2000), pp.25-31. One obstacle has to be overcome: In quantum field theories one has to do with closed systems whereas in theories of selforganization open systems are essential.

[37] H. Haken: *Synergetics*, Berlin-Heidelberg-New York 1978, chapter 8.1-8.7.3.

The Origin of Matter and How 3+1 Space-time Came To Be; a Possible Explanation for the Origin of Everything.

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Stability/instability with respect to the critical phenomenon of material phase transitions is shown to define a fundamental origin. It is the critical point/group symmetry breaking from which matter in the form of the experimentally validated quantizations of the elementary particles and 3+1 space-time, emerge, on all scales relative to the scale of the cosmos itself. This critical point, at which the speed of light c takes the role of a critical parameter, and before which neither matter as elementary particles nor 3+1 space-time existed, i.e. before which it can be postulated anything existed, therefore corresponds to the creation/origin of a cosmos, where this universal definition of stability /instability (for which Wilson was awarded the 1982 Nobel Prize) is a sufficient criterion to explain the nature of a cosmological evolution including, it is argued and evidence is presented, that of living systems, and ourselves.
For example, as cited in references, subject to the right boundary conditions, DNA as the semiotic genetic code of living systems, and ourselves as conscious life-forms capable of rational semiotic thought, are two of this evolution's later inevitable emergent consequences, as, at the postulated cosmological origin itself, are 3+1 space-time and matter as elementary particles, of the critical phenomenon of material phase transitions described in terms of the laws of quantum physics. That is, these laws constitute a semiotic reasoned theory of a cosmological evolution from this fundamental origin of nothing, during which everything (logically consistent with the laws, and this fundamental boundary condition) will eventually be emergent including the laws themselves. For we ourselves, as conscious life-forms capable of semiotic thought, are their originating agency. These laws can, in this case, following Bohm concepts, be said to constitute an implicate order, by means of which all explicate order can, in principle, be described.

Introduction.

From a group theoretic argument of Rowlands and Cullerne [1] outlined below, it follows :-
A) that the known experimentally validated quantizations of the elementary particles for the strong, electromagnetic, and weak forces, are exactly those that ensure the compatibility between quantum mechanics and general relativity, and

B) that the origin of the quantum universe as a Self-creation or means by which Everything can be derived from Nothing, corresponds to the unstable critical point/material phase transition from which the 3+1 spacetime field and its corresponding sources/sinks, such a quantization of elementary particles, emerge antithetically,

This emergence thus defines exactly what is meant :-

i) by " the 3+1 spacetime field" in the quantum mechanical sense,

ii) by "elementary particles" in accordance with the criterion for determining critical points [2] as laid down by K.G. Wilson's renormalization group universal methodology for calculating the critical phenomena of material phase transitions, for which he received the Nobel Prize [3] and

iii) by the observed cosmological isotropy. For, as a critical point of emergence analogous to the unstable critical point of liquid water/steam, at which bubbles of steam inside droplets of water and vice verse, exist in dynamic equilibrium on all scales upward from the atomic scale, it provides an explanation of why, the 3+1 spacetime field, and the quantizations of the elementary particles and their basic force-fields, are emergent on all appropriate scales, relative to the scale of the quantum universe itself.

This scale of the quantum universe, that in a self-referential system, cannot itself be measured since there remains nothing to measure it against, is thus uniquely available, in this case, to act as the essential measurement standard in relation to all measurement. Furthermore, in all self-measurement corresponding to quantum self-interference, such a quantum cosmos as all that exists, could not, in accordance to quantum law, clone itself, and so must evolve adaptively forever; a requirement consistent with a postulated cosmological system boundary condition of Nothing/the empty set, represented by, say, zero. For zero is infinitely topologically degenerate, and this would require that the quantum mechanical geometric/Berry phase of the cosmos can never return to zero [2], so as to enable its evolution without end.

This cosmos thus conforms to the generally implicit understanding that stability /instability relative to 3+1 spacetime is the primary criterion determining the nature of the observable material structure in the universe, and of its adaptive evolution. That is, the cosmological evolution will consist of the dynamic motion of matter in 3+1 spacetime, punctuated by critical points at which material phase transitions take place, in the region of which the matter concerned will, in relation to its thermodynamic degrees of freedom (for example, temperature) acquire distinctly different macroscopic properties. Such as those in the example above, where water takes on the properties of both steam and of liquid water and these may include entirely novel ones, which never have existed before, all of which are a consequence of quantum mechanical effects at the microscopic level. This unlimited spectrum of novel stable/unstable material phase transitions forecast by Wilson's methodology, can therefore be postulated in this cosmos, as the source of its unending evolution; an evolution in terms of

the 3+1 spacetime field and its sources/sinks, the elementary particles, in accordance with the accepted the basic laws/forces, by processes, such as fission, fusion, chemical composition/decomposition, etc, and where as noted the quantizations of the elementary particles correspond in this proposed model to critical points in 3+1 spacetime, so as to define the quantum mechanical properties of mass, and those of electromagnetic, strong and weak charge.

The velocity of light c as a critical fixed point and the unification of gravitational, electromagnetic, strong and weak forces.

It follows from the known fact that both general relativity and quantum mechanics include special relativity ie 3+1 spacetime in relation to the Lorentz group, that in Einstein's famous equation $E = mc^2$, c now takes on a new role in respect to critical phenomenon, as the "initial" critical parameter at which matter emerged spontaneously in relation to 3+1 space/time. That is, Wilson's discoveries in relation to material phase transitions, point to the fact, that there could exist in relation to both general relativity and quantum mechanics, the breaking of some group symmetry, related to the 4 vector algebriac group (describing 3+1 spacetime in a manner appropriate to general relativity) the properties of which may also describe the emergence of mass and generalised charge. This symmetry breaking, in accordance with intuitions, discoveries and the most exciting work of Peter Rowland and John Cullerne of Liverpool University [1], concerns that of the quaternion group. They show that these two groups together constitute the generalised Dirac algebra so as to describe the families/quantizations of the elementary particles, as they are currently known to exist from the experimental evidence, in relation to not only electromagnetic charge, but to the strong and weak charges too! [1] That is, to say, this Dirac algebra (from which Rowlands and Cullerne (R&C) are easily able to derive Dirac's famous wave equation and suitable generalisations) does indeed, as would be expected from symmetry breaking in relation to Wilson's renormalization group approach, describe the existing families of elementary particles as the material phase transition points of the 3+1 spacetime field, described by the 4 vector algebra. That is as its critical fixed points or sources /sinks, where stability and instability in 3+1 spacetime is now the fundamental criterion of the cosmological model, considered here. It can therefore be inferred in contradiction to generally held scientific opinion (but in excellent agreement with observed fact and as implied by string theory!) that the known parametric** elementary particle quantizations are exactly those, and only those, that are compatible with Einstein's general relativity, and that all further material complexity and novel material properties arise from combining these elementary particles in various ways (as can be in principle calculated by Wilson's methodology) according to their masses, charges, and the properties of the associated fields. These concern, for example, those of the stable and unstable

isotopes of the periodic table, following Wilson's prescription, their chemistry, and its material phase transitions, etc, which must include quite naturally all those in use in living systems and their biochemistry [2,4]. This immediately leads to the potentially validatable hypothesis, that human consciousness/self-awareness corresponds to such a novel critical material phase transition point, at which the human brain as a whole performs self-referentially in relation to its neural information processing capabilities, so as to be able to function as a macroscopic massively quantum parallel processing system. That is to say, it performs in the manner of this cosmos as a self-referential partially quantum coherent system. Both the cosmos and the brain can therefore be described as having a quantum mechanical "awareness of itself" at the corresponding critical points. An hypothesis immediately supported by the fact that consciousness is lost once the critical temperature of the human body deviates sufficiently from its norm, or if blood is withdrawn from the brain, so that in both cases, the partial quantum coherence necessary to the brain's conscious functioning as an integrated quantum mechanical whole would be lost.

Further Implications of the R&C model

The concept of the R&C model supported by the physical evidence in relation to known elementary particle quantizations, that both classical relativistic and quantum physics are subject to the constraints imposed by a basic mathematical group structure, is therefore a very powerful one. Further implications include :-
i) the group implication that Einstein's general relativistic metric will have an inverse. This is good accord with the concept of the new cyclic model of two branes**, and the work of Amari cited below,
ii) the emergence of spin [1] as show by R&C and the possibility that spin as it exists in elementary particles is a consequence of "frame dragging"[5], as first conceived by Lense and Thirring in 1918!
iii) that as show by R&C the generalised Dirac equation can be put into nilpotent form [6]. That is to say, that the now predicted simultaneous emergence of 3+1 space/time and matter described in terms of mass/generalised charge, may also be quantum mechanically described (as the postulated Self-creation must be) as an absorber/emitter model in terms of annihilation/creation operators, and
iv) will be such that above the critical parameter c (or, the present physical evidence indicates below a further now critical parameter, which one can assume is the Planck length) corresponding to $E = mc^2$, there is no 3+1 space/time at all nor any quantized material 3+1 spacetime sources and sinks. It may therefore be that E beyond this point is "continuous dark energy " or "a dark energy spectrum", that cosmologists are seeking, or is simply to be considered as the cosmological source/sink.
Further consequences are described in the paper [2] presented at CASYS 2001 in Liege. The most significant of these, however, is that the complementary

bosonic properties of this cosmos (akin to those of the fermionic described by the generalised Dirac algebra of the R&C model above), are again specified in terms of condition of nilpotence, ie that of the 3 dimensional Heisenberg nilpotent Lie group, the harmonic analysis [7] of which Schempp calls quantum holography. It already has extensive practical applications in signal theory, for example, in synthetic aperture radars, magnetic resonance imaging [8], etc. That is, this group is the means to incorporate holographic signal theory into quantum physics, a concept also proposed by Chapline [9] [also see 2]. That is, quantum theory can be understood as holographic theory of pattern recognition and as shown, may describe such signal theory in various living systems including DNA [4]. It is notable too, that Schempp's "quantum holography" and Jessel "holochory", which both generalise classical holography, concern hologram planes. One is inclined to think therefore that the new double brane model**, relates to what in modelling neural nets Amari [10] calls information geometry where there exists a dualistic geometry of manifolds with coupled Riemannian metrics such that there is a dually flat manifold having two different criteria of linearity or flatness one to the other such that the matrix of the metric tensor of the first is the inverse of the other, implying the existence of mutually dual or conjugate bases in their tangent spaces.
It maybe therefore that the model described here and in further detail in [2] able to model quantum mechanical phenomena on many scales [11] (such as those of living systems [4]), as the arguments in the Randall article** might also imply, is not only the GUT or Grand Unified Theory, but the theory of Everything as well. For this model describes a Self-Creation leading not only to the creation of life but as been hypothesized [4] to the creation of the quantum mechanical conscious human self!

References

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[2] Marcer P. Mitchell E. and Schempp W, 2002, Self-reference, the Dimensionality and Scale of Quantum Mechanical Effects, Critical Phenomena and Qualia. International Journal of Computing Anticipatory, Proceedings of the International Conference on Computing Anticipatory Systems, August 2001, editor Dubois D. volume 13, 340-359, (also available from P. Marcer, on-line, and in an earlier version, in the Proceedings of ANPA 23, ed. Bowden K. 247-268).
[3] Wilson K.G. 1983, The Renormalization Group and critical phenomena, Reviews of Modern Physics, 55, 3, July, 583-600.

[4] Basic models of living systems already published, employing quantum holography or holochory include for example :-
i) Marcer P. and Schempp W. 1996, A mathematically specified template for DNA, and the Genetic code in terms of the physically realizable processes of Quantum Holography, Proc. Symposium "Living Computers" 9th March, University of Greenwich, ed P.J.Marcer and A. Fedorec, 45-63, ISBN 1 86166 024 3.
ii) Gariaev P. et al, 2001, The DNA-wave biocomputer, 4th International Conference on Computing Anticipatory Systems, Liege, Belgium, Symposium 4, Proceedings of the Journal of Computing Anticipatory Systems ed. Dubois D. volume 10, 290-310,
iii) Gariaev P. et al, 2002, Fractal Structure in DNA Code and Human Language: Towards a Semiotics of Biogenetic information, 5th International Conference on Computing Anticipatory Systems, Liege, Belgium, Symposium 10, Proceedings of the Journal of Computing Anticipatory Systems ed. Dubois D., volume 13, 255-273.
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v) Marcer P. 1997, How the Hawkmoth Flies, 1st International Conference on Computing Anticipatory Systems, Liege, Belgium, Symposium 6, ECHOII, Abstract Book, ed. Dubois D., complete paper, 6-8.
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vii) Marcer P. and Schempp W. 1998, The Brain as a Conscious System, International Journal of General Systems, editor Bowden K., 27, 1-3, 231-248.
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ix).Clement B.E.P.et al, 1999, The Brain as a Huygen's Machine, Informatica, 23,389-398.
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[5] Technically the factor distinguishing integer and half integer spinors is related to the 1:1 and 2:1 representations of the 3 dimensional rotation group.
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Group with Applications in Signal Theory, Pitman Notes in Mathematics Series 14, Longman Scientific and Technical, London.
[8] Schempp W. 1998, Magnetic Resonance Imaging, Mathematical Foundations and Applications, John Wiley, New York.
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[10] Amari S. 1991, Dualistic Geometry of the Manifold of Higher Order Neurons, Neural Networks, 4, 443-451.
[11] Binz E. and Schempp W. 2001, Quantum Hologram and Relativistic Hodogram: Magnetic Resonance Tomography and Gravitational Wavelet Detection, American Institute of Physics Proceedings 573, of the Fourth International Conference on Computing Anticipatory Systems, editor Daniel Dubois, 98-131. section 9, 118-120.
[Further theoretical support for the model (A)&(B) proposed here, comes from the Combinatorial Hierarchy model see Bit String Physics, a finite and discrete approach to Natural Philosophy, by H. Pierre Noyes, edited by van den Berg, http://www.wspc.com/books/physics/4692.html]

This review, Subject : **Spacetime review in Science, 296, 24th May,2002 Date 02/06/2002
With particular reference to Extra Dimensions and Warped Geometries, Lisa Randall, and the new cyclic model of the universe, consisting of two infinite three dimensional "branes". Here as the article by Randall readily admits, there is as yet a failure to get to the heart of the matter of what parameters must be selected so as to described exactly how string theory resolves the dichotomy between quantum mechanics and general relativity, and why 3+1 spacetime came to be, which is, I am convinced, as outlined above and set out in the attached paper.
Note. There must, it can be hypothesized, in accordance with the existing physical and mathematical evidence for black holes etc, be a singularity/instability in null spacetime from which non-null spacetime emerges. That is to say the hypothesis explaining exactly how 3+1 spacetime and the whole material universe (in relation to such material phase transitions) came to be [2], is not in conflict with this.

