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INVITED ARTICLE

THE MULTIPHASIC MODEL OF PRECOGNITION: THE RATIONALE[1]

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ABSTRACT: Precognition is defined as an atypical perceptual ability that allows the acquisition of noninferential information arising from a future point in space-time. Despite the controversies, there is sufficient empirical evidence for the validity of the phenomenon. The *multiphasic model of precognition* (MMPC) is capable of addressing the experimental data. The MMPC identifies two distinct phases: The physics domain (PD) addresses the question, "How is it possible for information to traverse from one space-time point to another?" We suggest that the solution might be found within entropic considerations. The acquisition and interpretation of retrocausal signals from a future point in space-time is via three stages in the neuroscience domain (ND): Stage 1, perception of signals from an information carrier, which is based upon psychophysical variability in a putative signal transducer; Stage 2, cortical processing of the signals mediated by a cortical hyper-associative mechanism; and Stage 3, cognition, which is mediated by normal cognitive processes that lead to a precognitive response. The model is comprehensive, brain-based, and provides a new direction for research, requiring multidisciplinary expertise. In this article, the authors present the MMPC and discuss the rationale for the hypotheses put forth for the PD and the ND.

Keywords: precognition, retrocausation, entropy, signal-based model, cortical hyperassociative mechanism

Operationally, precognition (PC) is specified when a stimulus is generated relative to a response. In traditional human-centered research, a response is always elicited *after* some stimulus has been administered. In precognition studies, however, researchers reverse that order—a randomly determined stimulus is generated *after* a response has been registered. At the end of this article, we provide a more formal definition, based on the multiphasic model of precognition (MMPC).

The observables in informational-psi phenomena are: (a) information originating at some distant space-time point and (b) the information eventually reported as some form of cognition. Both informational and person perspectives are necessary for the holistic understanding of the phenomenon.

The problem of precognition (a person-centric perspective) needs to incorporate the external world. However, researchers trained in a person-centric perspective apply the principles of their field in interpreting physical theories. The absence of fidelity to the domain of a theory based in another discipline lends to utter confusion in its interpretation, leading to extending the theoretical constructs of a particular theory way beyond its intended applications, limitations, and domain specificity. Examples include quantum theory, which addresses the domain of the micro-world of matter; information theory, which addresses the domain of "pure information" without cognitive content; and phenomenological theories, which address the subjective experience of the external physical reality.

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[1] This is the written version of an Invited Address delivered at the 57th Annual Convention of the Parapsychological Association, Concord, CA, USA, August 14–17, 2014.

Defining the Problem Space

The multiphasic model of precognition (MMPC) is a signal-based,[2] process-oriented model designed to determine the causal mechanisms leading to the experience of precognition. As a starting point, we have formally defined the problem space of precognition (PC) by considering two phases.

1. Phase I falls exclusively within the physics domain (PD). It addresses the question, How is it possible that information can go between two space-time points and be used, especially if the two points are separated such that their can be no causal relations between the two points? It is related to how information is carried from an external source, which is distant in time and space, to the percipient. Or in simpler terms, the PD considers everything about PC that occurs outside the head. We refer to psi in the PD as retrocausation (RC) and the carrier of such information coming from a future point in space-time as a retrocausal signal (RC signal). In doing so, we provide a distinction between the PD aspect of the process and use PC for the ND, to refer to the internal and subjective part of the process.
2. Phase II falls entirely within the neuroscience domain (ND)—internal to the human percipient. It addresses the experiential part of the problem, that is, how the information is acquired by a putative sensory system, how this information is processed in the brain, and how it is expressed. We define the acquiring mechanism as a transition between the PD and ND.

In our view, RC information arises from the external world (i.e., the PD), and is perceived and processed in the internal world (i.e., the ND). This formal bifurcation clearly lays out the domain of activity for researchers from various disciplines. A physicist interested in the question of how information can travel from there/then to here/now need not be concerned with how the information is perceived. A geneticist searching for a possible genetic basis for brain structures that permit the interpretation of a putative RC signal need not concern himself with the questions faced by a physicist. While advances in both the domains will lead to an understanding of the *process* of PC, in the intermittent phase, fidelity to one's own discipline without encroaching on the constructs of the other domain will result in less confusion and generalization of terms to domains where they are not applicable.

The MMPC addresses both the PD and the ND by considering the well-established laws of the physical world and what we currently know—and will know—about brain–behavior relationships. Thus, the MMPC is a coherent assimilation of existing concepts that we believe can lead to understanding the *process* of PC—from the point of information origin to cognition. The structure of the MMPC permits a "specialization" in PC research based on the domain that a researcher chooses to focus on, based on his area of expertise. In our view, the two domains (PD and ND) and the three stages within the ND seem to be immutable, with scope for development of more hypotheses within each domain and stage.

In this article, we discuss the rationale for the hypotheses put forth in the two domains of the MMPC. Following this, we discuss the formal definition of precognition. As with advances in any field, new developments are based on the historical past and current thinking. At the outset, we acknowledge the foundations—across disciplines—on which this model is based.

