# PRECOGNITION: THE ONLY FORM OF PSI?

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**Abstract:**

Based on empirical evidence we discuss the nature of precognition, and address the questions whether retrocausation/precognition violates causality, whether precognition implies determinism, the questions of actual or probable futures, from where does the information arise, and other observed properties of precognition. This is followed by a discussion on the primacy of precognition by examining the various categories of psi. In our analysis, precognition is most likely the only form of psi, subsuming within it clairvoyance, telepathy, micro-PK, and the survival hypothesis. In this paper, we examine the various arguments for this assertion, the primary one being that it is impossible to close the precognition door.

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## Introduction

The general term *psi* encompasses a wide range of laboratory phenomena, including various forms of informational psi, i.e., extrasensory perception (e.g., clairvoyance, telepathy, and precognition), and influence psi, i.e., mind-matter interactions (a.k.a., psychokinesis). A host of other phenomena, such as survival after bodily death, mediumship, near death experiences (NDE), out of body experiences (OBE) and a wide range of activities falling into the general category of shamanism are difficult to tease into a laboratory. Although extrasensory perception is the commonly recognized term, over the years, nomenclature has changed to clarify the constructs. Anomalous cognition (AC) is a generic term used in place of extrasensory perception, and is defined as the perception and cognition of information that emerges from a distant point in space-time, but which is blocked from the usual sensory systems by distance, shielding or time. In this process, some individuals are able to gain access to information from events outside the range of their senses by a currently not understood mechanism (May, Utts, & Spottiswoode, 2014/1995). Several synonyms for this phenomenon are in use: psi, remote viewing (RV), precognition, clairvoyance, and ESP. There is significant controversy surrounding the evidence for psi, based on skeptical positions (e.g., Kurtz, 1985; Goertzel & Goertzel, 2014), arguments from methodological procedures (e.g., Akers, 1984; Alcock, 1991), and statistical methods (e.g., Wagenmakers, Wetzels, et al., 2011; 2015). Nevertheless, researchers from a variety of disciplines from anthropology to physics have steadfastly continued to examine psi phenomena with the scientific tools of their respective disciplines (Zingrone & Alvarado, 2015).

In his essay *ESP, Causation, and the Possibility of Precognition* philosopher Richard Corry (2015) sought to clarify the concept of ESP and examine its logical possibility. While

stating that the evidence for ESP must meet a high standard, he concluded, 'there is nothing impossible about ESP, nor is it impossible that we could find good empirical reasons to believe in ESP' (p. 126). Analyses of the logical possibility of precognition can also be found in Anglin (1981), Brier (1974, 2004), Brier and Schmidt-Raghavan (1982), Sheehan (2006, 2011, 2015), and Werth (1978).

Based on the evidence available in the early 1930's, C. D. Broad (1937, p. 178) stated, 'In my opinion the evidence, both experimental and non-experimental, for the occurrence of these kinds of super-normal cognition is adequate to establish a strong *prima facie* case, which philosophers and psychologists cannot ignore without challenging invidious comparisons to the ostrich.' Further stating that it is worth taking the hypothesis that veridical supernormal precognition occurs '*unless* there be some logical or metaphysical impossibility in it' (p. 179). As Brier (2002/1976, p. 46) stated, 'Instead of rejecting the notion of precognition out of hand for its lack of conformity, it might be more fruitful to re-examine and, in some cases, revise some aspects of our traditional world schema.'

The evidence for psi, therefore, appears solid enough to consider the potential mechanisms of the phenomena.

Based on the multiphasic model of precognition Marwaha and May (2015a) have defined precognition as an atypical perceptual ability that allows the acquisition of non-inferential information arising from a future point in space-time; that is, not enough time has passed between their occurrences for there to exist a causal relationship. In practical laboratory terms, it requires that target stimuli are randomly generated *after* responses are collected and secured.

Meta-analyses of studies in the above areas can be found in Bem and Honorton (1994), Honorton (1985), Honorton and Ferrari (1989), May, Utts, Trask et al., (1989), Utts (1991),

Parker and Brusewitz (2003), Radin and Nelson (2003), Steinkamp, Milton, and Morris (1998), Storm et al., (2006, 2010, 2012).