Limit of the Cartesian Order

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Abstract

McTaggart's argument to deny time is well known. He denied the reality of time because he recognized the reality of an event. However, in adopting the converse of this argument, the Japanese philosopher S. Omori denied the reality of the event. These arguments are only limited to 'time', but it is possible to extend them to space, because space is analogous to time, particularly when relativity is taken into account. In this case we arrive at a contradiction with the conventional Cartesian order. In this article, I discuss this contradiction and claim that a new order of space-time structure is required. This new ontology is similar to that held by ancient Japanese philosophers and Buddhist priests. I shall endeavour to show that these ideas have interesting connections with the Bohm interpretation of quantum mechanics.

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1.Why We Need the New Order of Space-Time Structure ——Introduction

It is widely held that the first quarter of the last century produced the second revolution of science. In physics this change was dramatic. We gained many new insights into nature through new physical theories such as the theory of relativity and quantum theory. Above all, the rise of quantum mechanics was more important and revolutionary than even Einstein's theory of relativity. Even though the theory of relativity was revolutionary, it did not require as deep and fundamental a change in our ontological outlook on the world as quantum theory. The latter demands a radical change in perception from the classical world-picture.

This departure produces two main problems. One is the loss of ontological consistency between classical theory and quantum theory. In philosophical terms, the ontological basis of the world as described by quantum mechanics is lost. For example, let us consider a flower in bloom on a mountainside and that nobody becomes aware of it. According to the standard interpretation of quantum mechanics, we are not able to hold the reality of an event (the flower) that we are not measuring—observing. We can only talk about the probability in relation to this flower. But what is the probability of a flower? Is it really superposition of the wave functions? I believe there is a flower on the mountainside and it is not a superposition of the wave functions. It is a real existence even though we are not aware of it. Therefore, we lost ontological consistency and the reality of the event. Following on, I would like to consider '*Can quantum mechanical description of reality be considered complete?* We must create a more complete theory. So we will go into detail about the ontology of the event in this consideration (this point will be discussed in depth after section 5 and we will argue some preparatory considerations and paradoxes in order to discuss this

problem).

Quantum theory only tells us about epistemology. However I believe we need an ontological basis in the theory. We need an ontological basis in order to hold scientific epistemology. That is to say, as Bohm and Hiley [1]emphasized, that;

> Quantum theory is primarily directed towards *epistemology,* which is the study that focuses on the question of how we obtain our knowledge.

It follows that the standard interpretation of quantum theory can say nothing about the ontological existence of the world. I believe a physical theory is not the real world and we do not have to worry about this question if we have a real world lying behind our theory. But if any theory is only epistemological, then our theory is not an accurate model or a copy of the real world. We must then admit that physical theory is not able to reach the root of the substantial world—if there is such a thing.

We are creating the theory—that is our way of understanding the world, by way of epistemology but not copying the external world. Then when we create the internal world it means that the theory is not only external but also internal. The Internal world and the external world are not separated. So I imagine they are generated simultaneously. We create our understanding of the world in this way. A physics theory is the most advanced *form* of our understanding of the world, perhaps. Rather it would be better to say, as Cassirer claimed[2], that physics theory is only one of the ways of understanding the world (world picture), and the modern physics is similar to myth. Myth told the ancient people how the world is. Cassirer said modern physics theory has the same function because it tells us how this world began –beginning with the big-bang theory, and gives us systematic explanations, for example, the fall of an object is due to gravity, in other words, the method of explanation, myth is a different method of explanation.

In the context of Cassirer's point of view, what can we say

about the so-called Copenhagen interpretation of quantum mechanics? To put it in different words, what kind of world-picture emerges from the Copenhagen interpretation as a consequence of adopting this position? We can say *nothing* about a world-picture that is based on some ontology. It is not possible to find a ontology—Gestalt in the theory. We are only using quantum theory as an algorithm for calculation. This means that modern physics theory becomes only a tool which produces valid results. The theory is the so-called black-box theory.

A second, bigger problem concerns the direction that our civilization is taking (of course this also concerns the first problem) and is born out of suspicion and the foundation of our civilization is physics. We are now living in a scientific civilization. It is out of suspicion and the foundation of our civilization is physics. We use a lot of electronic products for example TV, radio and computer etc. The foundations of these products are in physics and we cannot maintain our social life without them. M. Ende[3] warned us of the current trends of our time; if we live a long time in the materialistic world, the materialistic view will presently distance the human being from the essence of life because our existence is not only materialistic. In other words if our thoughts distance us from the world, we will soon lose our position in the world.

It is possible to put the argument in a different way: if we live too long in a world with no reality, we human beings will lose our own reality. We are now standing at this crisis because our physical theory has lost the Gestalt. We are dominated by a materialistic world, so we believe we are only material beings. But we human beings are not only materialistic beings: we have a spiritual aspect as well. Of course, I am not going to give an emotional argument. I hope to re-introduce ontology to our theory, —and into our world.

Unexpectedly, we are now standing at a very important turning point in civilization! So we must think about the foundation of our civilization. Some thinker said that Kant's philosophical base had lost its essential validity when Einstein

replaced Euclidean geometry with Riemannian geometry. However, Kant's way of thinking is still alive and effective, because all phenomena are described as events in space-time. We cannot give any expression of the phenomena without using some format of space-time. That is to say, if we change the format of space-time, we are able to see different aspects of the phenomena. The phenomena of the theory of relativity occurred in non-Euclidean space and time, and the normal interpretation of quantum theory is based on Hilbert space with linear time as a parameter. So if we try to think about the foundation of science, we must inevitably go back to the structure of space-time. All these mean that we need a new order for space-time structure.

2.Time Denial of McTaggart

Let us go back to the fundamental question about the role of time and ask the question "what is time?" We must keep in mind that all phenomena take place in space-time. Classical phenomena are described in Euclidean space and absolute time but relativistic phenomena are described in Riemannian geometry—non-Euclidean space, and quantum mechanical phenomena are described in Hilbert space.

If we think about time, we cannot ignore the famous argument of McTaggart[4]. He denied the reality of time, which was very radical. He thought of time as having two qualities, one is contained in the A-series and the other in the B-series (sometimes called A-time and B-time). The B-series consists of the relations "later than" and "earlier than". We can interpret this B-series as a horizontal time axis in the Cartesian order—that is a time parameter. The A-series consists of a series of positions which run from the distant past through the near past to the present, and then from the present through the near future to the distant future.[5] That is to say, he classified time by two qualities the A-series which consisted of the relations "past", "present" and "future" and the B-series which consisted of the relations "later than" and "earlier than" (see Figure-1).

McTaggart began his arguments stating:

> I believed that nothing exists (sic) can be temporal, and that therefore time is unreal.[6]

This seems highly paradoxical, because our judgments that time has no reality appear themselves to be temporal. But this temporal coordinate may be the ordinary Cartesian order.

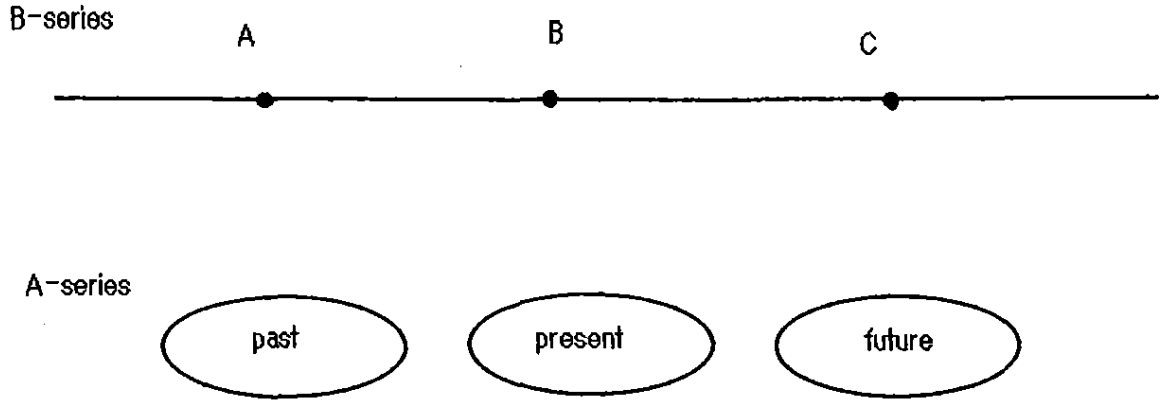

Figure-1: for example, point A is earlier than point B and C, and point C is later than point A and B (A, B and C represent an event at a particular time point).[7]

When we think about time, the most important aspect is 'change' because we recognise time through change. The sun rises and sets, then it becomes dark so we become aware that time has passed. According to McTaggart it is impossible to describe change by using only B-time because events in B-time are eternally fixed upon the time-line. For example, as McTaggart said, one particular event—the death of Queen Anne—was an event occurring at some moment. This event M is in the future when M has not yet happened. In this case, M is in the future of the B-time line, M then becomes the present as it happens and then M becomes part of the past. All the events are thus fixed in the B-time line. So if we try to describe the change using only B-time McTaggart claims that the event M must change to the event N. In other worlds the event M changes into another event

N or better still the event M would have ceased to be an event, and N would have become an event. But, for example, the death of Queen Anne will always be. It was an event and it will be an event even in future. That is to say, the event fixed upon the B-time line has no temporal meaning in itself. The fundamental misunderstanding is when we regard B-time as the real nature of time. The B-time, therefore, is not sufficient by itself to constitute time, since time involves 'change'.

How then do we construct or describe change? McTaggart argued that we need both A and B-time. That is as we move along A-time from left to right, B-time is fixed so that a point on the B-time line can be an event that can move from the far future to the future, and then into the present. This in turn moves into the past and finally into the far past. Alternatively we can slide along in B-time from right to left while A-time is fixed. We understand the change in this way. Or we can say we are *reading* the change in our mind because, strictly speaking, we do not have some objective reference of A-time—that is past, present and future. But, as McTaggart said, A-time is more fundamental than B-time.

However he concluded that A and B-time are not real. Let us simplify his arguments as follows. We have some event M, say M was present 50 years ago and we must represent it as "M is present" but "M is past". Furthermore, 60 years ago, we must represent it as "M is in the future". McTaggart thought that this was a paradox, saying;

> It is never true, the answer will run (sic), that M is present, past, and future. It is present, will be past, and has been future. Or it is past, and has been future and present, or again is future, and will be present and past. The characteristics are only incompatible when they are simultaneous, and there is no contradiction to this in the fact that each term has all of them successively.[8]

That is, if we make a further simplification, we can represent his

line of argument as;

'M = past, M = present, and M = future' are all true.[9]

Which of these equations are unreal, the right side or the left side? McTaggart thought the predicate past, present and future were unreal, because these predicates are exclusive to each other. It is impossible for them to be true simultaneously. So he concluded that A-time is unreal, therefore time has no reality.

3.Omori's Denial of an Event

Using the same line of argument as McTaggart, Omori[10] came to the opposite conclusion. He denied the reality of an event rather than deny the reality of time. That is, Omori denied the left side of the equation above that is M. We can imagine this M is a parameter. If we have two equations A=B and A=C then it is possible to conclude B=C. But if in the case $B \neq C$ we must conclude that A is false.

According to Omori's theory of time (rather we had better say the past theory of Omori), all events are interpreted as illusions—they have no reality. That is to say, McTaggart and Omori made different choices, namely that time is a reality or an event is a reality. If we took the reality of time, then we must abandon the reality of an event but if we took the reality of an event we must abandon the reality of time.

However, we must argue that these two conclusions cannot be true even though their philosophical proof seems obvious. This is because we know and believe in the simultaneous reality of time and events in our ordinarily life. Or do we have to accept the consequence based on the validity of the philosophical proof? Despite common sense we never think that events that have past are an illusion and that time is an illusion. These kinds of questions have been discussed in the past. For example, Augustine said that "I know what time is if nobody asks me, but if somebody asks me what it is, then I must admit that I know

nothing about it". That is to say, time was a serious problem for early philosophers. However, we still cannot find satisfactory answers to his question. It is true that Augustine could not explain what time is, but on the other hand, he claimed that he knew what time is in the same statement. Then, what does he know about time? What he knows is that time is real! If we lose the reality of time, it can safely be said that we will quickly suffer from some kind of mental disorder—for example, the simplest and best example is called 'depersonalization'[1]. If we lose the reality of an event, —especially an event in the past, we lose the notion of history. So we will lose the identity of our own personality, because we retain our identity though memory—which in itself, is history. Our identity (personal and social) is guaranteed by our history, which is formed by events. We also need a consistent history in order to retain a social order. This means that we must hold on to our common past. We cannot live together if each person has a disconnected memory about the past. We had World War I and II, we had the tragedy of 9.11 in 2001 and we had the tragedy of Hiroshima and Nagasaki, etc (Of course we also have good memories). But let us consider a hypothetical situation in which a friend believes that we did not have World War II and he or she believes that these 'past events' are just a story which modern people created, for example, in order to make a war film. Then he or she believes a different story, because history is a 'story' about the past. The history is created by each person and by each culture and such stories will change when formed in different eras. Consider ourselves living in the future. Will our stories about the past form a common historical account? History is changing at all times, so I claim

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[1] It is said that many of these symptoms involve a feeling of a change in its appearance related to space and time. For example, people who suffer from the depersonalization cannot feel the flow of the time or a patient complains that time becoming like a digital clock. There is a report of a person who complains of space losing a dimension. In all cases of this disorder a person has some abnormal feeling about time and space, but the reason is obvious because space and time are not independent of each other, so if we feel abnormal about time, we will feel abnormal about space simultaneously.

that history exists at present.

