The Yijing: Metaphysics and Physics[*]

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Introduction

The general background to the discussion in this paper is the idea that the study of mathematics forms a spiritual pursuit; that the investigation of abstraction through precise formal language provides, at the least, an analogue of transcendent reality. This was once a key underlying assumption of mathematics, but it is largely neglected in the modern world. The Image and Number (*Xiangshu* 象數) approach to the study of Change embodies this ideal and asks us to take seriously the idea that, just as mathematics can describe the physical dimensions of the world, so too it can provide a language to investigate both the psycho-spiritual dimensions of the individual, and the deep underlying patterns of reality. By providing a common language spanning all the dimensions of reality the conceptual parallels between the different domains can be clarified.

Because physics is the primary application of mathematics to the phenomenal world, the relationship between quantum theory and the metaphysics of the *Yijing* «易經» is taken to be a key aspect of the foundations of this project. In this connection, vacuum polarization is explored. This started as a theoretical consequence of a mathematical description from quantum theory which, decades later, later received experimental verification. I suggest there is a strong parallel between this effect and the metaphysical progression from *Wuji* 無極 to *Taiji* 太極. This serves as the canonical example of the meeting point between mathematics, physics and metaphysics. I then look at comparisons between the three realms of Heaven (*Tian* 天), Earth (*Di* 地) and Humanity (*Ren* 人) as described in the *Dazhuan* «大傳» and the philosophical physics of David Bohm, in particular his key idea of the implicate and explicate orders and their relationship to each other and to consciousness.

The pivotal role of consciousness in the structure of the cosmos suggested by both the traditional and modern approaches suggests a way of understanding the Jungian notion of synchronicity as something more than a purely psychological phenomenon. Instead, this phenomenon can be seen as a direct effect of recognizing the integration of the human psyche into the broader fabric of the universal reality. In turn, this leads to a consideration of what the process of divination means in the context of the Western scientific mind set.

Physics and Metaphysics

I am fond of quoting Russell (1917 p20), where he characterizes metaphysics as "the attempt to conceive the world as a whole through thought." To this we must add Bohm's proposition (1980 p71) that such holistic comprehension is to "be considered an art form, like poetry, which may dispose us toward order and harmony in the overall 'dance of the mind' (and thus in the general functioning of the brain and nervous system)." Thus, an appropriate metaphysics becomes significant not just to abstract philosophy, but also to a healthy, integrated psychology.

The philosophical implications of modern physics for our world view are still not fully grasped. Indeed, the underlying metaphysical assumptions, even for many scientists, still seem locked in to the mechanistic physics of the previous paradigm. As physics is the canonical example of the

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successful application of the language of mathematics to describe the world, it is significant that we can draw some strong parallels between some of its most contemporary concepts and the metaphysics of the *Yijing*.

Vacuum Polarization

The key relationship between *Wuji* 無極, *Taiji* 太極 and *Yin* 陰 and *Yang* 陽 is spelt out in the opening lines of the "Explanation of the *Taiji* Diagram" (*Taijitu Shuo* «太極圖說») by Zhou Dunyi 周敦頤 (1017-73CE). This says (translated Adler, 2009 p2):

> *Non-polar and yet Supreme Polarity!*
> *The Supreme Polarity in activity generates* yang*; yet at the limit of activity it is still. In stillness it generates* yin*; yet at the limit of stillness it is also active.*
> *Activity and stillness alternate; each is the basis of the other.*

We can visualize this development graphically through the simplified diagram given as Figure 1. Here we see a bi-directional connection between *Wuji* and *Taiji*, indicating their interconnected relationship: *Wuji* is undifferentiated, but nonetheless contains the potential for differentiation to arise. Once differentiation occurs, then the two poles, *Yin* and *Yang*, must be identified and characterized. This progression lays the foundation for the recursive generation of the *gua* 卦 by showing how *Yin* and *Yang* arise, via *Taiji*, from *Wuji*. *Wuji* is the primordial, limitless void, it is the unpolarized state before any phenomena arise. In contrast, *Taiji* is the "supreme polarization", the arising of something from nothing.[1]