These concepts have given rise to more questions regarding this astonishing natural phenomenon. Nevertheless, based on the vast literature of a work-in-progress, we believe there is no need for further evidential studies, and the focus now needs to, and has, shifted to process-oriented research. Considering this database, which is well beyond the scope of this paper, we believe it is time to reexamine some of the traditional constructs. As Bernard Carr (2015, p. 23) states:

> Most physicists interested in psi would probably agree that one should try to obtain as unified a description of psychic phenomena as possible, without invoking a new feature of physics for each one. Indeed, the introduction of the single term "psi" (although loosely defined) might be thought to anticipate that. In particular, it is important to have a unified description of psi as it appears in the laboratory and in the field.

**Raisons d'etre for the paper**

As described above, the term psi, even the informational part of psi, encompasses a wide range of topics, and at first look appear to require a nearly equal number of possible theories to understand the phenomena. By addressing the theoretical and experimental considerations of precognition at a practical level, we reduce the problem space for theorists. While philosophical problems such as free will, alternative futures, and bilking still persist, we hope that rethinking the problem based on psi data and theory can provide leads to addressing these conundrums. Towards that end, this paper posits that precognition collapses the problem space as illustrated in Table 1.

Table 1. Alternative Hypotheses for Informational Psi

| Informational Psi and Current Hypotheses | Alternative Hypothesis for Same Data |
|---|---|
| Telepathy (mind-to-mind communication)<br>Clairvoyance (object to mind communication)<br>Survival hypothesis<br>Micro-PK (mind to object influence) | Precognition |

**A Theoretical Model**

As psi is a process rather than a singular event, multiple theoretical frameworks ranging from hyperdimensional models to entropic and quantum mechanical considerations to neuroscientific and psychological considerations have been put forth to examine various points in the process (e.g., May & Marwaha, 2015a).

In their signal-based multiphasic model of precognition, Marwaha and May (2015a,b) have divided the problem space into the physics and neuroscience domains. The physics domain (PD) addresses the question how is it possible that information that can be used can go between two space-time points, especially if the two points are acausally separated. It is related to how information is carried from an external source, which is distant in time and space, to the percipient. This domain addresses the problem of retrocausation; that is, how is it possible that some future action can affect the present. Retrocausation is the "proposition that the future affects the present. Indeed, all fundamental questions in physics are time-symmetric (more properly, CPT [charge, parity, and time reversal] invariant), admitting both time-forward and time-reverse solutions; thus, retrocausation is mathematically allowable" (Sheehan, 2011, p. 1). In the context of psi experience, it is an information-centric perspective. It is advantageous to break up the theoretical psi problem into separate and mostly non-overlapping domains. The

physics that addresses the major problem in the PD has nothing whatsoever do with the human percipient. Therefore, otherwise important issues such as personality, physiology, and psychology of the percipient are irrelevant in the PD.

The neuroscience domain (ND) addresses the experiential part of the problem, that is, how is the information acquired by a putative sensory system, how is this information processed in the brain, and how is it expressed. This domain addresses the problem of precognition, which is a person-centric perspective.

These issues are independent of the physics in the PD but with one important exception. Regardless of how the information traverses space-time, no matter what will comprise the energy carrier of this information, there must be some kind of a transducer that converts the incoming energy to electrochemical impulses that the central nervous system (CNS) can understand. Consider this, by analogy, as a 'psychic' retina.

The basic premise of this model is that retrocausal signals emerging from a distant space-time point, impinge on an atypical sensory process, and are then cognized in the manner of other sensory inputs. The biggest challenge in the physics domain is determining the nature of a retrocausal-signal carrier that propagates backward in time. Experimental and theoretical considerations have shown that the retrocausal-signal carrier may not be mediated by electromagnetic waves (Targ, May, Puthoff, Galin, & Ornstein, 1976). This division of the problem space permits us to examine the process of precognition from their specific disciplines.