Of course I believe we experienced, for example, World War II (because I have a common sense about the past that is widely recognized). But this is one of the 'stories'—we create the story as a history *later than* the past events, so philosophically we have no way to prove that these events really did happen. Omori takes an example about a dream. He emphasized that "a dream is dreamed after we wake up, we are not dreaming while sleeping". So we have to say that evidence of the existence of World War II for example an atomic bomb dropped on Hiroshima is existence "at present", it does not exist in the past, it exists in the present. We cannot reach *the past-in-itself* with the same meaning of Kant's the thing-in-itself (das Ding an sich).

That is to say, we have some deep process or order within us that keeps our identity (and also our social identity). Without these processes, we have to admit the alternative consequence about reality. We may assume that we have a very important internal 'core' in ourselves—I imagine this 'core' is a process similar to that mentioned by Bohm. This is not only mental but must have a material aspect as well. We have to say that our mind (this is a mental process) is one aspect of the reflected shadow of the material process but also the mind reflects upon the material process. For the sake of brevity I will give a name to this process, namely, a "whole process" because the reality about the world will be generated from our mind and this is both a material and a mental process. I will mention in section 5 and 6 how this idea is related to an old Japanese philosophy. It will then become clear that this idea is very similar to Bohm's idea of process.

The strange point in the McTaggart and Omori argument is that, if we follow their argument, we fall into the alternatives of time or event. But we do not lose the reality of existence in their argument. For example, the moon exists over the sky, and a London bridge exists over the River Thames. However we will lose this reality, the moon and a London bridge, if we expand

McTaggart's argument to space. We will see this in the next section.

4.Space and Event Denial —A- and B- place

In this section, I will try to apply the argument of the McTaggart A- and B- series of time to *space*. This has already been attempted by Mellor[11]. That is, I will extend McTaggart and Omori arguments to event and space.

McTaggart B-series contains the relationships "later than" and "earlier than". We can say this type of time is linear time as Omori calls it. Therefore, the B-time can be regarded as a time parameter (as one of the dimensions of 4-dimentional space-time) that we use in the ordinary Cartesian order. We cannot find "now" or "present" and "past" or "future" in the B-time. In other words, it means that every point can become "present", "past" and "future". So we must conclude that the B-time as a parameter. In this B-time, all we have to do is to designate one particular point as point representing "now", then left (or right) of that point is interpreted as "earlier than" ie 'past' and right (or left) of that point is interpreted as "later than" i.e. 'future'. (But this 'past', 'present' and 'future' are not concerned with A-time because I use these terms to mean that we are reading 'past', ' present' and 'future' in the B-time as a linear parameter).

We defined B-space using an analogy of latitude and longitude. In order to make this simple, let us consider one-dimensional space (Figure-2). If we designate one particular point 'B', for example, as 'here' we can interpret point A as to the left of here and C as to the right of here.[II] Then, it will be possible to say as McTaggart concluded that "nothing exists can be *spatial*, and

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[II] This connection clearly sounds like commonsense, but this spatial sense has its foundation in the human left and right. All spatial order has a mythical origin as Cassirer claimed. That is to say, we understand space by means of our original physical sense. In ancient time it was believed that we human being were a microcosmic.

that therefore space is unreal". On the other hand Omori concluded that to make an induction, event is unreal.

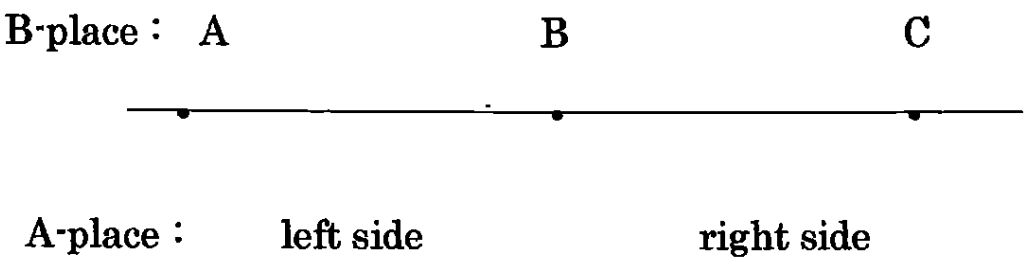

Figure-2:One-dimensional A and B-place

Latitude and longitude represent the distance so Mellor argued that the so-called B-place is summarized as latitude and longitude. The latitude of Cambridge is 52° north, and of course this B-place is fixed. On the other hand A-place is defined in terms of north, west, east, south, up and down. Left and right are just for a one dimensional model (see Figure-2). These terms are not fixed because we can say Cambridge is north of London but also it is possible to say that Cambridge is south of Edinburgh. Then we recognize that we must use A and B-place simultaneously in order to express the event in space—for example, here in Cambridge, London is sixty miles (B-place) south of here (A-place), but that is not London's A-place everywhere,[1 2] because A-place is not fixed.

Let us simplify Mellor's arguments, by considering a one-dimensional space that is specified by two predicates here and there. For example let us think of London and Kyoto[III].

[III] Now we are thinking about only space. Take Kyoto and London as 'timeless events' so not ordinary events because events are in time. And of course these are the names of places so this argument seems rather confused. It is better to express it as just existence but it is clear that this is only a problem of the usage of words. If you think it uncomfortable let us imagine some physical event takes place in these cities, for example, 'Ryo Morikawa' is smoking in some area. This is an event. It is fixed upon the B-place and happened on the some area with some name. We cannot separate events of smoking and city. So it is possible to substitute smoking for name of city.

London and Kyoto are fixed in latitude and longitude and it is believed that they never change their place, on the other hand, the predicates of here and there are not fixed because if I stay in London, Kyoto is over there and London is here, but when I stay in Kyoto, London is over there and Kyoto is here, so both may be regarded it as A-place. Then, if I am in London, of course it is possible to say that "Kyoto is *over there*". But when I am in Kyoto, then I must say that "Kyoto is here". That is to say:

Kyoto = here and Kyoto = over there are both of true.

As long as we believe McTaggart's argument we must conclude that the indicated predicates such as here and there are illusions. That is to say, A-place is illusion. Because McTaggart's argument could be considered as a contradiction, some event E was present 50 years ago but now the same event E is past. E was in the future of 100 years ago, that is to say one particular event is related to three different indicated predicates, which is the paradox. E is Kyoto in this case. Then, this means that these spaces indicated by such predicates are illusions. That is, space is an illusion! This represents the paradox as well as the time denial of McTaggart, but the converse line of argument implies that we must conclude that Kyoto and London, which are believed to be *real existence*, are illusions according to the argument of Omori. If we believe in the reality of space we must have doubts about the notion of an event that is taking place in this space. Then we again fall into alternatives, reality of space or event (existence). We have the reality of space that we are looking at now, because this is a place where we exist at present—this is 'here'. But how does it come to the reality of space that we are not in? In other words, how do we grasp the reality of space that we are not looking at.

We cannot doubt the reality we are looking at—to say the least, I cannot doubt it. But the main point of these arguments is that the reality of the things we are not looking at is in doubt. Why do I believe in the reality and existence of Kyoto when I am

in London? In the strict sense of the word, I have no reason. To say the least, I can say that it is commonsense to do what we do.

But we see that our commonsense breaks down if we follow the arguments of McTaggart and Omori. But they unconsciously assumed the Cartesian order and Mellor's B-place is also a Cartesian space order. So is it possible to say that there is a limit to this way of thinking?

5.Limit of the Cartesian Order

We must say that the above argument is similar to typical paradox of quantum mechanics. I spend most of my time in London but I know Kyoto exists in Japan. Even when I live in Kyoto, my reality about London will never break down and London will never lose its own reality, because Kyoto and London (or even other places that I do not see, for example, Moscow, New York or Beijing etc) exist in themselves. However according to the standard interpretation of quantum theory, that is the Copenhagen interpretation, it is impossible to hold the reality of existence that we are not mesuring. It follows that we cannot refer to Kyoto as a ontological existence because I am not looking at (observing) Kyoto (I am not in Kyoto). It does not have a reality and existence when I am not observing it. Standard interpretation of quantum mechanics claims that an object only has a probability of existing while we are not observing it. Human observation restores the probabilistic (stochastic) situation of existence to its normal eigen-state[13] (this means time has stopped with this observation).

At this moment I do not see the "moon" (I am looking at the picture on my computer and incidentally it is night time at present) but my commonsense tells me (of course I have this kind of common sense!), that the moon exists above the clouds (or I had better say that the moon exists *over there from here;* A-place). But the quantum theory tells us that we can say nothing about objective existence until a measurement has taken place. This means I can say nothing about the existence of moon

when I do not see (observe) it. Then we have to deny the reality of spatial existence. More generally we have to deny all existence if we strictly follow quantum theory except when an observation is taking place. We can only talk about probability. We cannot admit the ontological existence in such a probabilistic world. If the world is really probabilistic, then the world has no ontology. Or do we deny the reality of space and time, as we discussed in the arguments above? The standard interpretation of quantum theory tells us that the world does not have an ontology—Gestalt.

It should be stressed that in the above we are using the Cartesian order or Cartesian-'like' order (a curved surface is not Cartesian order) from beginning to end. McTaggart's B-time can be thought of as the horizontal time axis we customarily use. The B-space is also the Cartesian space that we customarily use in our daily life. For example, let us think simply of the map that uses latitude and longitude. This is a typical Cartesian order that we use in our daily life. We must conclude that it is just a descriptive coordinate system but not a real space. We cannot find reality in a descriptive coordinate system. However if we think about these things seriously, these conclusions are natural, because our spatiotemporal reality is not in the coordinate system itself but of course we have the spatiotemporal reality in our mind. Reality can arise and be created in the human mind. But this does not mean that we create the internal world by copying the external world. The external and internal worlds are generated simultaneously. In this sense, it is not possible to divide the external world and internal world sufficiently. The Cartesian order has obvious limitations in describing reality. The artificial coordinate system is a convenient way to describe spatiotemporal events and we must conclude that the arguments about the Cartesian order are basically that it is an invalid way to describe reality.

We are living the whole process. The Cartesian order is convenient to describe "mechanical" movement, but the world is not only mechanical, it has also organic process. And ordinary mechanics cannot describe real movement. It is a contradiction in

terms because if we describe movement by mechanics (that is the present theory and customary way of physics), the movement is frozen at any particular moment. Reality exists in an organic world, because we are organic human beings 'reading' reality with our minds. If we look at an event from the mechanical point of view it becomes a contradiction because events are generated from an organic 'whole' process. It is possible to say that an event is generated from the whole process and disappears into the whole process. Change can arise as an event ceases to be an event and goes back into this whole process. The Cartesian order is only describing the surface. But if we look at the whole process then we can find a deeper order of existence.

I think it is possible to name this ontology Seisei-Ruten[IV] ontology It has been written about in many old Japanese books[14] and it is even sometimes used in modern Japanese literature. In this view everything is generated from what I call the "whole process" (Seisei) and is subject to continuous change (Ruten). Or better still, that "all things are impermanent and constantly changing". In fact Seisei-Ruten means constant change. But, then how do we create new ontology if all things are impermanent and constantly changing?

6.Seisei-Ruten and Shiki-Soku-Ze-Ku Ontology—Whole process

That which is born will also die,

That which has met will also part,

What has been taken will be lost,

What has been made will break.

Time flies past like an arrow,

[IV] It is written 生々流転(Seisei-Ruten) in Japanese.

All is evanescence,

Is there, in this world,

Anything not transient?

[Dogen Zenji]

Quantum theory forces us to think about the ontology of the world. Since it suggests that we might be only looking at the surface of the world, Bohm calls this the "explicate" order. Western thinkers tend to regard these explicate orders as descriptions of the whole of the world. But "that which is born will also die" means "that which is generated will also disappear", that is, it is generated from the whole process and then disappears back into the whole process. We can interpret the whole process as the implicate order introduced by Bohm.

Hannya-Shinkyo is an old Japanese sutra expressed as the "Shiki-Soku-Ze-Ku [v] ontology". This means that everything disappears into the vacuum (Ku) almost as soon as it appears in the world. So it is impossible to maintain that the world is unchanging. The world presents a Gestalt to us that is ever-changing from moment to moment, from second to second. There are no things in permanent existence. We are looking at a completely different view of existence. For example my desk is different from that I used yesterday, because it is changing every moment. So we cannot find persisting existence. It sounds as if the ontological world has broken down because we cannot see an unchanging existence. All we have is an epistemology. We cannot see the Ku from which everything is generated and into which everything disappears. We are only looking at Shiki, which means the color—Shiki that is generated from the Ku. The surface is changing eternally. It means the color is changing from

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[v] It is written 色即是空 in Japanese.

moment to moment, from second to second, because the color is the surface and that is the explicate order. Epistemology tells us how to obtain and construct knowledge, but it says nothing about the ontological existence of the world itself. We have to admit that we cannot see the most important essence of the world but we must argue that the epistemology has been generated from the some kind of ontology. Then, we have two different levels of the existence, one is the existence of epistemology and the other is the ontology.