The Rationale

In this section, we discuss the rationale behind the model. To do this, we first examine what we *do know* and *do not know* about informational psi and briefly discuss the development of the MMPC. Follow-

[2] Signal detection theory "provides a general framework to describe and study decisions that are made in uncertain or ambiguous situations. It is most widely applied in psychophysics—the domain of study that investigates the relationship between a physical stimulus and its subjective or psychological effect—but the theory has implications about how any type of decision under uncertainty is made. It is among the most successful of the quantitative investigations of human performance, with both theoretical and practical applications. . . . The decisions depend on many particulars: what the decider knows, his or her expectations and beliefs, how later information affects the interpretation of the original observations, and the like. An understanding of much domain-specific knowledge is needed [to extract meaning from the physical stimulus]." (Wickens, 2002, pp. 3–4).

ing this, we discuss the considerations on which the PD and ND are based, and in the following section, present the model. Further details of the MMPC can be found in Marwaha and May (2015a, 2015b) and May and Depp (2015).

What We *Do* Know About Informational Psi

The consolidated informational psi data suggest that it is a robust statistical phenomenon and provides robust qualitative information for model development as well. Examples of quantitative data are found in the entire body of psi literature. Meta-analyses of these data present a summary picture (Bem, Palmer, & Broughton, 2001; Honorton, 1993; Honorton & Ferrari, 1989; Honorton, Ferrari, & Bem, 1998; May, Utts, Trask, Luke, Frivold, & Humphrey, 1989; Mossbridge, Tressoldi, & Utts, 2012; Steinkamp, Milton, & Morris, 1998; Storm, Tressoldi, & Di Risio, 2010, 2012).

Qualitative information for a model is found in the entire database of remote viewing studies; examples can be found in May and Marwaha (2015, p. 345), McMoneagle (2015), and Puthoff, Targ, and May (1977). As these examples suggest, the remote viewing responses have been used in operational situations along with data from other traditional sources of intelligence. The research further indicates that one cannot be trained to develop a psi ability; it is an innate ability much like musical giftedness and other aptitudes that we have (May et al., 1989). For instance, there are people who are tone deaf, many who can appreciate music, and gifted musicians who create the music. The PC information is obtained from forward in time and appears independent of distance. The channel capacity appears to be low; that is, over any reasonable time for a session, the total amount of formal information is limited. For example, it would be like trying to listen to your favorite concert with an old-fashioned telephone. This implies that the information received is diffused and scant. PC may be a nonstationary stochastic system; that is, its statistical properties are not constant. Although this uncertainty could be in the source, transmission, or detector (brain) systems, it most likely arises in the detection system, like the vagaries of perception for other sensory inputs.

There are two classes of analyses that we have for any study: (a) quantitative analysis, which helps determine the robustness of the data, and (b) qualitative information for model building, which usually is not contained in the numbers. There is much value in the qualitative information that one can acquire by examining the raw data, especially when we are undertaking the task of understanding the process of PC. While the statistical data are critical for determining what is valid, it does not help much to determine the process. An example such as Joe McMoneagle's remote viewing of a building in Severodvinsk in the northern part of the Soviet Union, conducted over several days and sessions, is best analyzed qualitatively, because like in most operations no quantitative data are available. Analysis of the interview process during response generation, transcript recording, and response drawings yield answers to questions such as the point in space-time from which the information arises, the process of data acquisition, the amount of data acquired, the correspondence of remote viewed data to the target site, insight into cognitive overlays during the process of response generation, and so forth. In describing the remote viewing of this site, McMoneagle (2015, p. 286) states, "At the time, our side did not know what was going on inside, and I was tasked with finding out via remote viewing. It was learned later that the building was being used as a Soviet submarine base to construct an unknown (to the United States) first Typhoon class submarine (as it was called by the North Atlantic Treaty Organization [NATO]). The accuracy of this viewing was later confirmed." Examples such as this provide indicators to the underlying mechanism. As a prototype of PC, this example cannot be explained via quantum theory based models or models using a QM metaphor. Examples such as this, and the numerous spontaneous experiences, need a different explanation, and at the same time they provide useful information with regard to model building.

Existing data in the psi literature, such as personality, neurophysiology and so forth, appear not to be predictive nor are they explanatory. Extraversion-introversion was one of the most widely explored dimensions of personality factors in relation to ESP. However, extraversion has not been predictive of psi ability and its apparent correlation with psi appears to be an artifact of the data collection procedure (Honorton, Ferrari, & Bem, 1998). Because we are examining the process of PC, the question as to how exactly does extraversion contribute to the acquiring of RC information, whether we use a brain-based, a dualist, or a quantum-based model, does not yield satisfactory answers. If extraversion were a critical factor in the PC process, and not an artifact of the test situation, then, considering that extraverts are widely distributed in the population, psi too should have a wider distribution. However, this is not the case. Moreover, even if extraversion were a critical factor, we would still need to look at the neurological correlates of extraversion to understand how PC occurs.

What We Do *Not* Know About Informational Psi

One of the biggest problems that psi researchers face is that we do not know when, where, or for how long psi occurs (i.e., we are unable to pin down the specific moment when RC information is obtained from the external world). Further, we do not know the nature of the RC signal, nor what the information carrier is. We do not know from where the apparent stochastic nature of the RC signals arises. We do not know its genuine transmission rate (bits/symbol). We do not know who has psi ability and why we cannot train for it—although we now have a model (MMPC) that addresses this point and provides testable hypotheses. Confidence calling is problematic, in that for the most part it appears impossible to determine via some a priori method whether or not a given response is correct. One hint that this problem may be tractable comes from May (2007/2014a), in which he demonstrates 10 correct calls in 12 attempts in a one-in-three setup. We do not see *stable* CNS correlates. Further, we do not know *many* other things, such as whether the remote viewer sees actual or probable futures. What about free will? Can we bilk the future? And other such interesting questions that deal with the nature of time and information.