In this paper, we examine the nature of precognition and discuss the proposition that *precognition is the only form of psi*. If this contention were true, then there would be a number of immediate benefits. First, it would substantially reduce the problem space. As we will show below, we then can ignore some of the traditional phenomena associated with ESP such as telepathy and clairvoyance and even the interesting concept and research into survival (i.e.,

some aspect of the human being survives bodily death.) Even micro-psychokinesis that uses statistical inference for its observations vanishes as a mechanism.

Another benefit is that theorists and experimentalists could focus their work more sharply to understand the very nature of retrocausation/precognition. While retrocausation/precognition, itself, poses daunting problems, at least there is only one with which to inquire rather than a separate mechanism for each observable—the current approach in the literature.

## The Nature of Precognition

*Precognition* is a person-centered perspective that generally refers to information perceived about future events, where the information could not be inferred by ordinary means. Or more formally, Marwaha and May (2015a,b) recently defined precognition as *an atypical perceptual ability that allows the acquisition of non-inferential information arising from a future point in space-time.* Procedurally in anomalous cognition experiments, it means that target stimuli are randomly generated *after* data collection is complete. Associated concepts include rectrocausation, remote viewing, presentiment and prestimulus response—physiological responses *before* random stimuli—and precognitive dreams.

Thus, the "pre" in precognition refers to the possible existence of a target or event in the future. We make this distinction because once information from a future point propagates to "the vicinity" of the percipient, the perception of the retrocausal information is occurring in close to real time.

### Does Retrocausation/Precognition Violate Causality?

Retrocausation in physics poses an interesting question: Is it possible for some action in the future to influence the present? There is considerable theoretical discussion (Sheehan,

2006, 2011, 2015) on this notion; however, at this stage the only data in support of retrocausation might be the data from psi research. However, one thing is clear; the present cannot influence the past. That is, history is history and no matter what we do today, it cannot change history. As discussed by Steinkamp (1997), 'affecting the past will also be impossible because there are no such things as unactualized past events (the past is closed). That is, there are no past events whose outcome we can alter from the present and it would be inconsistent of us to think that we could alter such events.'

One way to think of this apparent contradiction is this. "Today" represents the "future" for some time in the past. The distinction is that retrocausation only applies to systems "in the past" that have yet to be determined. For example, last Tuesday someone flipped a coin. Once determined that it landed heads that outcome cannot then be changed into tails. But retrocausation suggests that maybe while the coin is in the air retrocausal influences could bias the coin more often (multiple flips) to land heads.

Figure 1 graphically demonstrates the difference between retrocausation and precognition.

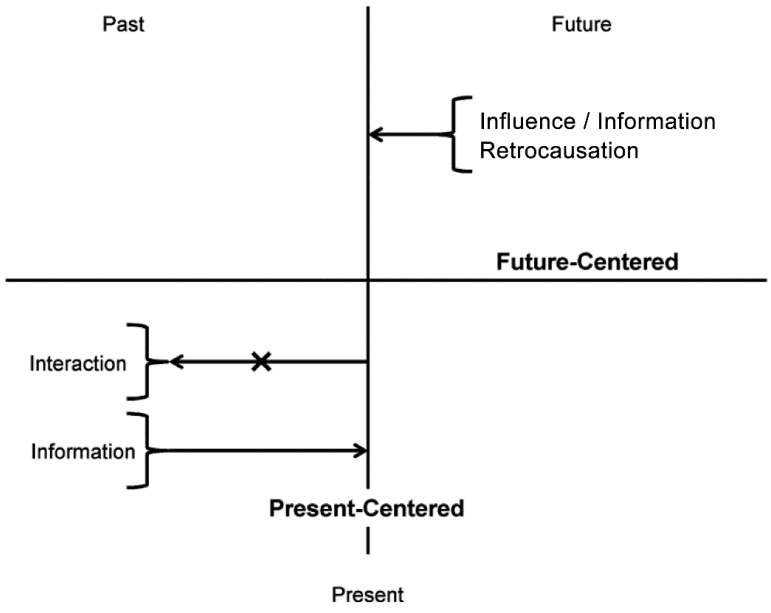


Figure 1. The prefix, *retro*, means action or information from the future affecting the present.