Epistemology is related to the level that we are looking at because we basically acquire the knowledge by our five senses. Ontology is related to the level that the epistemology has generated. That is, these levels correspond to a relationship between implicate order and explicate order (explicate order is like epistemology, implicate order is like ontology). We only infer the implicate order from the explicated order because it is not directly visible. Bohm suggested that the implicate order is more fundamental than the explicate order. Then, the implicate order is the process. All existence has been explicated from this whole process of implicate order. Bohm thought that the essence of the notion of process was captured by the sentence "Not only is everything changing, but all is flux[15]". Bohm also wrote,

> That is to say, *what is* the process of becoming in itself, while all objects, events, entities, conditions, structures, etc., are forms that can be abstracted from this process.[16]

Bohm's ideas about existence are very similar to Dogen Zenji's ontology, Seisei-Ruten and Shiki-Soku-Ze-Ku ontology. This ontology, which calls for a new way of describing existence, has been pioneered by Bohm and Hiley (mostly these days developments are carried out by Hiley)[17]. The Cartesian order describes only the explicate order. It does not describe the implicate order which is more fundamental to existence. Bohm's ontology calls for a drastic paradigm change. It suggests the

demotion of the Cartesian order to second place.

Bohm's ideas generated not merely a metaphysical 'armchair' theory but they comprise a new theory providing a novel interpretation of quantum mechanics. One interesting feature at the heart of this theory is the quantum potential $Q=-\frac{\hbar^2}{2m}\frac{\nabla^2 R}{R}$ [VI]. This quantum potential describes information but this information is different from Shannon's information. The quantum potential describes an active process, not a static process. That is to say, the quantum potential is an information potential. Here we note that the word in-form literally means to form within[18]. Information acts on the material and makes a form. To simplify we note that the Japanese and Chinese meaning of information is literally some 'hidden action of mind'. We therefore can guess there is some process, which I call 'whole process', in our psychic level. We need a new order of space and time to describe this unknown level.

7.Cultural Background of McTaggart and Omori Time Theory

In this section, let us go back to the arguments of McTaggart and Omori again. McTaggart denied the reality of time and Omori denied the reality of the event. If we look at their arguments we can see significant differences between the western and eastern cultural backgrounds. Omori presents the new concept as a Gen-Sei time[19][VII] meaning "origin of the reality of time" and it contains the idea that time, events and

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[VI] This form is due to D. Bohm at 1952. All we need to do is to write the wave function in the form $\Psi(\mathbf{r},t)=R(\mathbf{r},t)\exp[iS(\mathbf{r},t)/\hbar]$, and substitute it into the Schrödinger equation. Then we separate this equation into real and imaginary part we get two equation, $\frac{\partial S}{\partial t}+\frac{(\nabla S)^2}{2m}+V-\frac{\hbar^2}{2m}\frac{\nabla^2 R}{R}=0$ and $\frac{\partial P}{\partial t}+\nabla\cdot(P\frac{\nabla S}{m})=0$.

[VII] Gen means "the source" and Sei has a meaning "life" in English. Also it is written 原生 in Japanese.

existences are all generated from this origin. This is a very delicate argument. Existence exists at present and Omori denied the reality of the event. But he claimed that reality is generated from the origin of time, he called Gen-Sei time. This tends to fall into serious misunderstanding, because it seems to be a contradiction. However he claims there is a primitive time in existence. This means we cannot separate existence and time. Existence has reality (or we had better say, we feel reality in existence for example; a desk, a pen, a TV, a book and a person etc.) and reality contains the process from past and perhaps to future. We can interpret his Gen-Sei time—the origin of time, as a process from past to present, from present to future. So I named this process the 'whole process'.

Eastern thinkers tend to regard events (past, present or future) as illusions. This idea has a very long history, for example Dogen Zenji [VIII] said 'Yu-Ji' in Sho-Ho-Gan-Sho[20] (his voluminous work). Yu-Ji means that there is time in existence. Omori believed in the reality of time in the same way. He considered that time is much more important than the existence of events because all things are generated from the whole process, that is, events and things are of secondary importance. He could not believe in the reality of past events but he never doubted the reality of time, —Gen-Sei time. He emphasized that 'time' (Gen-Sei time) is condensed in existence. Or all the existences have 'original time' (Gen-Sei time) originally. His idea was very similar to that of Bohm's process, because Omori said the reality of existence is generated from Gen-Sei time. But there is no immortal thing. All existence goes back to the *flow of time*[21]. Flow of the time is a 'process'. We cannot find the 'flow' of time. It is a metaphor. A river is in existence at present but the water of the river is changing in every moment. The bubbles floating on stagnant water stop for a moment then fade away. Events are generated onto the surface which is the explicate order and

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[VIII] Dogen Zenji (道元禅師) is a Japanese ancient Buddhist priest and philosopher. And we write 有時 in Japanese.

disappear into the invisible implicate order. We can say this creation and annihilation is Bohm's idea of process. He wrote:

> However, it has been found that even the 'elementary particles' can be created, annihilated and transformed, and this indicates that not even these can be ultimate substances but, rather, they too are relatively constant forms, abstracted from some deeper level of movement.[22]

I am calling this deeper level a 'whole process'. Creation, annihilation and transformation are processes of existence. These must be regarded as an abstraction from an unknown and indefinable totality—that is the implicate order. Then the idea of 'all is flux' or as Heraclitus claimed that 'everything flows' has similarity with eastern culture. This flow and flux are aware that of a feeling of ephemeral or fleeting in eastern culture. All things are fleeting.

We cannot deny that it was the cultural background that led McTaggart to keep the reality of an event and led Omori to keep the reality of time, when looking at their arguments in detail. And I think it is fair to say that Bohm's idea is very similar to the ideas in eastern culture. Bohm tried to describe the reality and ontology of the world from the deepest level, that is the 'implicate order'. In this way he has departed from the Cartesian order. This calls for a new order for space-time that differs from the one that exists in the Cartesian order, but as yet we do not know the nature of this structure.

In the science community, the western way of thinking is dominant. This deep tradition is one of the reasons why Bohm is regarded as dealing in mysticism. People are apt to avoid an unfamiliar world-view. People are apt to think that this approach is mysticism but it is ultimately not possible to understand the whole world picture if we retain the old way of thinking. Quantum theory suggests to us that there is a deeper stratum of existence that is the implicate order. We have to conclude that

the directly visible is only 'one' aspect of the world.

8.Conclusion

The Bohm interpretation of quantum mechanics and the work that his group is involved in is suggesting a fundamental change of paradigm, from mechanical world to organic world. Our world is not static but dynamic! And we must argue that quantum theory tells us we cannot hold the classical world picture, –mechanical world picture anymore. The world is not like a clock, which the Newtonian world picture suggests. Copenhagen interpretation of the quantum theory shows that it is impossible to describe the ontological world if we stay within the Cartesian order that we habitually use. The Cartesian order is convenient to describe the level of events but it is not possible to describe the deep level that generates the event.

Using the Cartesian order is limited when we come to grapple with the difficulties of describing the ontology of the world, both scientifically and philosophically. So, as I said at the beginning we have lost the world because we have lost the Gestalt of the world. We have to admit that there is a gap between our realistic world (that which we have in common) and theory that is expressed through the Cartesian order. So we must search for a new way of thinking that makes it possible to fill this gap, a gap that is due to a lack of ontological consistency.

We create the reality by our internal process that is commonly referred to as 'mind'. Reality is not in the external world but in our minds. We are only looking at the surface of the world. But our world is organic and it has intention—similar to Aristotle's formative cause[2 3]. This is not the only way of describing the event, but modern science forgets to see the organic world. We live in the organic world and the world of movement, but it is impossible to describe this movement.

Bohm's interpretation of quantum theory shows us the possibilities, that the concept of process and the older eastern way of thinking will open up a new way of describing and

understanding ontological existence. But we are still not able to see the complete form of this new way of approach. Now we are in the process of the creating this new approach. But I am convinced that the change has occurred.

We are living in a 4-dimensional world. The Cartesian order is convenient to describe events that happen in our 4-dimentional world. But I believe the real meaning of quantum theory tells us that there is a much deeper layer. We must think about this deep order so that it will give us a better understanding of nature and of human beings.

Furthermore, I would like to propose the idea of 'Gen-Sei Space-Time'. Omori and many eastern thinkers claimed that it is an origin of everything. It will suggest the new way of thinking about existence. Bohm's idea of process and implicate order will extended and will be more plentiful by this idea.

9.Remaining Problem

In this article, I wrote about Cartesian order even though the standard quantum theory is written in Hilbert space. Hilbert space is not real space but a mathematical space. However the problem remains—what is the relationship between our world, the Cartesian order and Hilbert space.

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TIME

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This talk, intended as a twenty-minute introduction to a discussion, would have been very different if I had read Ryo Morikawa's scholarly piece before I prepared it. So I will content myself with a very short description of what I said. Why is there a problem of time? For ANPA participants, in particular, it comes via quantum mechanics. Tony Deakin alerted us to it many years ago;- one needs a variable called t to express Schrödinger's equation with a $\partial/\partial t$ in it, yet there is no suitable operator to represent it in Hilbert space. But this is only the obverse of the corresponding problem which in everyday life we call that of personal identity and which there is answered by saying that X is the same person as he was 24 hours ago because of spatio-temporal continuity. For this answer is not possible in quantum mechanics where we cannot say that the particle which was at A and is now at B is the same particle unless we construct an experiment to see where it was at an intermediate time, and this alters the whole experimental set-up.

Now philosophers have thought about time on many occasions. There are two particular points of view which I should mention because they are important but which I do not want to follow. The first is Kant's. For him time is simply the mode of interior perception, which (like the mode of exterior perception, that is, space) has to be given before perception is possible. This conclusion is one I would accept, but would say, where does it get us? Secondly, there is the very acute analysis of McTaggart which leads him to the conclusion that time is unreal because temporal discourse is inevitably inconsistent. It is hard to fault McTaggart's logic but one is left with the feeling that we still need some concept which we can call time.

My decision to raise this matter at this meeting comes from some discussion I have had with Viv Pope. When I sent him a review I had written, he rejoined "Time is just what clocks measure". My reply to this, which was not the one I should have made, was "What is a clock; don't you have to reply that it is something that measures time?" Viv answered this by insisting that any atom is a clock and I see his point here and would accept this, if with a slight condition. But the answer I should have made to Viv was surely "Do you know that they measure anything?" Later in our discussion we came to a measure of agreement by seeing time in terms of events and that is an approach which I want to return to at the end.

Another sidetrack which I don't want to follow is special relativity. It is true that Einstein played an important role in opening people's eyes to the fact that they had to change their concept of time, when up to that point they did not know they had such a concept. But the problem in special relativity is, in Bridgman's phrase, spreading time through space. The central problem of time remains at the origin of the first coordinate-system, as it were, where Einstein, in a Viv-like move, talks about the "minute hand of my watch".

What I really want to argue is that the concept of time is an emergent one. I put this to Viv and his objection was that for something to emerge is a temporal process, so that my argument was circular. My reply to him is that the problem is partly one of language, which has been formed by people who take time for granted. But rather than trying to construe emergence in a non-temporal way - though I think that is possible - I want to show how an emergent theory is possible by exhibiting a grossly over-simplified version of one that has been put forward recently. I don't accept this theory, as it happens, even in its non-simplified form, though I admire it. It is the theory of Julian Barbour. I apologise to him in advance for the travesty that my simplification produces.

I begin with a set of points; I would like to have said of particles, but the notion of particle has a number of overtones, some of which may assume temporal concepts, so I stick with points. Barbour prefers to describe the set of points by means of their mutual distances, so if there are N points, the description consists of $\frac{1}{2}N(N-1)$ numbers. For simplicity, I shall take $N = 3$ (though in real cases it will be very large), and then there are also 3 mutual distances. Take such a set of 3 distances. One can plot them relative to a standard three-dimensional cartesian coordinate system. Of course, this is just a graphical representation; nothing is implied about space. Now suppose another set of mutual distances. One cannot immediately plot this set in the same 3D graph, because you don't know which distances in the second set correspond to which in the first.So what you have to do is to plot, not one point but six, corresponding to all the permutations. Then for a third set of distances, another six points. What will happen is that after a sufficient number of such plots, some of the points will cohere in a curve through the first one. That tells you which permutations you should take each time and it also gives an ordering of the sets. This ordering along the curve is a time ordering (though at this stage the arrow of time has not emerged). It is easy to give a rule which would assign numbers to the various sets and this set of numbers constitutes the emergence of a time-variable. Naturally, in order to get the sort of time variable useful in physics, one must put in Newton's laws. It is only the first step in which I am interested here.

Barbour's original theory is immensely more complicated and subtle; but my object is only to show that emergence is possible. I want in future to explore this idea in the context of the CH. When new entities come into play, they are either incorporated in the same level, or the process goes up a level to accomodate them. The first is the essence of a time step and the second is a spatial one. But this needs developing (and shows that an analysis of time must bring in space too).

Chi Generators Exist

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Abstract

In the Eastern part of the world, chi (also Ki or prana) is described as the life force that underlies living systems. Most western scientists do not believe that chi exists at all because no machine has been built to measure its physical reality. This talk describes my experience of working with an immigrated (to USA) Russian physicist, Dr. Yury Kronn, that claims to have built a chi generator using modulated light. This claim is paradoxical because Eastern scientists who believe in chi would declare that it is impossible to generate except from living system. Western scientists would continue to deny such a machine is possible because no objective measurement proof for chi exists.

In an effort of due diligence regarding a potential business opportunity with this inventor, we started talking with people who claimed to be sensitive and trained in chi lore, awareness and abilities. This task was facilitated by fact that the inventor had also created a way to imprint the chi patterns on conventional magnetic audiotape. In addition, Dr Kronn later worked with an immigrated Chinese-trained chi master who confirmed that indeed this technology generated "Master Chi" since it was very pure and contained very little noise. This talk discusses this investigation, the results of the research, and presents a double blind experiment using the chi tapes, plus direct experience of playing the tapes. So even though chi detector machines do not exist (except humans apparently), chi generators certainly do exist.

1. Introduction to Chi and Chi Generators

This chapter discusses Chi from both the historical and modern perspective.