Development of the MMPC

Considering that there is statistical evidence for an information transfer anomaly that we currently do not understand, our interest was in understanding that anomaly—that is, the "how" of PC. The initial name for our model was "multiphasic model of *anomalous* cognition." Despite the many blank spaces and a need for experimental verification for the hypotheses put forth, at the end of the exercise of model development, we realized that we did have a possible answer for the process of how psi may occur; that is, the process of the PC experience may no longer be an anomaly.

An extremely important realization was the primacy of PC. An important point for PC as the *only* form of psi—both experimentally and theoretically—is that if we are to accept the possible existence of PC, then, we cannot ignore the PD (Marwaha & May, in press). Extensive details about the entropy hypothesis of the PD can be found in the section on "Entropy: A Fundamental Model of Anomalous Cognition" in May and Marwaha (2014), and May and Depp (2015). Another approach has been to say that psi is simply a form of correlation (von Lucadou, 1995, 2015) that abandons the concept of signals; however, that cannot be if the information obtained can be used. The psi literature, including the anecdotes of the Star Gate spying program, describes examples in which psi has been successfully used.

While the physics domain is especially challenging, nonetheless, the observable that psi can be used demands a signal based model.

Considerations for the neuroscience domain. Based on precognition protocols and qualitative analysis, we know that information is coming from a future point in space-time. For all our normal perceptions, the sensory organs are not extending *out* to the object of perception (as was thought by ancient theorists). Rather, information from the object is coming *to* the sensory system. For example, the eyes are not reaching out to the sun; rather, 8 minutes and 19 seconds later, photons from the sun are impinging on the retina, from where they are absorbed, biochemical reactions take place, and information is sent to the visual cortex. In our view, there is no apparent reason why precognition should be any different.

Moreover, once information from a distant space-time point (i.e., the future), traveling via the processes suggested by, and yet to be discovered in, the PD, comes to the percipient, at that moment it is no longer "pre"-cognitive. Rather, the percipient is perceiving the information in the "here and now." Thus, from the point of view of the ND, that is, the person-centric perspective, we do not have to be concerned about the distant in space-time nature of the information. *The information—that may be from the future—is available in the present*.

In that case, as far as the perception of retrocausal signals is concerned, in a process-oriented model that addresses the person-centric perspective, we need to take into account (a) the nonuniversality of psi ability, (b) the stochastic nature of the signal, (c) the absence of an identified transducer for a putative RC signal, and (d) the probably different nature of the RC signal.

Thus, we have to ask the question *how* the human brain can perceive such RC informational signals.

The normal process of acquiring information from the external world occurs in the following three stages: perception (through a transducer), cortical processing of the information, and the cognitive processing that interprets the information. Thus, a transducer and cortical connections are required for the conversion of any external signals to biochemical actions that can be processed by the brain, so that "pure" information can be interpreted in a subjectively meaningful way.

Much of the information that we have on the "normality" of any aspect of human ability is based on averaged data. While this gives us population norms, and we can identify persons who are at the lower end of the normality curve (for developing treatment and rehabilitation programs, and for research if they present as savant syndromes), we rarely pay attention to and examine those on the higher ends, particularly the outliers. Similarly even within the ranges of what is termed normal human perceptual limits, there are outliers on both sides of the curve, whereby those individuals may have the ability to perceive ranges that are beyond the normative ranges but *within* the limitations of the species-specific abilities.

Thus, in order to address these factors, we need a model that can account for how information travels from there/then to here/now, a feature that can serve as a link between the external and internal world and process a different type of signal. The multiphasic model of precognition addresses this process across two phases: Phase I—the PD, and Phase II—the ND. It occurs in three stages: Stage 1, the perception of RC signals; Stage 2, cortical processing of RC signals; and Stage 3, cognition. In the following section, we illustrate the PD and ND of the MMPC.

Phase I: The Physics Domain

Phase I is within the PD. As stated, it addresses the question, how is it possible for information to propagate between two noncausally related points and be acted upon? It is related to how information is carried from an external source, which is distant in space-time, to the percipient. We suggest that the solution might be found within entropic considerations. Figure 1 illustrates the PD.

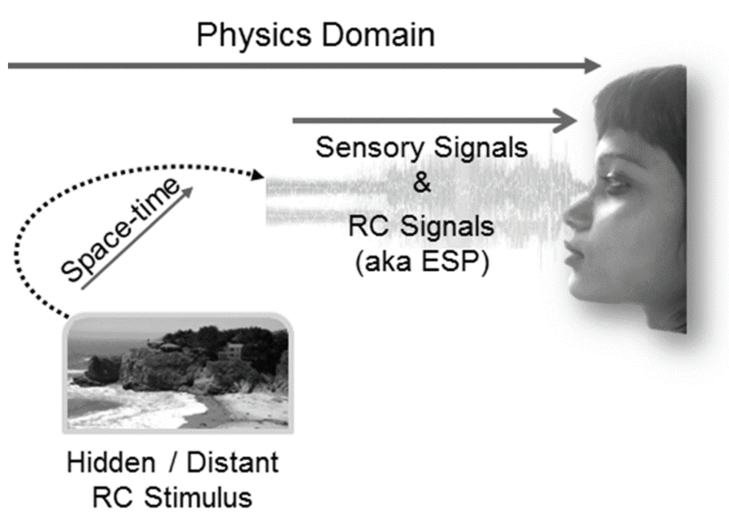

Figure 1. Physics domain. How the information traverses space-time and arrives in the near vicinity of the participant is completely independent of the parameters of that participant. He or she could be an atheist, a Buddhist monk, a stockbroker, or a skeptic.