The short answer to the question posed is that retrocausation/precognition appears to violate macroscopic causality. In simple terms, causality is the notion that things can only happen when the things that cause them to happen, happen first. For example, my pen cannot drop to the floor until I open my fingers and not before. The key feature in retrocausation/precognition is that retrocausal-signals emerge from a distant space-time point. This counterintuitive feature—information from the future—lends itself to being considered as logically impossible. How can information about a future event—for instance, a train accident—be obtained one week prior to the event? While it is easy—but not sufficient—to state that we do not know everything about the physical world, and dismiss any instances of causality violation as a logical impossibility, it is necessary to consider the possibility of such violations based on the precognition data and anecdotal reports—at least in the current context of space-time.

The issue of causality violation is strictly confined to the physics domain. From the person-centered perspective, as stated earlier, once information from a future point arrives "in the vicinity" of the percipient, the perception of the retrocausal information is occurring in close to real time. As Sheehan (2015, p. 101) states, 'So long as the psychological arrow [of time] is aligned with the external *local* arrow (e.g., thermodynamic, radiation, quantum), regardless of the direction of the overall *global* arrow, the world will be perceived (psychologically) as unfolding in the normal time-forward fashion.'

From this perspective, precognition does not violate causality. With this in view, seeking answers in the neuroscience domain does not have to contend with the causality violation, which is a problem only for the physics domain.

**Does Precognition Imply Determinism?**

The question of determinism versus free will has been the subject of intense scrutiny through the ages, and a discussion on the preceding arguments is well beyond the scope of this paper. Nevertheless, we state our view on this matter with specific reference to precognition. As a general note, we think that the construct of free will is paradoxical as on the one hand, we are bound by cultural constraints imposed on us as social beings, and on the other hand, we do make independent choices. The possibility of precognition adds a different dimension to this debate as it implies that an event or information is existing in the future.

However, *a future event is deterministic only when there is a single outcome of an event.* For example, a two-headed coin will always land heads; however, a normal, but biased coin with 90% chance of landing heads is not deterministic because even though it is *likely* to land heads there is a 10% chance that it will not. All real life experiences *always* have possibilities of having multiple outcomes due to the vagaries of the human condition. Retrocausal-information of a future event is not deterministic as there are likely to be more than one

outcome to an event. In spontaneous precognition, the viewer may have access to *probable futures*. We will consider this point in detail below.

In real-time remote viewing for intelligence collection, which was carried out at Ft. Meade, Maryland, USA for example, when the target stimulus turned out to be a submarine base in Severodvinsk in the Northern part of the Soviet Union, the viewer appeared to access information from an actualized event in real-time (McMoneagle, 2015).

The difficult question is from which time frame did the viewer access the information? If the information that was perceived came directly from the submarine's construction in "real" time, then that stimulus is time-like separated from the viewer, similar to all other perceptions. However, if the information was perceived from some later time such as the eventual feedback of the event 100 days later, then it is an example of precognition. Moreover, predictions based on these perceptions may be based on retrocausal signals or on inference from the already acquired retrocausal information. The challenge, of course, is to learn from which time frame the information arose. Either way, from the person-centric perspective, the information signals are present in real-time. Nevertheless, we continue using the term 'precognition' because of its operational definition (target generated *before* the response), and for historical continuity of the term.

This leads to the big question, if you can see the future via precognition, are you condemned to experience that future? If you have a precognitive dream that you will be hit by a truck on the way to work, can you avoid it by simply staying in bed for the day? Since it appears that we have access to probable futures then in the most likely future you would have gone to work, but you also then can stay at home (Radin, 1987). Steinkamp (1997) has extensively discussed the problems and paradoxes of retrocausation and the intervention paradox.

As these examples indicate, precognition does *not* imply determinism. The percipient is privy to probable futures. What determines which of the probable futures becomes an actualized event is a moot point.