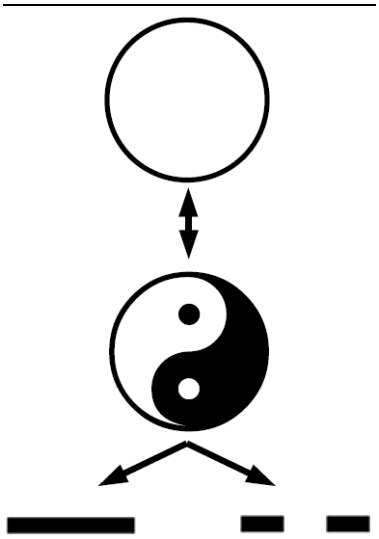

Figure 1: Wuji, Taiji, Yin and Yang

This description is very interesting from the perspective of quantum mechanics, particularly with respect to the phenomena of virtual particle pairs and vacuum polarization.[2] The vacuum is what remains after everything has been removed from a volume of space. In classical physics, this vacuum is truly empty and, therefore, nothing happens in such a region of space. However, in quantum physics the behaviour of the vacuum is very different. Heisenberg's *uncertainty principle* means that there are some properties that form complementary pairs when measured: the more precisely one property is measured, the less information is available about the other. Position and momentum is one such pair. This means that the more certain one is about the location of a point in space, the less certain one can be about the energy at that point. Thus, in a vacuum, once all the matter has been removed, the space itself fizzes with random energy fluctuations. This is called the zero point energy. This energy is not merely an interesting artefact of the mathematics, but has a measurable effect.

1 As Adler (2009 p24) notes, whilst the usual translation of *Taiji* as "Supreme Ultimate" catches its colloquial meaning, it "completely misses the significance of the term" in relation to *Wuji* and *Yin*/*Yang* as polarity being the most fundamental principle of ordering reality. Earlier (p11) he describes *Taiji* as "the principle or pattern of polarity", equating *Taiji* 太極 with *li* 理. It is because of the verbal, rather than the nominal, mode of this expression that I prefer the translation "supreme polarization".

2 The full details of this phenomenon are complex and would take us too far afield here. The interested reader can find a digestible account in Barrow (2001 pp230-235) or Close (2009 pp99-111).

Since energy and mass are interchangeable, these energy fluctuations must amount to the spontaneous creation of particles in the vacuum. In order to not violate the various conservation laws of physics, any particle which possesses a conservable property (such as electric charge) must be simultaneously created as a pair with its antiparticle. Further, in order to avoid violating the conservation of energy, the pair must mutually annihilate each other so quickly that they are effectively unobservable. Because of this, such particle pairs are called "virtual" particle pairs to distinguish them from normally observable "real" particles. Thus, as Barrow (2001 p233) says "the quantum vacuum can be viewed as a sea composed of all the elementary particles and their antiparticles constantly appearing and disappearing." I suggest that this is a modern rendering of the idea that *Taiji* arises from *Wuji*: *Wuji* describes the quantum vacuum – an apparently empty, but infinitely creative state; then *Taiji* can be seen as the closely bound pair of a particle and its antiparticle that arise spontaneously from the vacuum.

Although *Yin* and *Yang* exist in *Taiji* they are still tightly bound together and the final stage in the metaphysical development shown in Figure 1 can be seen as the arising of *Yin* and *Yang* as individual forces, connected by the principle of polarity, which interact to create observable phenomena. Although quantum theory tells us that the virtual particle pair must be unobservable, if a charged pair of virtual particles arises within close proximity to a real charged particle, then the two sets of charges can interact. Penrose (2005 p677) describes how the presence of a real electron creates a charge separation in the virtual electron-positron pair, repelling the electron and attracting the positron. Although slight, the cumulative effect of this vacuum polarization is to reduce the apparent charge on the real electron and this can have an observable effect on the interaction of real particles.