What Might the Concept of Entropy Hold for Psi Research?

Building upon the pioneering work of Leó Szilárd (1964; Szilárd & Feld, 1972a, 1972b), Shannon and Weaver (1949) developed what is now called information theory. This theory formalizes the intuitive idea of information that there is more "information" in rare events, such as a train accident, than in common ones, such as taking a breath. Shannon defined the entropy for a given system as the weighted average of the probability of occurrence of all possible events in the system. Entropy, used in this sense, is defined as a measure of our uncertainty, or lack of information, about a system. Consider, for example, a raw egg sitting on the table. It is well organized as a small spheroidal shaped object. Now knock it to the floor and this once organized (i.e., low entropy object) becomes highly disorganized (i.e., higher entropy state). This tendency in nature for systems to move from low to higher entropic states is called the second law of thermodynamics. The details of how this relates to understanding psi can be found in May and Depp (2015). It is well known that this law provides us with the observable that the flow of time at the human level is unidirectional. For example, the skin of a newborn is smooth and unblemished (i.e., low entropy) and the skin of an old person is wrinkled and blemished (i.e., higher entropy); this apparent unidirectional flow of time is at odds with time at the micro-level.

The second law of thermodynamics relates the bidirectional flow of time in the micro world of atoms and molecules to the unidirectional flow of time at the human level. As we discuss next, entropy considerations lie at the heart of psi data.

The Data

In the Star Gate program, we noticed that a class of anomalous cognition "spying" missions *never* failed. The targets for these remote viewing sessions represented a large change of thermodynamic entropy at various target sites (May & Lantz, 2010/2014). Further research in seven laboratory studies has shown a persistent correlation with changes of entropy of the target stimuli; that is, $r = .211$, 95% confidence interval [0.084, 0.332], $p = 6.4 \times 10^{-4}$ (May, 2011/2014b). Because entropy and its changes connect the micro- to the macro-flow of time, and because PC appears to violate that flow at the macro-level, these data strongly provide a clue on how to move forward in the PD.

Criteria for the PD

There are no examples of information transfer with which one can do work (i.e., use) that do not have a concomitant energy carrier. Examples include vision information as carried upon EM waves and sound carried upon a compression wave in some medium. Therefore, it is unlikely that PC will be the first counterexample. Thus, we require an energy carrier. One implication of this requirement is that the putative energy carrier must be capable of propagating from the future to the present.

Conclusions for the Physics Domain

We have noted that there is considerable experimental evidence that suggests entropic gradients may be important in understanding the PD. Clearly, more work is needed. Further details on the PD can be found in Marwaha and May (2015a, 2015b) and May and Depp (2015).

Although the concepts of entropy, arrow of time, and information are all connected, these notions are all highly speculative at this moment as candidates for the PD part of the model. What the carrier of RC information is comprised of is even more speculative. We speculated in the PD in the MMPC that perhaps information can propagate backward in time through wormholes in hyperdimensional space.

Once the information is somehow in present time, how it gets into the CNS remains a major mystery, and the requirements for the transducer (i.e., psychic retina so to speak) will depend upon the energy details of the transfer mechanism.

The ND is far better developed, with immediately testable elements.

Phase II: The Neuroscience Domain

Phase II of the model refers to the processes that occur once the signals from any external source, including RC signals, have reached the percipient's CNS, and the processes that occur from perception to cognition of that data. This phase is primarily an implicit process. The MMPC deconstructs this domain into three discrete but fluid stages: (a) Stage 1—perception of RC signals from an energy carrier, (b) Stage 2—cortical processing of RC signals, and (c) Stage 3—cognition. One aspect of our model is that Stages 1 and 2 are critically different from normal perception in PC, following which, in Stage 3, normal processing occurs as it does for any other sensory input. Figure 2 illustrates the process of PC.