**Actual or Probable Futures?**

We illustrate this notion with a laboratory anecdote. During the U.S. Star Gate era, the researchers applied a psi technique, called associational remote viewing, to attempt to win money at a horse race. The day before the 6-horse race, an assistant randomly assigned each horse to a separate site from a set-orthogonal physical locations in the San Francisco Bay area. For example horse 1, might be assigned to a park, but horse 2 to a gas station and so on. Then a monitor and a participant, who are both blind to the location site assignments, address the following tasking. The monitor says, 'Please access and describe the place I will escort you to tomorrow at 16:00 hours.' The participant responds with the usual words and drawings—the participant remains blind to the site locations. Afterward, the monitor analyzes the response against the six sites. If one of the sites appears to be a high quality match to the participant's response, the plan is to bet on the horse associated with that site. For example, if the response best matches the gas station site, which is associated with horse 2, then the bet is that that horse will win the race the next day. Regardless of which horse actually wins the next day, the winning horse will determine where to the participant will be escorted. This worked and the team walked away with $300 profit. So, the following day at 16:00 the investigators told the participant to get ready to visit the chosen location. The participant responded, 'Hell no. Give me my share of the winnings; I am watching a football game just now'. So, the research team divided up the winning and left.

This anecdote demonstrates that the most likely future—escorting the participant to the gas station—did not actually happen; but, if the participant followed the tasking exactly, why

did he not perceive the couch and the television set instead—the actual future? In the absence of free will, he would have been compelled to go to the gas station. However, by using his free will, he remained at home, instead of actualizing a probable future. In other words, the participant bilked his future! In this case, the experimenter too could have bilked the future by forcefully taking him to a third location.

**From Where Does the Information Arise—From an Event or From Later Feedback?**

According to the multiphasic model of precognition, the physics domain is independent of the neuroscience domain. This is analogous to the notion that photons coming from the sunset know nothing about the individuals viewing the sunset nor anything about their potential experiences of it. However, the neuroscience domain is somewhat dependent on the physics domain, because a putative transducer between the two domains will depend upon the energy propagation. However, experimental situations are loaded in favor of the neuroscience domain. The assumption being, information already exists in the physics domain, and the experiment tasking focuses attention on the target stimulus. Nevertheless, the question arises, from where does the percipient obtain the information—is it from the distant event or is it from the feedback that is provided post-session or an event much later? This has been one of the most intriguing questions for psi researchers since a long time (e.g., May, Lantz, & Piantineda, 2014/1996; Schmeidler, & Lewis, 1968; Tart, Palmer, & Redington, 1979.)

This leads us to two of the biggest challenges of precognition research that influences replicability: When and where does psi happen? Experiment participants tell us that they do not have control over when they are 'psychic.' Suppose, for example—and a real case in one of the SRI International EEG studies (May, Spottiswoode & Faith, 2014/2005)—a well-designed experiment requires the participant to exhibit psi when, and only when, (1) their EEG is monitored and (2) when and only when the effort protocol is in force and *not* the control

protocol. As an example of (1), maybe a 'psychic' hit happened as that participant was in the parking lot before coming into the laboratory. Joe McMoneagle, one of the leading remote viewers for the Star Gate program has expressed this well:

> I have so much difficulty in determining when psi is taking place; e.g., when the experimenter says something like 'Joe, come prepared on Monday morning for good RV, because we are beginning a new series.' Over the next couple of hundred milliseconds, unconsciously I've already collected sufficient data to spend the next couple of days trying to analyze and break down what my impressions might actually mean in terms of data. If I'm lucky, I will probably begin to remember on Monday morning something of significance. I find it very difficult to equate a specific time in time/space where the perception of the data actually took place. (McMoneagle, personal communication, 2014).

To the degree to which that is true, renders void all the details of the experiment and might even negate the entire complex protocol. This brings us to the question why do we need to engage in the experimental exercise and create a target stimulus, as in principle, the target is independent of time of generation. At best, we can state that the purpose of generating a target for an experiment is to initiate intention and attention towards the task. It would be akin to clapping your hands to draw someone's attention to an activity.

In a recent study May, Hawley, & Marwaha (in-preparation) observed that the response of the percipient was emerging from the event rather than the computer chosen target image. According to the experimental protocol, the participant first provided the response, following which a target stimulus was randomly generated from a target pool of five sets of five natural sites from the San Francisco Bay area. A specific photograph of each site was taken at the exact spot the viewer would be standing during the feedback portion of the trial (May, Hawley, Chaganti, & Ratra, 2014). The images for the target pool were created on-site about nine

months *before* the commencement of the experiment sessions. As per the protocol, the participant was taken blindfolded to the target site. As feedback, the blindfold was removed upon reaching the site and standing at the designated spot, so that the first thing that the participant saw was the actual site of the randomly generated target site and not as it was six months prior when the site selection photographs were obtained.