1.1 What is Chi?

The knowledge of Chi primarily comes from the ancient eastern traditions. This understanding was developed thousands of years ago so our modern technological infrastructure was *not* in place. This knowledge of chi forms the backbone of their ancient science and is strongly self-consistent. This understanding was applied to everything from their medicine, military, religious beliefs, and philosophy in general. Just because this understanding has not been thoroughly integrated into our modern science does not mean this ancient knowledge was fictitious or even wishful thinking. In fact, the relationship between Chi and modern science is becoming stronger all the time with our deepening understanding of complementary medicine and quantum information theory. Here is a simple list of properties that form my descriptive summary of this alternate paradigm.

- Chi is the life force (from all living things)
- Chi is ubiquitous (everywhere in nature especially in air)
- Chi is like flowing water (not a lake or battery)
- Chi is free (no reason to stock pile or hoard)
- Chi is not measurable (not classically physical)
- Chi is connective (non-local in space and time)
- Chi is awareness and informative (not massive or energetic)

This list does not appear like the foundation of a science but rather a religion. Part of the mystery is to understand this *very* alternate paradigm from the context of the modern western scientific perspective. This list is presented in this way to help form a bridge between these two camps of thought. Remember, acupuncture has been practiced for thousands of years but was only first demonstrated for anesthesia during surgery to the western medical community in the early 70's. The primary mechanism behind acupuncture is still not understood from a western medical model since it depends on the theory of chi flowing in meridians in the body.

The synopsis of the above traits is that some "essence" was discovered long ago by direct human awareness and intent that has an affect on a variety of systems, but is *not real* from our modern "measurement" criteria for existence. These properties have many of the descriptive properties of quantum systems, thereby constituting an information/energy duality and paradox.

1.2 Chi Generators and Chi Tapes

In the late 1980s a Russian physicist named Dr. Yury Khronos (or Kronn since he shortened his name from his longer Russian last name) emigrated to the USA and built a computer controlled modulated light source he claimed generated Chi patterns. Here is the short description of the properties of the system. His insight was that chi was very subtle so he used the subtlest form of matter he knew, ions, which he modulated in a florescent mini-light bulb (see Figure 1).

- Computer controlled modulated light source
- Modulated ions using noble gases in miniature cylindrical florescent tubes
- Audio band frequency generator – primitive frequency/shapes
- Methodology of human subjects for validating pattern effects
- Hundreds of chi patterns or "programs" possible

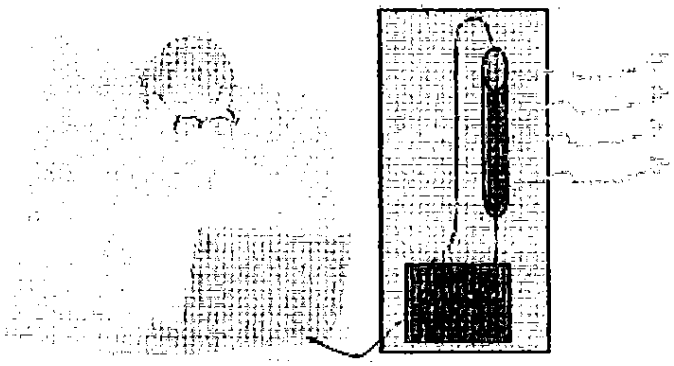

Figure 1. Schematic of Programmable Chi Generator Machine

Over several years, Yury developed a variety of patterns or programs that would produce different sensations. His "objective" feedback of the patterns used the subjective experience of trusted and talented "sensitives" under a blind-testing methodology. This idea of using blind subjective experience as the basis of objective data is important in other sensation based subjective areas such as music, art, perfumes and wine tasting. Of course Yury developed his own sensitivity to his chi patterns by practicing meditation and changing his diet. Both had the affect of quieting his mind so he became more aware.

Delivering the generated patterns to volunteers was greatly facilitated when Yury discovered how to capture the patterns onto magnetic tape. Figure 2 shows this process for making master Chi pattern tapes, which could then be used to create tape copies. Even though Chi is not identical to an electromagnetic (EM) pattern, Chi can apparently use EM as a carrier the same way that radios use EM modulation to send audio patterns. Both the audio band modulation of light and EM signal using audio sound system allowed the patterns to be experienced.

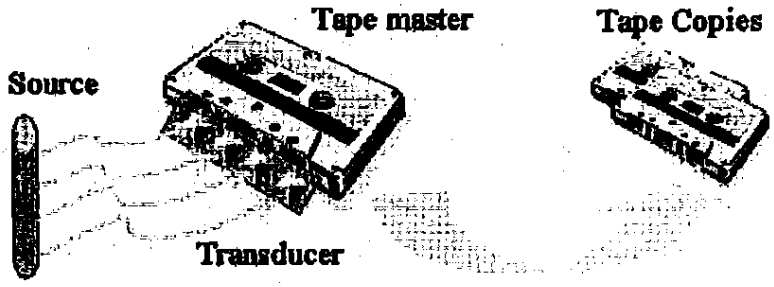

Figure 2. Creation of tape master from Chi generator

Figure 3 shows how playing the Chi tapes in a conventional audio system would also generate the Chi patterns. Based on this technology and methodology, Yury developed and sold sixteen self-help tapes that he marketed under the name of "Vital Energy" tapes. These tapes had only chi on one side and on the other side chi plus new age style music that was choreographed with the chi. The exact pattern frequencies and tape master transducer/production process were kept proprietary by Yury, since they were developed before we started our joint business arrangements. Everything described in this paper is public domain since, he would present the same details in his public seminars on this subject (around the mid 1990s).

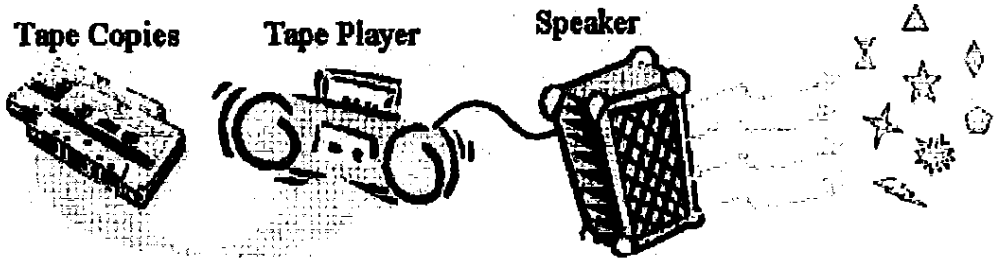

Figure 3. Tape copies perform like Chi generator

A very interesting observation about the Chi tapes is the Chi pattern is *not in the sound*, because the paper cones of the speaker could be removed with the same results. The audio pattern on the tapes sounds like white noise or tape hiss, with no discernable pattern. Digital sampling (as on a CD) distorts the chi pattern. Visually oriented sensitive people who experienced the tapes describe geometric patterns emerging from the speakers.

1.3 My Experiences with Chi Tapes

During the due-diligence phase of our effort, we sought people who were sensitive to chi. One obvious place was the organization founded by Elmer Green called ISSSEEM (International Society for the Study of Subtle energy and Energy Medicine). They hold an annual summer convention in Boulder Colorado, so I attended. We also found local healers in the Dallas area. Here are some of the results when playing the tapes with just a small hand-held tape player.

A tape was played for a man in Boulder who was very sensitive to chi. As soon as the play button was pushed he gasped and grabbed his chest in the heart area, so I immediately stopped the taped. He said it was very intense, but it would help if I did not aim the speaker directly at him. So I redirected the tape player tangentially and started it again. He proceeded to describe the geometric patterns emitting from the speaker. At another time, we went to a health fair and played the tapes continuously for hours. We felt totally out of sorts and disoriented for days afterwards. Therefore, we cautioned our customers against long term playing of tapes (using auto-repeat tape player and then falling asleep). This same caution should be applied in long-term exposure of chi tapes when researching new patterns.

A topic related to dosage is how the pattern is presented. For instance, the tape can be played over the phone (one lady screamed in my ear on one occasion), or broadcast on radio/TV with similar results (a woman called the radio station sobbing during an interview with Yury) but the chi is degraded due to resampling effects. Another key result is that the tape does not even have to be played to have an effect, illustrated by an interaction with an electromagnetically sensitive patient in Dallas (he passes out when driving under power lines). When a chi tape was passed toward him he would slump over in his chair and then recover when it was moved away. For these reasons we warned customers against plying any chi tapes in an automobile. These results show how varied the responses can be for the same "low" chi dosage level.

The effect of chi tape patterns without playing them is correlated with several other first hand accounts of my own. At a complementary medicine conference we made the conscious choice to always carry tapes with us when walking around. At a coffee break a gentleman approached and started a conversation. After exchanging our who, where and why the subject of the chi tapes emerged and we pulled a tape from our pocket. He clutched the tape and exclaimed that was why we were emitting such an unusually strong aura, which had prompted him to talk with us in the first place. We looked like a "blue-light" special that only certain people could see. We collectively have dozens of such stories where people initiated contact due to tapes playing (or being present), some being drawn unconsciously to the tape situation. Finally, at the ISSSEEM conference where a western MD (who is also highly trained in Eastern medicine techniques) was handed a tape, he instantly described which meridians that tape influenced.

My own sensitivity to chi began to improve during this period. This showed up in increased awareness to emotions and unpleasant sensitivity to strongly emotional situations. As a result, I virtually stopped watching broadcast football games because of these unpleasant feelings. I also started having euphoric experiences during performances with an international champion chorus I sing with in Dallas. Awareness of both chi and emotions are linked somehow. It is also well understood in the psychological community that memories are stored based on one's emotional state thereby tying chi patterns to the information structure underlying memories and awareness.

2. Scientific Background for Chi

Therefore, as scientists we should suspend any disbelief we may have about chi long enough to understand the history and key concepts. In fact, these ancient, time-tested discoveries constitute their science, being based on awareness, observation, structured thinking, intent, discipline and repeatability. This methodology is directed inward rather than to the external world, as does modern science. Neither emphasis need invalidate the results of the other, so it is possible for east to meet west. The most direct way to bridge the gap is to describe chi as the *science of form*. My personal belief is this science of form must intersect with information theory, quantum theory, and any science of consciousness. The Quantum Mind conferences held in Tucson, Arizona attract researchers who are most likely interested in this intersection.

2.1 Science and Subjective experience

The topic of subjective experience is important to the methodology of science because subjective experience is a valid way to collect data. Willis Harmon of the Institute of Noetic Sciences (IONS) lectured on the importance of this subject area for years before his death. Essentially the Eastern meditative traditions have developed techniques and the individual discipline to directly tap into the "knowing" that formed the backbone of their "scien*chi*fic" traditions. These techniques could be structured, taught and learned, as evidenced by the long history of apprenticeship that sustains and renews virtually all eastern traditions. Chi is the backbone of their tradition just as quantum mechanics is emerging as the backbone of our western worldview.

You might ask; why does consciousness need to be involved with chi and quantum mechanics? The first reason is that many people are apparently aware of the "invisible" patterns produced by the quantum ion chi generators. The other reason occurs when highly trained apprentices develop such chi abilities they are called "Chi Masters". Chi Masters have developed such disciplined awareness of chi patterns, they are analogous to highly trained musicians that can listen to any music and instantly know the chords, melodies and keys. The most interesting talent of senior chi masters is that they can also produce/mimic any chi pattern using their own chi and disciplined intent. Using the music analogy again, this is equivalent to a musician's listening to a piece of music and then instantly playing back the whole piece note-for-note and chord-for-chord. Not all musicians are so adept and many people do not even know such a person, but tens of thousands exist (i.e. composers, conductors, etc) and the same can be said for Chi Masters using chi.

Programmable chi generators in effect mimic the chi generation abilities of senior Chi Masters. In fact, during the period we worked with Yury, he met a Chi Master named Dong Chen. Master Chen examined Yury's chi patterns using his own exceptional awareness of chi. He confirmed that indeed Yury's machine and tapes were producing chi. He also reported back that the patterns contained very little noise, and so represent "Master Chi" as produced by Chi Masters. Tapes would allow more junior apprentice Chi Masters to produce repeatable clean senior Master Chi.

Master Chen and Yury worked together for a year and co-developed a variety of new patterns. The methodology involved trying to program the chi generator to produce known useful patterns from the perspective of Chinese medicine. As a result of their collaboration, they developed patterns that could stimulate each of the acupuncture meridians, I-ching patterns and others. Senior Chi masters can also directly stimulate the acupuncture points without needles, using only

intent. I have directly experienced some of these advanced patterns and a mere three-minute exposure to them had a dramatic effect on my mental state.

This relationship between quantum ion based chi generators in conjunction with human awareness and intent of chi connects these topics. Even in quantum mechanics, any complex form can contain information, which suggests that structured thought may be the most rarified example of form. Any form made of a 'substance' that cannot be directly measured (i.e. quantum forms or thought forms) can still contain highly specialized, and hence information-rich, states.

2.2 Chi and Quantum Information

Dr Kronn's demonstrated process for creating advanced chi patterns shows it is possible to generate chi patterns using both human abilities and quantum-based machines. Humans can learn awareness and experience chi from both sources. Likewise, many of the preceding properties used to describe chi appear to be identical to those used to describe quantum states of qubits and ebits. Using Occam's Razor principle, why would two ubiquitous mechanisms exist in the universe, when perhaps one would do?

What if chi and quantum mechanics are really both the same discovered information/form mechanism, but using different methodologies; ancient subjective practices vs. modern objective methodology? I have been thinking about this for many years and an entire paper should really be devoted to this topic, but not here. There may be large overlap with the active information ideas of David Bohm and Basil Hiley, and as well Michael Manthey's continued investigation of AI, QM, and chi-type phenomena. It also appears to be related to the Corob theory paper also in these proceedings. It may be too early to say for sure, but this field of quantum consciousness is theory poor so any theory that equates chi and quantum states may lead to interesting predictions.