Bohm's Holographic Universe

Bohm (1980 p181) says "not only is undivided wholeness implied in the *content* of physics (notably relativity and quantum theory) but also in the *manner of working* in physics." As a result of this he argues for a radically new order aimed at exploring the connection between theoretical frameworks, observations and instrumentation which, he says, cannot be coherently regarded as separate from each other. He proceeds by analogy with the hologram which captures a three-dimensional image of a solid object on a two-dimensional photographic plane by means of recording the interference patterns in coherent light. Each portion of the hologram contains information about the whole image. Thus, when we look at the whole image, we are able to see the original object from various angles as we change our view point on the hologram. Further, if we take only a portion of the hologram, we see not a part of the original object, but rather the whole original object but with reduced brightness and from restricted viewpoints. So, the pattern in each region of the image encodes aspects of the whole object and, conversely, each part of the object is encoded across the whole pattern of the hologram. This is clearly very different from an ordinary photographic image, where each portion of the image merely encodes a portion of the object and taking only a portion of the image shows us only a portion of the original object.

Bohm conceives of the whole of reality in such a holographic manner. That is, each part of reality contains information about the structure of the whole "enfolded" within it. This enfolded structure is what Bohm calls the *implicate* order. The notion of implicate order is to be contrasted with *explicate* order: the aspect of reality that is immediately available to our senses and instrumentation. From one perspective, parts of the implicate order are carried as information. For example, the patterns of vibration in light waves enfold information about the objects they have interacted with

on their journey through the universe. More generally, the information structures of the implicate order are carried by the *holomovement* – a generalization of all the possible carriers of implicate order. The explicate order, our manifest reality is continuously unfolding from the holomovement of the implicate order and then re-enfolding into it.[3] In this picture, the implicate order is primary. What we see as causal links between events in the explicate order are, more properly, to be seen as connected unfoldings from the implicate order, related by deeper principles which are to be expressed in terms appropriate to the implicate order, rather than the gross mechanical rules of classical physics.[4]

Consciousness plays a key role in this picture of the structure of reality. Bohm uses the example of our perception of music. The notes of a melody arrive sequentially, separated in time, but it is the reverberation of earlier notes continuing in our consciousness that provides the context for the understanding of the current note. The earlier elements of the music, although they have ceased to exist in the explicate order, have been enfolded into the implicate order of our mind, whilst the perception of the immediate sensation of the new note forms an explicate order of thought. It is the interaction between these two aspects that actively creates the structure of the musical piece. Thus, our bodies, as stable, extended physical structures are elements of the explicate order; whilst our minds, able to enfold and unfold information, exist in the implicate order.

I have previously suggested (Schöter 2004a) that we can make a strong parallel between the picture of reality given by Bohm and the structure given in the *Yijing* based on the traditional realms of *Tian* 天 (Heaven), *Di* 地 (Earth) and *Ren* 人 (Humanity). Consider the following lines from the *Dazhuan* «大傳» translated by Wu (1991 p263):

> *In the heavens images are completed.*
> *On the earth bodies are formed.*
> *...*
> *Qian knows the great beginnings.*
> *Kun makes and finishes things.*

The trigram associated with Heaven is *Qian* 乾, the Creative; this is pure *Yang*, the source of all movement, and generates the patterns which events follow. In contrast, the trigram associated with Earth is *Kun* 坤, the Receptive, pure *Yin*; this provides a material substrate in which the unfolding of the Creative patterns can actually take form. The parallels between the implicate order as *Tian* and the explicate order as *Di* are clear. Further, in the traditional metaphysics Humanity, *Ren*, arises between, and serves to connect, Heaven and Earth, which is exactly how consciousness functions in Bohm's picture, connecting the implicate and the explicate.

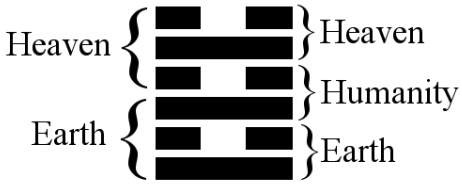

Figure 2: The Domains of Change

This relationship is represented directly in the structure of the hexagram as shown in Figure 2. Consider the major division into two domains first: the top three lines of the *gua* form the upper trigram, which represents the pattern of

3 In Schöter 2005, I describe the mathematical structure of the *gua* as a lattice with sequences of sublattices in a way that facilitates the modelling of the unfolding of the explicate order from the implicate in the language of the *Yijing*.