Over time, some of the sites had changed. For example, ponds had completely dried because of a drought, or construction that was underway when selecting the site for the experiment was now complete.

In one session, the target stimulus was a water tower in Hayward, CA. Figure 2a shows what the site was like prior to the start of the study, and Figure 2b is what it looked like at the time of the trial. The complete response is provided on the left side of the figure. Note that we have added typed version of the handwriting for clarity.

What is important to note is that the participant spoke in detail about a chain linked fence that was *not* part of the original site, yet was there at the time of the feedback.

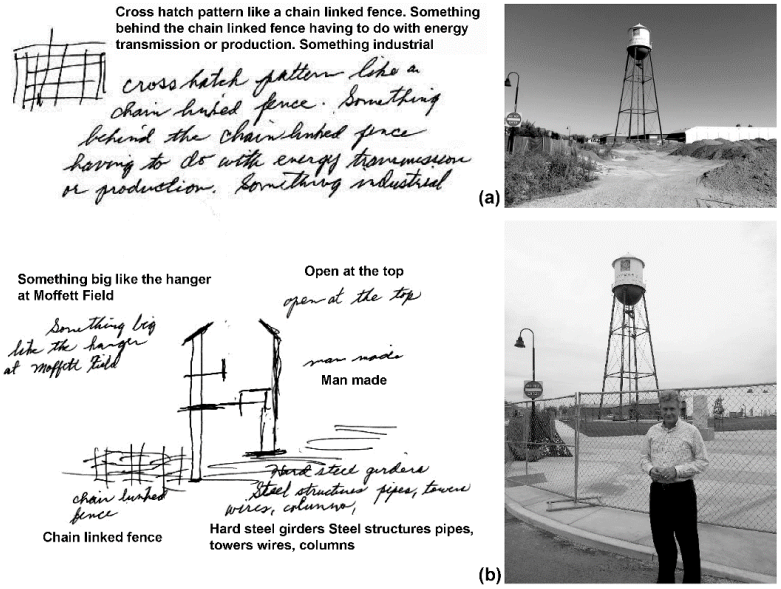

Figure 2: (a) Original site, (b) Feedback of the actual site taken approximately six months later.

Beginning in 1986, May, Lantz, and Piantineda (2014/1996, p. 114) conducted a 2-year investigation of the dependency of the quality of anomalous cognition on the feedback to the participant. The question of feedback or no feedback on an individual session does not matter as either way the information is coming from a future point, ten minutes later or a week later, as the instance of random selection of target and provision, or not, of the feedback is *after* the response is recorded—the percipient is already in possession of the information *before* the target is generated. In this study, even though great care was taken that only the participant was exposed to the feedback using a tachistoscope, five trials for each of four participants occurred when no person ever saw the intended target including the participant. Only the computer analyzed the data and created summary results for reporting, after which, the raw data was purposely destroyed. Post hoc, the two experienced participants performed well in these trials ($n$ = 10, $z$ = 1.9, $p$ = .029, ES = 0.60). While at first glance, this appears to be an example of clairvoyance (i.e., real-time) of the intended target, however, an acausally separated feedback event resides in the computer before that data were destroyed. This result agrees with Targ and Targ (1986) and Rhine and Pratt (1957) in that they found, trial-by trial feedback was *not* necessary for significant psi. However, feedback to the percipient may be necessary for psychological reasons, such as knowing one's performance on a task.