2.3 Proposed Experiments

Two obvious experiments emerge from this the ory. First, if chi is 'informative' then it should be possible to design and perform double blind experiments using the direct human perception of chi tapes. The methodology is straightforward since the chi tapes represent a standardized static chi pattern Take a chi tape and two newly bought blank tapes from different vendors. Have someone seal each of these tapes in identical opaque envelopes, randomize them and then seal again in another set of opaque envelopes. Next hand them to a second person who randomly marks the outside of each envelope with a unique identifying symbol (i.e. triangle, square, circle). Pass the envelopes around to a group of people and freely encourage them to record on special sheets whatever impressions they have about each envelope and rank their choices. After all the sheets are turned in and tallied, the envelopes can be opened to see how well each person did. Alternatively it is possible to perform a formal, blind judging and ranking like that used in remote viewing experiments. It is expected for a large group that only a third will have guessed the chi tape correctly by chance.

Second, if chi is quantum mechanical and Chi Masters can generate arbitrary chi patterns, it should be possible to create quantum systems that can be directly and repeatedly influenced by both Chi Masters and/or chi generators. This experiment was proposed in my 1996 Tucson consciousness conference paper. The paper's prediction may already be occurring, as humans

may be *unintentionally* interacting with the quantum systems in semiconductors, thereby injecting noise into computing systems. Think of this as a psychokinetic noise detection circuit.

3. Experiencing Chi

Can anyone experience chi? My answer is "Yes", since chi is ubiquitous and probably an integral part of our mental makeup and the universe in general. By using the music analogy, if motivated everyone should be able to play the piano with widely varying degrees of skills. I would describe the levels of awareness into four categories represented by this two dimensional chart.

Knowledge	Sensitivity	
	low	high
low	no detectable awareness	strong feelings yet unsettling
high	tingling & fleeting thoughts	instant awareness & knowing

What does it feel like to experience chi? If chi is really the informational internet mechanism for the mind, it can have an effect on your physiology as well. So sensation and understanding can start slowly as entirely subconscious and progress to a chill or where the hair of your neck stands on end. As your ability grows the sensations can be interpreted as perceptions (colors, patterns, sounds, feelings), and at an advanced stage, progress to kundalini awakening, direct knowing (reading emotions and thoughts with telepathy, knowing answers to complex problems) and specific skills (medical intuition, astral projection, occult chemistry perception of the subatomic anu, etc). Be aware that these skills are not limited to local spacetime ("in the zone", precognition, remote viewing, the Void, nirvana, ecstasy, etc). Even more abilities occur when intent impacts the physical world (healing, copper wall, electronic disturbances, PK, etc).

3.1 Playing the Chi tapes

A chi tape was played for several minutes for the ANPA attendees. Some people declined to participate and left the room. Generally, the first time someone is exposed to these chi patterns, they feel a tingling in the arms and legs. Frequently, apparently random quiet thoughts were thrust into their mind, seemingly from out of nowhere. Also the air appears to get thick and you can feel it as if moving your arms around under water. As it turns out, we also had a visual dowser attending ANPA24, and who commented that the size of my energy pattern appeared to shrink when I played the tape.

3.2 Results of Double Blind Experiments

Our tallied results of the above described double-blind protocol were apparently random, but this is not surprising because it is unclear how aware logic-dominated mathematicians and physicists might be of chi. The overall group size was small since due to schedule conflicts this lecture was split up into to two presentations. One of the attendees said he "tested" the envelopes/tapes 5 times with the same correct results. Anybody who wants a sample chi tape can have as many as they like (contact me).

The most interesting result came from the visual dowser. Before the sealed envelopes were opened he visually dowsed each envelope by tracing with his finger the meridian line going through each tape. For two of the tapes, he said the meridian went straight thru unimpeded and for the third tape it curved back around on it self. This third tape was indeed the chi tape, and supports the evidence that humans can observe the chi patterns directly from the static tape.

3.3 Pros and Cons of Chi Generators

Since chi generators are a new technology it can be both useful and detrimental. These pros and cons are based on my perspective that chi and quantum systems are somehow related.

Advantages:

- Unify western and eastern belief systems
- Impact persons' "quantum" field, thoughts or health
- Unconnectedness and isolation are a classical-world illusion

Disadvantages:

- Safety: Dosage levels have widely varying effects
- Ungrounding effects due to *bad* patterns or overexposure
- Paradoxical: due to East/West beliefs; also Info/Energy duality
- Subtle energy manipulation and/or "chi" pollution (artificial lights)
- Intellectual property, patents and pattern theft (no objective proof for courts)
- "Luke, beware of the dark side of the force!"

I think that care should be used with any chi generator technology because who can say right now what programmed patterns are good or bad for you. Also, I don't believe that patients will be fatally poisoned from chi patterns as were the early researchers of radioactivity, but it would be useful to develop shielding technology for chi research. Of course future work in this area requires interaction between technologists and sensitives working together.

4. Conclusions and Future Work

I find this research very interesting. Here are my major conclusions from this work.

- Chi generators *exist* (also Chi exists!)
- Humans can detect Chi and can master awareness of Chi
- Some humans can generate specific intent-focused Chi (Chi Masters, reiki, healers)
- Expands western world view: validity of subjective experience
- Science of consciousness and awareness

Here are the major future technological implications of chi generation technology.

- Disastrous effects if not vigilant (Mind control?)
- Expanded science/physics to include chi and quantum
- Communications/computation models
- Mind/Machine interface technology
- Human potential/Health technology

More articles about consciousness and chi generators are located on my personal web site.

QuantaGraphy®: Images from the Quantum Hologram

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Abstract

It is generally accepted that all substances and parts of the human organism, etc exhibit unique signatures, for example, spectra, and patterns such as fingerprints, etc. Much less well appreciated is the fact that all such signatures and patterns, in principle, relate to quantum mechanically determined material phase transitions points, and that in the neighborhood of these phase transition points, as the Nobel Laureate Kenneth Wilson has shown, the assumption made by Landau that quantum mechanics only concerns atomic scales, maybe false in fewer than four dimensions. In light of this and other recent discoveries in quantum science, the work in Radionics of the George DelaWarr camera from the decades of 1940-60, is re-examined with modern technology and some of the results presented here. The dependence of the functioning of this extra-ordinary camera system on its human operator and other remarkable factors is then discussed in terms of quantum mechanical principles.

Most significantly the results of thorough spectral analysis with an electron microscope and image analysis software of representative photographic

plates from the large collection originally produced by DelaWarr, clearly show three-dimensional spatial encoding of information, suggestive of holography. The discovery and development of Magnetic Resonance 2D Imaging (MRI) and 3D microscopy, decades later, for which quantum holography is a mathematical foundation, thus provides, a posteriori theory to explain the DelaWarr results. Particularly as the camera images produced by DelaWarr are evaluated as equivalent to, and in some cases superior to those produced by MRI. The theoretical and experimental implications of the DelaWarr camera constituting a macro-scale quantum phenomenon like MRI are therefore presented in some detail.
QuantaGraphy® is the registered trademark of this process for creation of both 2-D QuantaGraph® and 3-D QuantaGram® images.
Keywords: quantum science, the George DelaWarr camera, magnetic resonance imaging, Radionics, remote imaging.

1 Introduction

A plethora of psi and alternative healing research has demonstrated the existence of macro-scale "non-local" phenomena. Even so, two crucial barriers remain challenging these findings:
(i) a generalized theory sufficient to describe a mechanism for the non-local nature of such observed macro-effects and (ii) empirical evidence that non-locality exists among macro-scale physical objects. Both have been dealt with in a moresgeneral context [Marcer, Mitchell and Schempp, 2002] summarized here and receive further support from the recently discovery of the quantum Carnot engine [Scully et al, 2002] reported in Science, 7th February 2003, 299, 862-864.
The objective of this paper is therefore to present, what the authors believe, is some compelling new scientific evidence, as well as a detailed history, specifically related to the recently revitalized fifty-year old DelaWarr imaging camera, extensively used in the 1950s in such alternative remote healing research.
For example, many thousands of frames previously taken by this camera still exist. Thought by DelaWarr and his co-workers to contain only 2D photographic images, a re-examination of the film frames using modern technology, remarkably reveals them to have spatially-encoded characteristics able to yield 3D images, in line with a quantum mechanical non local explanation, quantum holography (QH) [Schempp 1992]. In fact it was this observation that prompted one of the authors Benford [1999] to

successfully render 3D images from the DelaWarr 2D-image archive. This new evidence of a highly-plausible connection between the image formation processes inherent in QuantaGraphy®, as the camera process used by DelaWarr has now been renamed, and those of Magnetic Resonance Imaging (MRI), for which Schempp's quantum holography provides a mathematical foundation [1998], then led to the acceptance of radionic photography as a bona fide QH manifestation by another, Mitchell [2000]. The evidence of such a correlation between the two techniques, as presented here, would, if fully proven, require redefining existing presuppositions underlying the materialist/reductionist philosophy of nature, as well as expanding long-held beliefs of the availability of reproducible information from the quantum field. It would show, that under the right conditions, which future research will attempt to determine, that quantum mechanics, as shown by Schempp's mathematical foundations of QH [1992] and MRI [1998], and as independently argued by Chapline[1999], is in fact, a physical non-local theory of 3D pattern recognition, signal processing and communication. A further step is the realization [Marcer, Mitchell and Schempp 2002] that the physical processes of QH constitute a means to implement the mathematical lattice rescaling procedure P fundamental to Wilson's renormalization group methodology for the calculation of critical phenomena [1983, Anderson 1982]. For under these circumstances, as Wilson showed, the usual assumption that quantum effects only concern atomic scales, can be false in fewer than four dimensions, in the neighbourhood of the points, where the critical phenomena take place.

2 The Background to Radionics and Remote Imaging

Radionics is a derivative from two words: "Radi" from Radiation and "Onics" from Electronics. It refers to the idea that all discrete matter radiates unique energy signatures or patterns, which are measurable and manipulatable with proper technology. Radionic photography, now termed QuantaGraphy®, the application of concern in this paper, owes its origin to the development of Radionic medicine, which began in the early 20th century with Dr. Albert Abrams. To understand fully the nature of this unique remote imaging system it is important to know the history of how the technology developed.

Dr. Albert Abrams (1863-1924) was born in San Francisco into a wealthy merchant family. He was an outstanding individual who devoted his life and considerable fortune to medical research. He completed a M.D. and M.A. with first-class honors and was awarded the Gold Medal from the University

Of Heidelberg in Germany. He did extensive postgraduate work throughout Europe and worked with renowned researchers Virchow, Frerichs, Von Helmholtz and Wasserman.
Returning to California, Abrams became a fellow of the American Medical Association (AMA) and Professor of Pathology and finally Director of Clinical Medicine at Stanford University.
He specialized in diseases of the nervous system and authored twelve books. One of his works on spinal reflexes ran through 5 editions in 4 years. He was an important figure in the development of the art and science of Percussion, which is germane to the discovery of what eventually became known as Radionics. This discovery is detailed in his book New Concepts in Diagnosis and Disease [1924]. During a routine examination of a middle-aged male with an epithelioma on his lip, Abrams percussed the abdomen of the subject to define the border of the stomach. To his amazement he heard a dull and thick tone instead of the normal hollow sound he was expecting. Perplexed, he palpated the patient's stomach to see if a tumor was present but none could be found. He persisted with his percussion techniques and discovered that the dull note only manifested when the subject was in certain spatial orientations, otherwise, the note was normal. Moreover, the note was detectable only at a specific point on the patient's abdomen above the navel.
Intrigued by this phenomenon, Abrams tested other cancer patients with the same end result. Subsequently, he tested healthy subjects with a small biopsies sample of disease tissue attached or connected to their bodies and was able to obtain the abnormal abdominal tones.
He reasoned that disease emanated a specific form of radiating energy that affected the entire nervous system. Furthermore, he constructed an apparatus with a variable electrical resistance to measure "disease patterns". This enabled him to distinguish one disease from another. For example, cancer could be measured at 50 ohms and syphilis reacted at 55 ohms. With further research, Abrams was able to create equipment that eliminated the need for the subject to be present while the detection process went on. Instead, a blood sample from the subject was used and the "radiations" from the sample were measured. Abrams also developed treatment devices, which used weak electromagnetic energy modified by the disease treatment patterns, or "rates," as they came to be known. *These features of Abrams' findings might well therefore concern non-local quantum gauge field effects, as has be shown to be the case, for example, in relation to DNA [Gariaev et al. 2001].*

The Electronic Reactions of Abrams became famous and at least 3000 physicians, chiropractors and osteopaths from the USA and Europe learned how to use his equipment and techniques.
In 1924 Sir Thomas Horder (later Lord Horder) set up an investigation, in the UK, of the Abrams diagnostic claims and concluded reluctantly that the Abrams instrument and techniques were valid. The odds against chance in the tests conducted were calculated at 33,554,432 to 1.
Abrams was invited to demonstrate his techniques before the AMA but he died before he could do so.
Following Abrams death numerous individuals in Europe and the United States continued radionic research in the 1920s and 1930s, attempting to improve the technology and therapeutic effectiveness of Abram's work. None, however, were able to produce diagnostic or therapeutic protocols sufficiently replicable to withstand scientific and medical peer review of the period. The particular obstacle was that the phenomena being observed, though occasionally tested under rigorous conditions, simply would not yield to explanation within then accepted theory. However several decades have now elapsed while quantum theory matured to its present state, such that new knowledge has, *in particular,* been acquired in relation to the experimentally validated phenomenon of quantum non-locality including, very recently for example, the teleportation of quantum states. The hypothesis, that these remarkable manifestations of nature could provide a proper scientific explanation for the phenomenon of radionics can therefore be posited, particularly in view of the work of George DelaWarr..
The British engineer George DelaWarr, and his wife Marjorie, whose work forms the basis of this paper took radionics into a long period of very intense experimentation. The DelaWarr Laboratories in Oxford UK were founded in the 1940s and were active until the beginning of the 1990s. George DelaWarr, as the result of this extensive experimentation, defined radionics as the, "Science of the inter-action between Mind and Matter and of the complete inter-relationship of all things." He was the first scientist to fully recognize that the mind of the operator could be fundamental to the whole process of radionics. His postulate and his extensive experimental research ,is therefore, as may be seen below, in line with the frequently recurring theme in quantum mechanics taken up by many eminent scientists, including for example, Pauli, Schrodinger , Eccles, Penrose and Pribram that quantum measurement which depend on the state of the observing system may relate to the science of the mind and to the phenomena of consciousness; a *fact suggested but not pursued by the new science of quantum mechanics. He*

defined radionics as the, "Science of the inter-action between Mind and Matter and of the complete inter-relationship of all things."
DelaWarr's research led him to reconstruct instruments, which had formerly been made from old fashioned electrical components, using electronics and dials which could be better calibrated to record and measure the nature of sound, light and resonance [Manual Of Practice, 1966, DelaWarr Laboratories; a brief summary setting out the operation of the DelaWarr Camera is given in Appendix I] . He introduced magnets into his instruments, which seemed to improve the link between the operator, subject and equipment. His theories and key experiments are listed in the books, New Worlds beyond the Atom, [1956] and Matter in the Making [1966]. In these works the evolution of the camera for diagnostic use is detailed. Unlike previous machines the DelaWarr Camera was non-electrical in nature and was composed of components of standard diagnostic and treatment instruments along with a light tight chamber and various optical focusing devices.
This camera system, from which a number of different model systems evolved, was successful at producing over 13,000 black and white photographic images, with over 9,000 still in the archive today. Many of these images deal with medical conditions while others cover experiments with water imprinting, the location of minerals and the detection of what were termed "fundamental rays" emanating from the primary elements and compound molecules such as hydrogen, iodine, copper sulfate and so forth.
The Camera was capable of replicating photos and consistent performance, when used correctly. It took the skills of a trained operator, however, to make it function effectively. After 1963 the Camera was not in use for a variety of reasons, mostly due to lack of acceptance by the scientific establishment. However, in 1996 a team of researchers, lead by one of the authors (Moscow) from the USA and the UK were able to successfully activate the system again. Currently, the full restoration and use of the Camera is now in the hands of an experimental team in the UK.