4 Bohm actually suggests a whole hierarchy of implicate and super-implicate orders, each unfolding into the order below until the phenomena become manifest in the explicate order. The simplification, in this paper, of talking only of *the* implicate order does not detract from the essence of his view.

energy in Heaven, the implicate order; the bottom three lines form the lower trigram, which represents the pattern of energy in Earth, the explicate order.[5]

Now consider the ternary division shown on the right of the diagram. Here the middle two lines are assigned to the domain of Humanity. Thus, the bottom line of the top trigram (Heaven) and the top line of the bottom trigram (Earth) combine together to give form to Humanity, where the function of the mind acts in the implicate order and the body is a manifestation in the explicate order.

I have now presented two key metaphysical aspects of the foundation of the *Yijing*. The first described how the basic polarization of experience arises spontaneously from the undifferentiated void. The second described the division of reality into distinct but interacting domains. These two ideas contribute to the conceptual foundation of the *Yijing*. In both cases we found ideas in modern physics that provide striking parallels. I suggest that this lends weight to the assertion that the underlying symbolism of the *Yijing* is, in a strong sense, universal.

Physics and Divination

Divination is a difficult practice for the modern scientific framework to accommodate. Perhaps the best we might hope for from the perspective of classical science is an explanation based in the psychological aspects of interpretation and significance. I have previously explored divination in terms of the dynamics of a conversation between the symbolic content of the *Yijing* and the diviner (Schöter, 2004a). Here I wish to revisit some of those ideas, delving a little deeper, and connecting these issues with the metaphysical foundations already described. The aim is to provide scope for a stronger explanation of divination that finds a basis in the interaction of the implicate and explicate orders. To begin with I shall define the process of divination as *the interpretation, in relation to a given situation, of the symbolic output of an unpredictable process*. Along with the creative act of interpretation, chance and predictability are therefore at the heart of divination.

For Zhu Xi 朱熹 (1130-1200CE) the act of divination is at the heart of understanding the *Yijing*, describing the original meaning of the work as "not in its various layers of text, but in the oracular function of the hexagrams." (Adler, 1990 p1). The ancient understanding of the functioning of divination relied on the agency of *gui-shen* 鬼神 (ghosts and spirits). However, although he used this terminology, Zhu interpreted these as essentially impersonal: on the one hand, they were "nothing more than the waxing and waning of yin and yang" and on the other, they were also "traces of the creative process" (Adler, *ibid.* p22-23). Thus, divination is not concerned with the supernatural, but with the more subtle aspects of the natural. In Zhu's view divination is a technique for self-cultivation and requires a quiet mind that can listen to the waxing and waning of *yin* and *yang*; only if one is peaceful and concentrated is it possible to hear the response of the *gui-shen*.

Synchronicity and The Implicate Order

Combs and Holland (2001 p152) describe systems such as the *Yijing* as being forms of "active divination". The contrast is with the interpretation of omens and similar events, which happen regardless of the actions of the individual, but which are interpreted relative to the individual's situation. With the *Yijing*, however, the individual actively asks a question and then uses a

5 In the hexagram, these two domains are distinct and do not overlap. However, the traditional relationship of correspondence, *Ying* 應, describes a dynamic connection between the patterns in the two domains. I explored this relationship from an algebraic perspective in Schöter 1999.

deliberate technique to generate a symbol which is taken to encode an answer to the question. Even in the context of the preceding metaphysics, we are left with the question of the nature of the connection between the situation that gives rise to the act of divination and with respect to which the symbols are interpreted, and the actual outcome of the divination process. More bluntly, how can the resulting symbols, generated by the unpredictable technique, be relevant to the problem? Answers to this question can take a variety of forms.