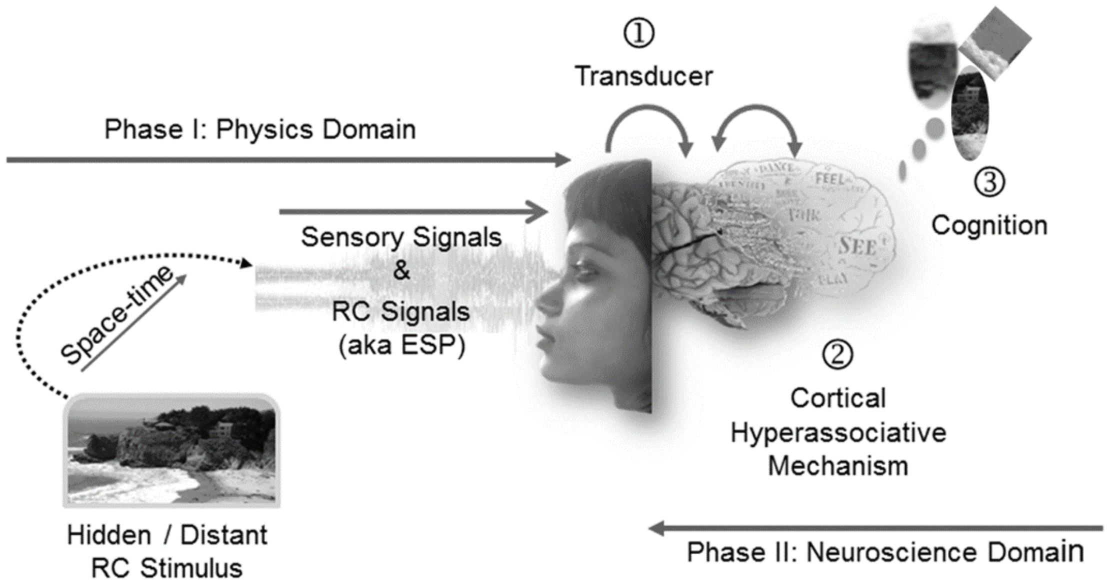

Figure 2. The process of precognition according to the multiphasic model of precognition. Although difficult to see, the cognition is scrambled compared to the stimulus. The house on the right of the stimulus is perceived accurately, but the rock on the left is missing, and the houses in between are blurred. The cognitive fragments are jumbled as well.

Stage 1: Perception of Retrocausal Signals

An important element in the process of PC is the presence of a signal transducer to serve as an interface between the incoming signals and the processing of that data. For example, the visual receptors in the retina are the transducers for signals from the visible EM spectrum. We can keep the nature of a putative PC channel an open question until we have a better understanding of the PD. Nevertheless, we can work under the assumption that PC information is received and processed internally in the same manner as are signals impinging on other sensory systems. As the nature of the putative RC signal is presently unknown, we have to assume that it is different from the normal thresholds perceived by us. This requires us to consider a possible variation in the transducer and the processing mechanisms. We have labeled the following hypotheses 1.1 and 2.1 to indicate the scope for additional hypotheses within each stage.

Hypothesis of psychophysical variability in a signal transducer (Hypothesis 1.1). This hypothesis states that psychophysical variability, in both CNS extent and function, can account for variation in the reception of RC signals; that is, some individuals demonstrate PC ability, whereas others do not. Approximately 1% of the general population possesses a natural remote viewing ability (May et al., 1989). As we have seen over 40 years of experimental work, PC ability is seen in varying levels of proficiency across the population, much like the varying levels of music ability, for example.

This hypothesis suggests that individuals with PC ability are different from those without it at the level of sensory input, as follows: The RC signal is acquired by those with PC ability due to a possible variation in a putative biological transducer, which is the point where external signals are transformed into biochemical/bioelectrical sensory signals and transmitted to the cortical structures where cognition occurs. These signals are connected and processed across multiple cortical areas. These steps are part of Stage 2 of the MMPC as described in the following section. The question of what the transducer is may be answered by our understanding of the PD, and vice versa. (We note that this is the only part of the ND that is dependent on the PD. From Stage 2 onward, the ND is independent of any PD considerations.)

The *hypothesis of psychophysical variability in a signal transducer* is the first stage wherein retrocausal signals emerging from a distant space-time point but existing in the "now" of the percipient may be acquired from the near, external environment.

Stage 2: Cortical Processing of RC Signals

Stage 2 of the model involves the processing of RC signals received as hypothesized in Stage 1.

Hypothesis of cortical hyperassociative mechanism (Hypothesis 2.1). Considering the possible variation in the nature of an RC signal, we may assume that it has characteristics that are different from known signals, and thus we propose that RC signals are processed via a crossmodal mechanism leading to a PC experience. We consider this notion by formulating the hypothesis of cortical hyperassociative mechanism (Hypothesis 2.1).

Cortical hyperconnectivity has been associated with atypical perceptual abilities such as synesthesia (Hänggi, Beeli, Oechslin, & Jäncke, 2008; Ramachandran & Hubbard, 2001; Rouw & Scholte, 2007; Simner & Hubbard, 2013) and savant skills in autism (Wallace, Happé, & Giedd, 2009). Hence, we borrow the term *hyperassociative mechanism* as used by Simner (2012) for describing the possible underlying mechanisms for synesthesia. As Simner states:

> . . .[there may be] *one of any number of* [original emphasis] possible neurological processes that might give rise to the "open channel" between different brain regions, which allows sound to be interpreted as colour, taste as touch, touch as smell, and so on. In fact, this neutral term should cover not one of several possible mechanisms, but rather, one or more of these possibilities. . . . Whether a functional connection is established by hyperconnectivity, by disinhibited pathways, by other means, or indeed, a combination of these, the outcome is the opening of a communication between regions that would otherwise not directly interact to produce a conscious experience in the average person. (p. 25)

Considering the possibility of a similarity in underlying mechanisms between synesthesia and the proposed internal PC mechanism, in our view the synesthete population may be a good point to start for examining this hypothesis. A crucial distinction between synesthesia and PC experiences is that synesthetic experiences apparently may occur in the *absence* of an external signal. As Sean Day (personal communication, January 3, 2014) stated, "Synesthesia does not convey information of any reality; it adds one or more nonreal perceptions to an initial inducing perception which may (or may not) be based upon reality." PC experiences, as we propose here, arise due to the *presence* of external signals. Others have also claimed that synesthesia may actually underpin ESP experiences (e.g., Alvarado, 1994; Myers, 1903; Simmonds-Moore, 2010, 2014).

In summary of Stages 1 and 2, RC signals may be acquired by an individual with PC ability, due to psychophysical variability in the signal transducer (Hypothesis 1.1); these signals are then processed in accordance with Stage 2. The cortical hyperassociative mechanism (Hypothesis 2.1) takes advantage of a possible increase in spectral range of EM and/or the perception of the RC signals that the brain can process.