3 Composition of the Camera Images

In the 1950s when DelaWarr created most of his images, science was highly skeptical of the origin of his creations and, further, incapable, at that time, of discerning that their true nature might have a proper scientific explanation, as quantum science was still immature. Several accusations were leveled at DelaWarr involving fraud and deceit in the image formation process. The more typical allegations included some type of additive to the photographic

plate, such as an artist's pigment, dye, paint or other process like an X-ray, etching, or chemical compound. In attempting to respond to his critics, DelaWarr asserted that the images were not the result of any type of human intervention but, rather, were created when some "unidentified fundamental radiation" interacted with the photoemulsion (a standard silver compound) applied to the surface of the 4x5 inch glass plates he used.

In order to test the validity of DelaWarr's claims with modern knowledge and technologies, experiments were conducted at The Ohio State University Microscopic and Chemical Analysis Research Center (MARC Lab) on April 19, 2000 to determine the origin and composition of the image(s) on the glass plates. In the first phase of the evaluation, two glass plates from the DelaWarr archive were examined under a Carl Zeiss light photoscope with 6.3 multiplier using a variety of amplification settings. The results demonstrated that the silver grains on the surface of the glass plate were bigger in the darker, in the more heavily exposed areas of the image and, subsequently, smaller in the lighter or less intense portions of the image. This is the typical response of a standard photographic material exposed to any electromagnetic light source. No added pigment, dye, stain or coloration was noted beyond the silver particles.

Phase two of the evaluation involved scraping a sample from the non-image section of the glass plate to determine the chemical composition of the plate itself. A Camera SX-50 Scanning Electron Microscope (SEM) was used for this analysis. SEM is capable of performing quantitative chemical microanalysis of major and minor elements in solids including glass. It is ideal for characterization of surfaces or particles including thin films. The results of this analysis (Graph 1) demonstrated that the glass was a standard silicon-based material with no unusual properties.

Phase three included scraping a sample from the image portion of the glass plate. Using the same equipment and procedure as for the non-image sample described above, the SEM results revealed a standard silver-based photo emulsion as described by DelaWarr (Graph 2). No other pigments and/or proportionately significant chemicals were identified via the SEM analysis. The MARC Lab concluded that the images were, most likely, the result of some "high-energy radiation" for which they could not ascertain the origin or composition.

Benford followed this up and analyzed sample plates with modern image analysis software, discovering that 3-D encoding seemed to be present. After Benford's initial 1999 discovery of the 3-D spatial-encoding characteristics within the DelaWarr images, further research involving Mitchell's profound paper, "Nature's Mind," led her to suspect that DelaWarr was, in fact,

dealing with was the Quantum Hologram. Her introduction of this concept to Mitchell led him to concur with this conclusion. The DelaWarr images produce a 3-D effect, similar to that possible via layering of single slices from Magnetic Resonance Imaging (MRI) techniques [Schempp 1998].
The VP-Image Analyzer is an analog device, while the commercially available Bryce4® Software is digital. Both techniques convert image density (lights and darks) into vertical relief (shadows and highlights). When using either the VP-8 or 3-D software systems, an ordinary photograph does not result in a three-dimensional image but in a rather distorted jumble of "shapes." X-ray images, although spatially superior to routine photographs, are also characteristically distorted (see Figure 1). Yet the images (see Figure 2A) produced by DelaWarr yield very accurate and well-formed three-dimensional relief, as is clearly evident in the QuantaGram® of a cow's stomach (see Figure 2B). Further the observer can select numerous angles by which to review the captured information as multiple 3-D relief patterns. Full rotation around the organ and/or object is also possible with the digital computer software; thus permitting significantly enhanced visual assessment.
Most convincing of the true holographic nature of these images is the fact that certain information about the object is only available on the 3-D reconstruction and not explicitly seen in the original image produced by DelaWarr. For instance, in the QuantaGraph® of the cow's stomach (Figure 2A), the curvature of the wire lodged in the stomach is represented as a highlighted straight line. However, upon analysis of the 3-D image (Figure 2B), the distinct "two bump" curvature of the wire is clearly delineated. It is crucial to note that the original VP-8 analog technology (developed for use with NASA's space exploration program) needed to decode the spatial information in the 2-D images was not created until 1976. Clearly, DelaWarr, whose first book was published in 1956, could not have knowingly produced 3-D spatial encoding in the undecipherable photographic images of that period.

4 Comparison between QuantaGraphy® and MRI

MRI is one of the most advanced diagnostic imaging systems available today. MRI images are formed by the combination of a strong magnetic field and radio waves interacting with, primarily, the hydrogen protons of water in the body. Patients are enclosed in a magnetic field created by a large magnet, which causes the spinning nuclei of these hydrogen atoms within the body to change their axes of rotation. Altering the magnetic field by sending radio

waves through it further affects the behavior of the hydrogen protons by causing them to move out of alignment. When the radio signal stops, the protons relax back into alignment and release energy. These changes in excitation and relaxation are recorded by receivers (antenna coils), then mathematically reconstructed by a sophisticated computer into spatially-encoded two and three-dimensional pictures of the body [Schempp 1998].

In June of 2000, a blinded evaluation was conducted of several 3-D reconstructions from the original DelaWarr images. The review was done by Dr. Philip Morse, MRI expert and Professor of Chemistry at Illinois State University (USA) and resulted in several important findings. Believing that what he was examining were computer-generated MRI-related renderings, Morse commented, "What it looks like you've done is generate a 3-D image using intensity data as the third dimension with some shading (that is, any given point is represented by X, Y, Z = intensity). . . . the "bones" in the fetus picture are clearly NOT on the surface of the fetus, but are interior. . . To get actual 3-D information would require multiple images from different angles and a more complex reconstruction algorithm. It can be done from, for example, MRI slices. . . You have some great images!!!" (see Figures 3A and 3B for QuantaGraph® and QuantaGram® of fetus).
In attempting to explain the DelaWarr images in terms of the principles of MRI, Morse used the cow's stomach image. He commented, "The object is one dimension (wire), so bends will be reflected in the intensity differences depending on the amount of other material surrounding it. The 2-D image actually encodes the spatial distribution of the object because it is only one-dimensional in the first place, so position (location in the stomach) could be encoded by intensity. . . I'd need to see your (computer) code to figure out what you are doing. I don't see any need at the moment to postulate anything other than graphical manipulation (in the most positive sense) to generate the images you produced. However, if you are using some other method to obtain the image, then..... THAT is interesting!" Clearly, the images easily passed muster as good, if not superior, reconstructions of some type of "MRI" imaging (see Table 1: Comparative Features). Undeniably, no computer code or MRI slice compilation was used in capturing, or rendering, any of the DelaWarr images.

Table 1: Comparative Features of MRI and QuantaGraphy®

Feature	**Magnetic Resonance Imaging (MRI) (1)**	**DelaWarr Images (2) (QuantaGraphy®)**

Probe engaging source; object/subject holographic encoding	Low-energy photon in the form of radio frequencies (r.f.)	Unknown energy possible quantum
Source of energy	Magnet (NMR) or Paramagnet (EPR), vibration generator, antenna, and intentionality r.f. transmitter, and antenna coil unknown frequencies and composition)	Bar magnet, (thought-waves of
Interaction exclusive with quantum hologram radiated from in body and to subject being imaged /or quantum field	Nuclear Magnetic Resonance of water protons in body; Electron Paramagnetic Resonance of free radicals	Interaction "test object" linked
Detected/Imaged by photosensitive emulsions	Antenna coil, r.f. receiver	Antenna coils,
Tissue characteristics causing contrast characteristics; spin response rate(?)	Water-proton spin relaxations rate frequency specific attributes in quantum field or free radical spin response rate for EPR	Existence of reflecting physical
Soft tissue contrast encoding compared to X-ray (without contrast agent)	High; spatial encoding	High; spatial
Resolution	Good	Excellent
Shows Anatomy Both and/or Physiology	Both	
Visible light required encased in dark to produce images?	No	No, subject/object

(1) Wolbarst AB. Looking Within. Univ. of California Press, Los Angeles, 1999;171.
(2) Day L. (with DelaWarr G.). New Worlds Beyond the Atom. Vincent Stuart Publishers Ltd., London, 1956.

The Graphical and photographic information referenced but not included in the text for reasons of on-line file size, may be obtained by contacting one of the first two authors of the paper

5 The Functioning of the Camera System

The camera system consists of a trained operator, a receptacle for the test object, a control panel to adjust and "tune" the system, and a light tight compartment for the photographic plate [see Appendix I for further detail of the Camera's operational procedures]. The need is, however, to explain the most remarkable aspects of QuantaGraphs® experimentally demonstrated by DelaWarr in his creation of unique reproducible images for simple minerals, tissue, organs and organisms as already described above. The evidence presented above has, *in our view,* clear parallels with the quantum holographic operation of MRI, which concerns the nonlocal quantum coherent holographic properties of matter [Binz, Schempp 2000a; 2000b] not formalized in quantum theory until the present period. DelaWarr's work would then presage and support the later discovery: -

(a) that there exists in nature a nonlocal quantum holographic representation of macro-scale objects,

(b) that each substance possesses its own unique and distinguishable characteristics, including its shape and location in 3+1 space/time,

(c) that such spatially encoded holographic information, encodable in any form of physical wave incident upon any object can be recorded as in the case of the QuantaGraphs®, on a photographic emulsion, or indeed, as evidenced from the medical work of Abrams, on physical or biological objects, and

(d) that, as with MRI, the precondition for production of a 2-D brain/body slice image, or as in Magnetic resonance microscopy a 3-D one, is phase-conjugate-adaptive-resonance [Schempp1992]. That is, to say, both in the Radionics of Abrams, and of DelaWarr, the brain/mind (of the physician or respectively that of the camera operator) is able ***to*** "recognize" the point of resonance, which signifies the desired spectral signature, or image being sought; this corresponding to a quantum gauge condition. That is, the physician's or operator's brain/mind and sensory apparatii act as quantum holographic transducers [Schempp 1992; Marcer,Schempp 1996; Marcer, Mitchell 2000] in order to perform what is a quantum holographic measurement. Noting that such quantum holographic measurements may indeed apply to any kind of physical field, electromagnetic, acoustic, etc; such as, in the case of Abrams, the acoustic and tactile percussing of the stomach of his patient.

Items (a), (b), (c) and (d) immediately bring to mind, what in quantum theory Bohm and Hiley have called the quantum potential Q [Bohm and Hiley1993]. This is derived directly from the Schrodinger equation, when the wave function Ψ is written in the form Rexp(iS/h) so that

$\partial S/\partial t + [\{\nabla S\}^2]2m + C + Q = 0$ where $Q = h^2(\nabla^2 R/R)/2m$
S is the action, h is Planck's constant, m is a mass, C is the classical potential.
This first equation can then be compared directly with the Hamilton-Jacobi equation of classical mechanics, where there is no Q-term. This describes an ensemble of classical trajectories. The quantum potential Q is thus one description for a new kind of energy (which others attribute to the zero point field or quantum ether), that therefore only appears in quantum descriptions of phenomena such as quantum gauge fields. This difference between classical and quantum mechanics, concerns, what Feynman called the essential mystery of the quantum mechanics, quantum non-locality. For example, that described in EPR correlations, the existence of which was first disputed in the 1930's in a famous paper by Einstein, Podolsky and Rosen (EPR), but much later experimentally confirmed by Aspect et al, in 1982, following earlier theoretical work by John Bell. Another later example is that of quantum teleportation [Sudbery, 1997]. The existence of this even more remarkable manifestation of quantum non-locality was first proposed in 1993 by the IBM physicist Charles Bennett and others, but again was only experimentally demonstrated in 1997 by two groups working independently. These experiments proved that the quantum properties of photon polarization or of the spin of particles, can be used, subject to specific controls, to transmit quantum information instantaneously between two laboratories independent of their location in space-time, the separation of which can again, as in the Aspect experiment, be made so large, that any possibility of conventional signal transfer to duplicate the result is made impossible. In brief, the quantum communication channel for teleportation T consisted of a pair of entangled particles, one held by a sender, now traditionally called Alice and one by a receiver, called Bob. Entanglement is the non-local resource of the invisible purely quantum mechanical connection between Alice and Bob, which, in this case, makes teleportation possible. A third party Carole, then gives Alice another particle, whose state, constituting the message, is to be communicated to Bob. Quantum mechanics, however, decrees that Alice cannot simply read this message and transmit the information by a conventional channel. Instead, Alice measures a joint property of the message particle and of T, so that the entanglement instantaneously causes a related change in Bob's particle. This is the quantum part of the information transfer. The classical part is the result of Alice's measurement, which Alice must now transfer via a conventional classical channel to Bob. It tells Bob, what operation to perform to make a perfect copy of the message.