As already suggested, the weakest answer, in terms of connection, is to simply say that the relevance lies entirely in the act of interpretation: the symbolic answer is relevant to the extent that a suitable interpretation can be given in relation to the original situation. The connection, in this picture, lies entirely in the mind of the diviner. Whilst such a picture raises interesting psychological questions, it is ultimately unsatisfactory from the perspective of the metaphysical framework.

Jung's principle of *synchronicity* is well-known in this context (Jung, 1955). Starting from the premise, already acknowledged in quantum physics, that causality is a problematical phenomenon, Jung suggests that there must be other principles that can serve to connect events in certain circumstances. To that end, he proposes synchronicty as an *acausal* connecting principle. The usual definition of this phenomenon is as "meaningful coincidence" – two or more events happen to occur, sometimes more or less contemporaneously, sometimes separated in time, and a significant connection is seen between them. Of course, it could be argued that this explanation is still predominantly psychological: the significance is in the mind and perhaps the coincident events have no other connection. However, we have already seen in the metaphysics of both the *Yijing* and Bohm's physics that the explicate physical order, consciousness, and the implicate order of pattern are woven from the flow of a single fabric. Further, in Bohm's view, what connects events and things should ultimately be expressed in terms of the implicate order, not the explicate. Things which have the same degree of enfoldment are *synordinant*, and so will unfold and become explicate together (Bohm, 1980 p194). But this notion of "together" is neither necessarily synchronous in time nor necessarily local in space – the implicate order can, in principle, unfold synordinate events at distinct spaciotemporal locations.

Because the mind is, in part, participating in the action of the implicate order it is conceivable that one could perceive synordinace even when spaciotemporal locality is lacking. This is, or course, sensitivity to a subtle, natural phenomenon, and therefore could be described, in other language, as listening to the *gui-shen*. Adler (1990 p17) notes that divination is to be explained in terms of *shen* 神 which enables both the mind and the unpredictable technique of the *Yi* to respond to the underlying patterns of transformation in *qi* 氣 and that "as a characteristic of [*qi*] itself *shen* refers to the coherence of certain phenomena in which coherence is not empirically observable by the ordinary mind." In the context of the current discussion, coherence which is not empirically observable could meaningfully be interpreted in terms of synordinant events in the implicate order. Thus, Bohm's physics offers a potential explanation for the non-local, acausal phenomenon of synchronicity that weaves the psychological and the physical together into a single framework.

Morphic Resonance and Divination

Nonetheless, we are left with an explanatory gap. Even if we take on board implicate synordinance as the basic structural property of reality and allow that consciousness has some direct access to this ordering, we are left wondering how a series of unpredictable events can result in symbols that are

relevant to the situation being divined about. That is, why, for any given act of divination, should we expect the patterns resulting from tossing some coins to be synordinant with the particular situation under consideration? But this is exactly what Jung suggested. Combs and Holland (2001 p153) say that Jung first introduced the concept of synchronicity in his memorial address for Richard Wilhelm in 1930, suggesting that it is the very unpredictability of the mechanism that allows the resulting pattern of the coins to reflect the broader patterns in the situation under consideration.[6] But there is more to it than this: as Combs and Holland are aware, the attitude of the person making the divination is also important. Confirming most people's experience, they observe that bringing an attitude of respect and reverence to the act of consulting with Change is crucial. This echoes Zhu's admonishment to be "extremely dignified and extremely reverent" when consulting the *gui-shen* through divination (Adler, 1990 p23). This attitude is a deeply significant part of the process, helping the mind to become sensitive and responsive to Change.

The metaphysical framework outlined above allows for the mind to interact directly with the implicate order. By bringing the mind into a suitable state, its deep patterns may be able to imprint directly into the implicate order and therefore effect the resulting events that unfold into the explicate order. This effect is clearly not direct – it does not seem possible to directly control whether a coin lands heads or tails through thought – but a divination relies on the overall pattern of the coins, not the individual tosses, and the resulting overall pattern is then indirectly interpreted as a pattern of change relevant to the circumstances. That is, in divination, the mind is not trying to directly impose a particular outcome on the unpredictable events. Instead, it is creating an implicate context in which those events occur, creating a unified situation in which the mental context and the events under consideration are both parts of the same whole.