Stage 3: Cognition

Following Stage 2, we propose that in Stage 3 cognition of the information occurs through the normal process, as it does for other sensory inputs, wherein information is stored, retrieved, influenced by subjective experiences, and manifested in the form of a response such as ideas/writing/drawing/narration/ in a dream state.

We strive to keep what is known in physics, psychology, and neuroscience as intact as possible. Therefore, it seems reasonable to assume that the processes involved in cognition of signals from normal sensory modalities will also be involved in the cognition of RC information. We have indicated in Stages 1 and 2 of the ND of the model that high variability of sensorial systems connected via a hyperassociative mechanism to other CNS structures may be the pathway for RC signals into the CNS. Once there, the cognitive correlates of RC signals may be indistinguishable from those of normal sensory signals. This would suggest that it might not be possible to observe CNS correlates of PC inputs simply because they would be indistinguishable from other CNS correlates. This is particularly so because, so far, we are unable to determine what signals to look for and unsure about *when* the RC signals were received and processed by a transducer. For instance, the percipient may have received them before being connected to the EEG gear or placed into an fMRI scanner, or the day before, or in the parking lot before entering the laboratory; or perhaps the signals have such a short duration that they are missed by the hardware.

As stated earlier, RC signals are generally not robust and are difficult to detect. Moreover, they also appear to be statistically nonstationary; that is, statistical properties vary with regard to when they are measured. Where that apparent nonstationary aspect arises is unknown; however, as stated, there are only three possibilities—at the source, in the transmission channel, or in the detection mechanism. Therefore, the cognition resulting from PC is unreliable. Normal psychological influences, such as memory formation, emotional overlays, lack of attention or intention, ill health, effects of medications, and so on, will interfere with PC response formation as they do with other forms of cognitive activities (McMoneagle & May, 2004/2014).

As PC is an unconscious process, we can assume that a PC-abled person is privy to a wider spectrum of information that he or she incorporates in his or her daily life. In our view, the most crucial aspect in the PC process lies in the PD, and PC involves Stages 1 and 2 of the ND. The MMPC proposes that once the information (PC stimulus—new information) has been implicitly received, it is stored in the memory in the same way as information from the other sensory systems. It is retrieved when the need for it arises or in dreams.

Factors such as attention, emotions, beliefs, memory, creativity, uncontrolled random thoughts, intellectual decisions, linguistic influences, and so on (May & Trask, 1988) may interfere with PC responses as they do for the other senses. In the parlance of PC protocols, they are referred to as “overlays.” Thus, in a normal protocol in a PC session at our laboratory, a participant is asked to first note-down/illustrate the thoughts/images that are on the top of the participant’s mind before the session begins. In this manner, the cognitive overlays—the personal preoccupations—are brought to the conscious level, and PC cognitions can be recognized by the percipient as being distinct. In an experimental situation, an experienced PC-abled individual can distinguish information that is emerging from his own frame of reference from newly acquired information.

As stated, the crucial distinction in PC—or the perception of RC-signals—occurs in Stages 1 and 2 of the ND. We further propose that examining these domains will lead to clues to the nature of the RC-signal and probably to the PD. In Marwaha and May (2015a, 2015b) and May and Depp (2015), we have provided supporting evidence from other areas of human perception and cognition that serve as a basis for the hypotheses put forth here.

The hypotheses put forth in the MMPC open up a new dimension in psi research. Figure 3 summarizes the testability feature of the ND based on a standard remote viewing test, for the identification of persons with PC ability.

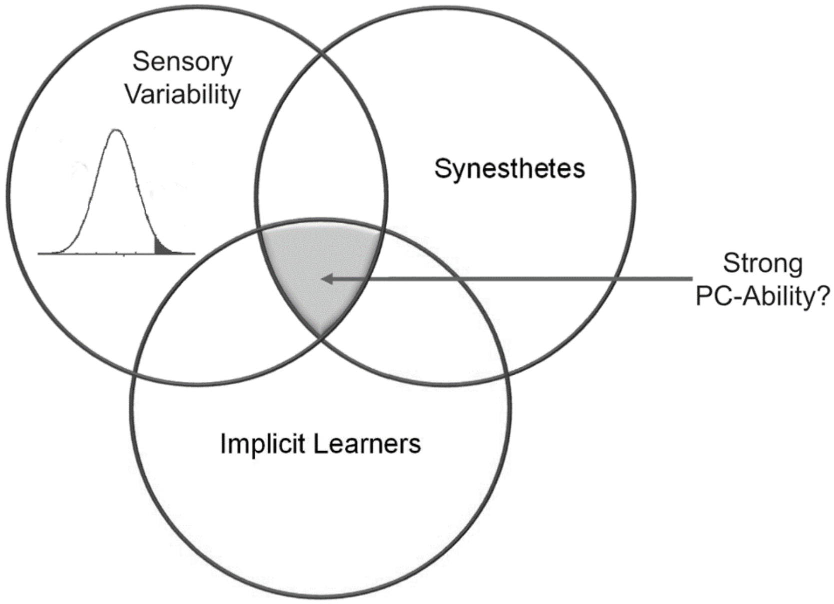

Figure 3. Identifying people with a precognition ability.