This new evidence from quantum mechanics, therefore requires, as posited here for further experimental evaluation, that the DelaWarr camera employs quantum teleportation and utilizes both quantum and conventional information channels in regard to its operation, such that (a) the test object contains the message, and (b) the photographic plate is exposed to the new kind of energy attributable to the quantum potential Q or quantum ether. This would then explain why the camera and DelaWarr operator (and the phenomena observed by Abrams), constituting regimes of quantum measurement, do not correspond to those of the conventional classical measurement paradigm, where measurements can always, with care, be regarded as totally repeatable.

Teleportation and the quantum potential also confirm one of Bohr's deepest quantum mechanical insights that (quantum) measurements must take into account the whole experimental arrangement, since such arrangements must be considered as a single non-separable object (such as in teleportation, Carole and the entangled pair Alice/ Bob are), and as the operator, the test object and the DelaWarr camera are and have to be respectively, in accordance with its experimental operational usage and it's posited quantum holographic measurement functioning. It should therefore now be possible to produce further quantitative evidence that this is indeed the case.

6 Further Links to Quantum Holography

The theories of a holographically-based universe were originally championed by two of the world's most eminent thinkers: physicist David Bohm, a protégé of Einstein's, and Karl Pribram, a highly-respected neurophysiologist from Stanford University, who was also the first to proposed a quantum holographic model of the brain [Pribram 1991]. Their holographic models first received experimental support in 1982 when a research team, led by physicist Alain Aspect in Paris, already mentioned, can be said to have demonstrated that the web of atomic particles that compose our physical universe possesses what appears to be an undeniable "holographic" property. Further, to quote Sudbery [1997], "Quantum teleportation is a striking application of the holistic nature of the physical world revealed by quantum mechanics"

Holograms have a property called "distributedness," which means that any fractional portion of the recorded hologram contains sufficient information to reconstruct the complete original 3-D information pattern, up to some degree of resolution of the whole image. Consequently, it can be posited that the blood, sputum, hair and other small subsets of a subject (as utilized by

DelaWarr) constituting such fractional portions of living objects, possess the similar but now non local quantum mechanical holographic property of distributedness of the whole organism, which manifests itself as a universal holographic biophysical (mitogenic) radiation [Gariaev et al 2001].
A hypothesis in full accord with Schempp's quantum holographic, mathematical foundations of MRI, which describe the production of 2-D brain and body slice images, and in the related medical field of MR microscopy, 3-D imagery (see http://wwwcivm.mc.duke.edu.) In such machinery, which employs quantum teleportation so as to work [Binz, Schempp 1999], the quantum holograms so produced, do indeed consist of radiated diffraction patterns, where the holographic property of distributedness, now applies relative to a hologram plane about a resonance peak. That is, to say, such quantum holograms concern a definite orientation, both to be detectable and to be decodable, a fact highly relevant to both the diagnostic percussive observations of Abrams, and to those of DelaWarr. There is therefore strong but not conclusive evidence that QuantaGraphy® works by the same principles as MRI, i.e., quantum holography. It will, of course, be objected by those who take the view that quantum mechanical effects, such as teleportation, etc., only operate at the atomic level, that this cannot be the case. However, as already cited, two of the co-authors of this paper Marcer and Mitchell, are co-authors of another paper [Marcer et al], "Self-reference, the dimensionality and scale of quantum mechanical effects, critical phenomena and qualia". This paper, following the work of the 1982 Nobel Laureate, Kenneth Wilson, describes the specific circumstances (also applicable to MRI), under which quantum mechanical effects, normally thought of as confined to the atomic scale, can in 3+1 space-time dimensions or lower, operate on scales up to the cosmological. All objects in such a cosmos (which would manifest itself as such an unstable critical phenomenon) [Marcer, 2001; Marcer et al., this conference] are therefore quantum mechanical objects, describable by a quantum state vector, possessing observable gauge invariant phases [Resta 1997] known as the geometric phase [Berry 1989] of the corresponding quantum field, and where phase as in classical holography is the essential quantity of physical significance. Furthermore, quantum holography is generalized holography applying to any kind of physical field, acoustic, electromagnetic, etc, where the condition for a detectable signal is phase-conjugate-adaptive-resonance [Marcer and Mitchell 2000]. That is, to say there exists coincident with each object, a virtual non-epiphenominal object image (since quantum mechanics shows it possesses a geometric phase or observable gauge invariant phases),

which in quantum holography will be a quantum holographic pattern entirely characteristic of the 3D object in question.
The known evidence, with respect to the quantum potential, quantum teleportation, and quantum holography (which all indicate that these phenomena are not subject to any known theoretical limits as to the extent and scale over which they might operate) is all, therefore, in remarkable agreement with DelaWarr's findings and the operation of his camera by QuantaGraphy®. Further, DelaWarr's findings in their turn confirm the fundamental thesis of the paper "Self-reference, ..." that we live in a quantum universe, and are ourselves, quantum objects, as is required in regard to the evidence concerning the operation of the DelaWarr camera.
It therefore, seems, in our view, that there is almost irrefutable evidence, some of which is presented here, that the potential benefits, which the DelaWarr camera and Radionics could now bring to medical science, warrant a much fuller investigation, and must no longer be dismissed out of hand as fraudulent by the scientific and medical establishments as was the case in the past. In particular, these investigations should give fullest consideration to the fundamental considerations set out below.

7 Conclusion - Fundamental considerations

Radionics is an extension of Radiesthesia, which is probably as old as civilization. The use of dowsing for water [or oil by major oil companies] is a simple example in common use. Radionics moves beyond radiesthesia in that it provides instrumentation to measure objective targets with greater precision. It also supplies a means of creating an energetic/informational instrumental bridge between the subject, (which can be a human, animal, plant or inanimate matter) and the practitioner, so as to facilitate a " similar tuning" as in dowsing of her/his perceptive faculties. Of particular significance therefore, and warranting extensive scientific investigation is the use of the operator's mind, since this appears essential in detecting the patterns of information in the subject. For example, corrections to the operation of the instrumentation that can be stimulated by energetic/informational exchanges between the operator and the subject.
In a recent European study [Rauer,2000] a variety of distant healing modalities were studied. Radionics produced twice the effect of any other modality. This would seem to indicate that instrumented Radionic healing is efficacious. It can therefore be presumed that the Human Brain/Mind/Consciousness (BMC) complex [Marcer, Mitchell 2000] is a necessary *a priori* concept to explain the phenomena of Radionics and

QuantaGraphy®. An epiphenomenological understanding of the Brain-Mind link is clearly inadequate to explain the results of researchers and practitioners. Only the presumption of a universal field, like the quantum potential, with which individual BMC complexes are connected, can provide the basis for an explanatory model that does justice to the facts of the situation.

The prerequisite need for human intention/anticipation as part of the BMC modeling also seems vital. Without that component, it is unlikely that any of the images would have been produced. The difficulty lies in defining "intentionality" as well as agreeing on a method to measure or control such an intangible, although the work on anticipation could provide, the authors believe, many clues. For all the evidence indicates that the BMC matrix of a human being obviously "anticipates" or "resonates" with the target information which it seeks by either sensory contact with the subject or an icon sufficiently representing the subject, so to permit resonance and their quantum entanglement/coherence. The transduction of that information is what appears to take place quantum holographically when the emulsion plates or other photo media are imprinted during a typical imaging session.

Fifty-years ago the remarkable images produced were considered dramatic enough as they were. No computers or software existed that could determine the "hidden" qualities of the pictures. Two researchers Malcolm Rae (1970s) and Jon Monroe (1980s) produced radionic instruments that reflected their understanding of Radionic "rates" as spatially-encoded informational patterns. DelaWarr, Vogel, Di Pinto and Moscow all stated and believed that the emulsion plates contained three-dimensional structures within the photographs; however, this information was merely conjecture until Benford [1999] revealed the underlying multi-dimensional nature of the images.

The *a posteriori* discovery of the images as 3D spatially encoded (as compared to "regular" photographs), which can only be obtained with a trained operator, establishes the possibility that the BMC complex is involved in the transduction process. On the basis of relevance alone it can be adduced that the human brain creates holographic images from the visual (and other sensory data) experienced on an empirical basis. It seems likely that it (the brain) must of necessity produce that which it can understand; thus, multi-dimensional images, or at least good quality two-dimensional structures, which it can partially extrapolate into acceptable pictures. The transfer of mental pictures to a visual format would be unusual enough, given the vast archive that exists, but the information produced is clearly evidentiary of objective and true targeting (see Cow's Stomach QuantaGraph® and QuantaGram®).

While there is every good reason to view the DelaWarr Remote Images as reflections of an objective physical field, it must be stated that other components appear to be present. It appears that the images are being viewed from the perspective of formative (morphogenetic) fields so that the viewer can see the bio-energetic structure of the diseases as well as the physical organ systems in which they are grounding themselves. Not all images display this information clearly but some do and, therefore, any interpretive model must ultimately be able to reflect this aspect of the phenomenology.

To posit a full theory of operation of the system, a number of questions must be fully examined: 1) What is the relationship between the test object and the subject? 2) How does the test object carry and transfer the complete information of the subject? 3) How is this information optically obtained by the DelaWarr system? The proposed theory is that the test object is a specimen from the subject that emits a complete quantum hologram, representative of the subject for the condition tested, and that such holograms represent quantum entanglement/coherence with the subject. That the quantum hologram can be caused to affect the optical part of this system through mediation of the operator's focused intention; such mediation creating resonance, entanglement /coherence of the entire system, and, under the right conditions, produce a holographic-like image.

To make a standard hologram, two optical waves are needed: a reference wave and an object wave. These two waves make a 3-D holographic image by creating an interference pattern frozen in space-time. Both waves are spatially and temporally coherent at the moment of creation, then separated into an object wave and reference wave. The object wave is directed towards the object and experiences intensity changes and phase-shifts upon illuminating the object. Normal 2-D photographs record only the intensity changes of the object wave and do not record the phase-shifts. However, when the reference wave is directed back towards and recombined with the object-bearing wave, an interference pattern is created that records the phase-shifts of the object wave relative to the reference wave. These phase-shifts are what produce the apparent freezing in space-time of the object's 3-D image.

The question remains: how is the quantum holographic pattern recorded with the DelaWarr system? Standard holography requires a reference wave be redirected towards the object radiation wave. For a quantum hologram to

exist requires the pcar condition, that is quantum entanglement/coherence, with its emitting object.

In attempting to resolve these questions in accordance with the postulated theory, in 2000 the Camera was taken out of storage and set up for a new series of experiments. Funding for this project is presently extremely limited but larger scale financing is being sought. The first phase of the new experiments has been devoted to bringing the Camera back to the same level of functioning that existed in the nineteen fifties when it was producing high grade photographs on demand on a daily basis. Due to restricted funding the number and frequency of experiments have been low but nonetheless the camera is producing many results identical in format to the early experiments of George DelaWarr. It is anticipated that this phase will yield in the near future to the first of a series of blinded trials similar in nature to the one conducted in St Bart's hospital London in October 1951 during which 400 plates were exposed -with excellent (qualitative) results. It is also anticipated that detailed work on the theory of the technology will continue as soon as adequate funds are available. For if such an extended programme of research is able to yield a satisfactory scientific explanation for the very extensive body of human experience, the benefits to mankind of remote healing could be substantial. And even if not, the frontiers of science will be substantially enhanced.

Appendix I. A Summary of the Operation of the DelaWarr Camera

The Camera consists of 4 major "boxes" mounted on a plinth, which contains a vibrator driven by a 220 volt supply. The vibrator is turned on during the time the Cassette is inserted into the Light Tight Box, which is mounted, superior to the other three specimen and tuning boxes. The Cassette contains the unexposed film or photographic plate (as in the original silver emulsion plates). The film is "exposed" in total darkness. There are focussing devices inside the top box which "direct" the information/energy towards the plate or film. The three other boxes are mounted beneath the top box and two of them contain specimen plates, magnetic tuning devices and radionic dials (to specify the information "codes"). The boxes also contain various types of focussing devices. The technique requires that the photographic medium (film or plate) be "sensitized" briefly in the dark room (no half light is permitted at this stage) before being placed in the light tight Cassette. When this is done the Cassette is inserted through a slot in the bottom of the top box where it is

"exposed" to the information being sought by the operator. After the Cassette is withdrawn it is taken to the darkroom and development of the film or plate proceeds normally.
Before the Cassette is loaded the operator(s) place an appropriate specimen on the plate(s) of one of the 2 tuning boxes beneath the Light Tight Box. The box dials are then "tuned" directly to the information being sought-e.g. Myocardial Infarction or Tuberculosis etc, etc.
The individual doing the plate sensitization is not necessarily the same person operating the camera. The camera will not produce an image if the condition etc is not specified precisely. A good example of this occurred years ago when a patient was suspected of having carcinoma in his jaw. The camera would not produce any image until the code was reset for Osteomyelitis at which point the image was produced.

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Alternative Natural Philosophy Association

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2. This purpose will be pursued by research, publications and any other appropriate means including the foundation of subsidiary organisations and the support of individuals and groups with the same objective.

3. The Association will remain open to new ideas and modes of action, however suggested, which might serve the primary purpose.

4. The Association will seek ways to use its knowledge and facilities for the benefit of humanity and will try to prevent such knowledge and facilities being used to the detriment of humanity.

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