The idea of the *morphic field* is relevant here (Sheldrake, 2009). In modern physics everything can be interpreted in terms of fields: electromagnetic fields are used daily in our radio and television transmissions, the receiver in the set resonates with the vibrations of the transmission to amplify its signal. But even particles such as electrons are to be understood as localized excitations of an underlying field, and the holomovement, discussed above as the carrier for the implicate order, is a vast collection of interacting fields. Sheldrake extends this idea to every aspect of reality. Thus, the mind itself generates a field that carries information about its intent and content. In this model then, the field of a mind, which already interpenetrates with the implicate order, could enter into resonance with the fields of the implicate order, resulting in a mutual influence where the deep concerns of the mind affect the content of the implicate order in such a way as to allow the unpredictable technique to express relevant pattern as it unfolds into the explicate order through the act of the divination.

Of course, I hardly need add that, from the scientific perspective, these ideas are highly speculative. Not only does Bohm's picture of the structure of reality lack empirical support, but it is even difficult to see what experimental techniques could be applied to it. Further, Sheldrake's work is extremely controversial in mainstream science. However, the strength of this approach is that the theory fits extremely well with the traditional metaphysics of the *Yijing* and, taken as a whole, seems to provide a coherent framework, expressed in the vernacular of science, which at least offers the potential of a contemporary explanation for divination.

6 The technique most usually taken to have spiritual content is the milfoil (yarrow) stalk. However, I am suggesting that it is the unpredictable nature of the process, not the physical material used, which carries the spiritual charge.

Conclusion

Adler (1990 p15) provides the following summary of Zhu Xi's view of the function of the *Yi*:

> *The hexagrams of the [Yi] represent the yin-yang fluctuations and transformations of the Way. The [Yi] as a symbol system "discloses things" by representing natural pattern in graphic form, making it easier to comprehend.*

Bohm, speaking of the mathematicization of the ideas of implicate and explicate orders, says (1980 p205) that "an algebra contains key features which are similar to the key features of structures built on implicate orders." Boolean algebra is one of the most basic forms of algebra and, as I have shown extensively elsewhere (for example Schöter, 1998, 2004b, 2005), Boolean algebra can be fruitfully applied to the symbols of the *Yijing*. As such, I suggest that the *Yijing* forms a powerful notational system for exploring the manner in which the implicate order unfolds into the explicate, for exploring the manifestation of consciousness within pattern and matter. However, this is only part of the picture. Adler goes on to say:

> *But the Way, to be actualized, must also be internalized by the human will and put into effect in human affairs. Moral decisions must be made, based on an integrated understanding of the self and the world. Self-doubt is inevitable at this point, and the [Yi] provides a method by which doubts can be settled and intentions trained to issue spontaneously in a proper direction. Divination is this method.*

We have seen that a coherent picture of divination can be expressed in terms of physics that directly parallels the metaphysics of the *Yi*. That the role of human consciousness is significant in this picture accords with Adler's characterization above. Further, the view of reality that this physics emphasises is a seamless, continuous field where human beings are deeply integrated into the basic fabric of reality through their consciousness. Once such a view is taken seriously, the only rational choice of action is an investigation into the causes of our fragmentary perception and a resulting movement towards realizing the true wholeness of reality. This is the essence of self-cultivation, as espoused by the great proponents of the *Yi*.

Zhu Xi, cited by Adler (1990 p8) says that we should "approach the old teaching in order to bring out new views." The work in this paper is presented in this spirit, and seeks to express the continuity of idea between the ancient sages of Change and contemporary thought. Bohm (1980 p31) is in agreement with the importance of this approach:

> *So what we have to do with regard to the great wisdom from the whole of the past, both in the East and in the West, is to assimilate it and to go on to new and original perception relevant to our present condition of life.*

I contend that the *Yijing*, both as a source of abstract philosophical study and as a practical tool for divination, provides an excellent method for generating, structuring and exploring "original perception relevant to our present condition".

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