Defining Precognition

Based on the MMPC, we define precognition as *an atypical perceptual ability that allows the acquisition of noninferential information arising from a future point in space-time.*

In an earlier version of the paper, we had used the term “space-like separated point” instead of “future point.” We are indebted to Stephan Baumgart for pointing out (personal communication, April 29, 2015) that the light cone shows that most all PC target stimuli are not space-like separated from the participant. Figure 4 shows the Minkowski light cones that illustrate this point.

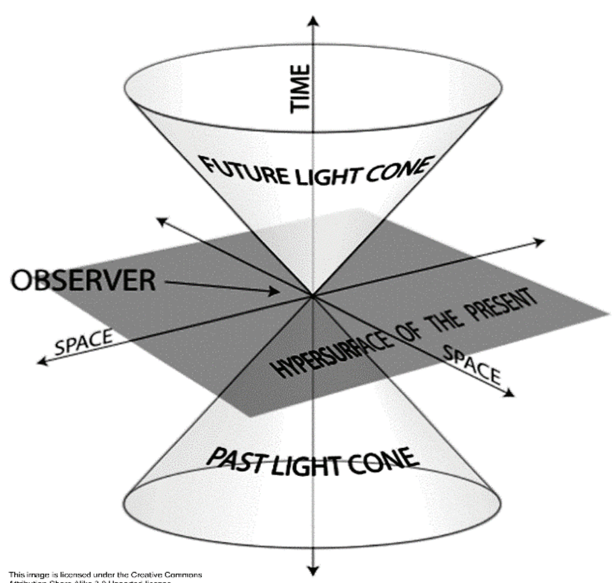

Figure 4. The standard depiction of the Minkowski light cones. The vertical axis represent time—times greater than “now” (i.e., time of the observer) represent the future. The past is represented by times that have gone by relative to the observer and are indicated by the “past light cone.” The x- and y-axes represent space.

Any points in space that are outside the upper cone in Figure 4, are called space-like separated from the observer. The fact that the edges of the cone represent how long it would take light to reach the observer given its distance, means that space-like separated points cannot be causally connected to the observer. For example, the circumference of the Earth is approximately 40,000 km, so the farthest away from the observer a psi stimulus could be is half that or 20,000 km. Because the speed of light is 300,000 km/s, it takes only 67 ms for light to reach the observer. That means a PC target, at best, is space-like separated from the observer by times shorter than that. Thus, for the most part, all laboratory-based PC experiments reside inside the upper cone yet remain noncausally related to the observer.

As a laboratory anecdote, we conducted a number of sessions wherein the target stimulus was the half-lit moon Io of Jupiter as it was eclipsed by the planet. At the time of the series, Jupiter was ~40 light-minutes away from earth, so in this case the target stimulus was space-like separated.

Conclusion

From the point of view of a psi experience, there are a few take-home messages from this model:

1. In our view, the bifurcation into two distinct domains collapses the problem space for experts within each domain to address separately.

2. The PD is concerned with the nature, carrier, and transmission of a putative RC-signal, emerging from a distant point in space-time. This is purely an information-centric perspective.

3. The "pre" aspect of the precognition experience is occurring in "real-time." Just as we are not concerned with the nature, carrier, and transmission of photons from the sun to our retina, as percipients of putative RC signals, we are not concerned with from what distant space-time point the RC signal emerged. As far as experience is concerned, by intention and/or attention a percipient has focused or accessed information—that is "floating" in the "here and now" vicinity of the transducer. Thus, from an experiential point of view (i.e., a person-centric view), the question of the "logical possibility of PC" does not arise.

4. Thus, what we now know as "precognition" becomes just another type of perception, albeit an atypical one.

5. The ND of the MMPC, particularly Stages 1 and 2, provide a bottom up approach to investigating the larger questions of the nature of RC signals. Examining the ND may yield information on the probable bandwidth on which RC signals may be carried and the sensory modalities that are involved. This may provide data for the PD to explore to determine the nature of a possible RC signal carrier.

6. This opens the door to understanding the fundamental questions that the experience of PC has raised—the nature of time, causality, and information.

7. The MMPC thus naturalizes the supernatural and the spiritual.

8. In the PD and ND there is scope for developing additional hypotheses.

9. Each aspect of the model, particularly in the ND, is eminently testable, requiring multidisciplinary expertise.

10. The two domains and the three stages provide us a language with which to analyze any psi problem.

11. The MMPC has the potential to fulfil the six criteria for the evaluation of a theory, as dis-

cussed by Cramer (2013): comprehensiveness, precision and testability, parsimony, empirical validity, and both heuristic and applied value.[3]

We strongly believe that as we shift focus from a person-centric perspective to a signal-based information-centric perspective, the seemingly difficult problems of the PC experience become relatively easy to explore. To examine the suggested hypotheses we need a truly interdisciplinary team. For all we know, answers for many elements of our questions may already be there in other disciplines and superspecialties. If we want to solve this problem, we need mainstream scientists to view psi as an atypical ability, rather than a spiritual, supernatural, or paranormal ability. The final theatre of this experience rests in the information-centric perspective, that is, in the PD for which the ND can provide clues.

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[3] *Comprehensiveness* refers to the range and diversity of phenomena encompassed by a theoretical perspective—the more comprehensive a perspective, the more ground it covers. *Precision and testability* demands that a good theory consist of constructs that are clearly defined, tightly interrelated, and readily open to reliable and valid measurement through falsifiable hypotheses (Popper, 1963). The criterion of *parsimony* highlights the notion that the preferred theoretical account of events is the one requiring the fewest number of concepts—the fewer the concepts the more parsimonious the theory. The idea of parsimony also includes simplicity—the simpler the theoretical account, the more parsimonious the theory. *Empirical validity* reflects the extent to which a theory manages disconfirming evidence, because studies with negative results carry more weight than those with positive results. A theory's *heuristic value* involves its ability to generate unique thoughts and perspectives and directions in other fields. A theory's *applied* value can be measured by the extent to which it offers effective solutions to problems.

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Abstracts in Other Languages

French

LE MODELE MULTIPHASIQUE DE LA PRECOGNITION : L'ARGUMENTAIRE

RÉSUMÉ: La precognition est définie comme une habileté perceptuelle atypique qui permet l'acquisition d'information non-inférentielle en provenance d'un point futur de l'espace-temps. En dépit des controverses, il y a suffisamment de preuves empiriques en faveur de la validité du phénomène. Le modèle multiphasique de la précognition (MMPC) est apte à rendre compte des données expérimentales. Le MMPC identifie deux phases distinctes : le domaine physique (PD) répond à la question « Comment est-il possible qu'une information traverse l'espace-temps d'un point à un autre ? Nous suggérons que la solution pourrait se trouver dans une réflexion sur l'entropie. L'acquisition et l'interprétation de signaux rétro-causaux d'un point futur de l'espace-temps passe par trois étapes dans le domaine neuroscientifique (ND) : l'étape 1 où les signaux sont perçus au moyen d'un porteur d'information, qui est basé sur la variabilité psychophysique dans un supposé transducteur de signal ; l'étape 2 avec le traitement cortical des signaux médiatisés par un mécanisme d'hyper-associativité corticale ; et l'étape 3 de la cognition, médiatisée par les processus cognitifs normaux qui aboutissent à la réaction précognitive. Ce modèle est global, basé sur le fonctionnement du cerveau et fournit de nouvelles directions de recherche qui nécessitent une expertise multidisciplinaire. Dans cet article, les auteurs présentent le MMPIC et discutent de la raison d'être de ses hypothèses concernant tant le PD que le ND.

German

DAS MULTIPHASISCHE MODELL DER PRÄKOGNITION: DER GRUNDGEDANKE

ZUSAMMENFASSUNG: Präkognition wird hier definiert als ein atypisches Wahrnehmungsvermögen, das den Erwerb von Information gestattet, die auf keinen Schlussfolgerungen beruht und einem zukünftigen Punkt in der Raumzeit entspringt. Ungeachtet der Kontroversen gibt es ausreichende empirische Evidenz für die Echtheit des Phänomens. Mit Hilfe des multiphasischen Modells der Präkognition (MMPK) können die experimentellen Befunde eingeordnet werden. Das MMPK unterscheidet zwei Phasen: Der Physikbereich (PB) behandelt die Frage, wie es möglich ist, dass Information von einem Raumzeitpunkt zu einem anderen gelangt? Wir schlagen vor, dass die Lösung mit Überlegungen zur Entropie zusammenhängt. Der Erwerb und die Interpretation retrokausaler Signale von einem zukünftigen Punkt in der Raumzeit geschieht mittels dreier Stadien im neurowissenschaftlichen Bereich (NB): Stadium 1: Wahrnehmung von Signalen eines Informationsträgers, der auf der psychophysischen Variabilität eines angenommenen Signalwandlers beruht; Stadium 2: die kortikale Verarbeitung der Signale, die durch einen kortikalen hyper-assoziativen Mechanismus vermittelt werden, und Stadium 3, die Kognition, die durch normale kognitive Prozesse vermittelt wird und zu einer präkognitiven Reaktion führt. Das Modell ist umfassend, basiert auf dem Gehirn und eröffnet eine neue Forschungsrichtung, die multidisziplinäre Kenntnisse erfordert. Die Autoren stellen in diesem Artikel das MMPK vor und diskutieren die Grundgedanken für die Hypothesen, die den PB und NB betreffen.

Spanish

EL MODELO MULTIFÁSICO DE PRECOGNICIÓN: LA JUSTIFICACIÓN

RESUMEN: Se define a la precognición como la capacidad perceptiva atípica que permite la adquisición de información no inferencial resultante de un punto futuro en el espacio-tiempo. A pesar de las controversias, existe suficiente evidencia empírica de la validez del fenómeno. El modelo multifásico de la precognición (MMPC) es capaz de hacer frente a los datos experimentales. El MMPC identifica dos fases distintas: El dominio de la física (PD) se refiere a la pregunta, ¿Cómo es posible que la información pueda viajar de un punto del espacio-tiempo a otro? Sugerimos que la solución podría encontrarse dentro de las consideraciones entrópicas. La adquisición e interpretación de señales retrocausales desde un punto en el espacio-tiempo futuro es a través de tres etapas en el dominio de la neurociencia (ND): Escenario 1, la percepción de señales de un agente de información, basada en la variabilidad psicofísica en un transductor putativo de señales. Etapa 2, el procesamiento cortical de las señales mediadas por un mecanismo cortical hiper-asociativo. Y Etapa 3, la cognición, mediada por procesos cognitivos normales que conducen a una respuesta precognitiva. El modelo es comprehensivo, basado en el cerebro, y proporciona una nueva dirección para la investigación que requiere conocimientos multidisciplinarios. En este artículo, los autores presentan el MMPC y discuten los fundamentos de la hipótesis planteados por el PD y el ND.