**Other Observed Properties of Precognition**

Any theory that purports to understand the nature of precognition must also include concepts that address the following:

- *Bandwidth Limitations.* A crude estimate of what in information theory is called channel capacity—how much information the channel can accommodate—is a

few millibits per second. In a landmark study Ryzl and Otani (1967) working with Stepanek, successfully used psi to transmit three 5-decimal digits without a single error. However, the bit rate for this experiment was 0.0046 bits/s (Puthoff & Targ, 1976, p. 333). For long distance experiments, Kogan (1966, 1968, 1969) found a similar channel capacity. Signal models entail a source, transmission channel, and a detector system. However, our other sensory systems are bandwidth limited at the transducer, which is the point of entry for external signals. For example, we cannot directly experience x-rays or infrared in the EM spectra because our retina cells cannot accommodate these frequencies. Similarly, our auditory and olfactory systems are also limited, say, compare to that of a dog, at their detection front-ends. It is therefore, not an unreasonable guess to assume that the psi bandwidth limitation will reside in the neurostructure that constitutes the transducer—that which converts the retrocausal signal carrier into electrochemical signals that the CNS can interpret.

- *Stochastic Nature*. Even with the best-selected participants, psi appears to be non-stationary; that is, there is high and unpredictable variance in the data. As with channel capacity, we cannot yet identify the source of noise that accounts for this unpredictability.

- *Attention Filters*. If, as precognition would suggest, participants appear to have access to all space-time, clearly, this would overwhelm any later cognitive process. So the question is what allows the participant to focus upon the relevant information? This is analogous to what allows us to understand a dinner conversation in a very loud restaurant.

## Primacy of Precognition

Forced-choice precognition (Honorton & Ferrari, 1989) and prestimulus response and presentiment studies, in which the stimuli are randomly generated post response (Mossbridge, Tressoldi & Utts, 2010) have been substantially investigated and documented. Additionally, all of Bem's (2011) time-reversed traditional social psychology experiments are further examples of precognition.

It might be argued that the substantial database of experiments including ganzfeld, remote viewing, clairvoyance and telepathy studies wherein the target stimuli are available at the time of data collection appear to provide a substantial set of data that are not precognition by definition of when the target stimulus is available. However, in these studies a participant may *still* have access to the target stimuli via precognition. Feedback—associating a given trial with a given stimulus—regardless to whom it is given—the participant, monitor, or experimenter—and when, or even exclusively stored in a computer provides a future-oriented possible source for the psi data. No matter how clever the protocol, it appears at this point that it is difficult or, perhaps, impossible to close the future precognition door. In other words, for every experimental situation in the present, the percipient/experimenter could have had access to retrocausal signals about the trial results, prior—for instance two days ago—to the commencement of the trial.

One way to think of this assertion is that precognition conceptually allows access to a future "answer book" in any experimental setup. For example in any informational psi study in which trial-by-trial feedback is provided, it is clear that feedback exists in the future before the trial begins, and in principle, the recipient could obtain the data from that future space-time point. This notion also holds when the recipient only receives summary data. Still there is a trial-by-trial accounting (the answer book) somewhere and, again, the recipient has access to that future space-time, even before the commencement of the experiment.

**Clairvoyance or Precognition?**

*Clairvoyance* generally refers to information received from a distance, beyond the reach of the ordinary senses. It refers to the anomalous cognition (AC) of objects and events as distinguished from AC of thoughts and mental states of individuals. Procedurally it means that the target stimuli in experiments are occurring in real-time, and are randomly generated *before* data collection is initiated. In contrast, in a precognition protocol, the target is generated *after* data collection is complete. Using a double-blind protocol is standard for all such experiments.

When a target stimulus is generated post-response, it is a case of space-time-like separated point in space-time and is the formal definition of precognition. When a target stimulus is generated pre-response it clearly is time-like separated, i.e., available in real time—the time of the AC session. Despite these two differing conditions, we still cannot control from *when* the percipient obtains the information. In all clairvoyant cases we know of there are always two possible open channels through which the psi information may be obtained:

- In real-time—the clairvoyant hypothesis
- From the future feedback of the trial-by-trial result either to the participant, the investigator or situated in a computer.

In a typical, real-time, laboratory-based clairvoyant protocol, the target stimulus is a photograph that is randomly chosen *before* the collection of data. The difficult question (assuming a successful trial) is, as discussed earlier, from what time frame did the experiment participant obtain the information—in real time (i.e., clairvoyance) or from the feedback in the future either directly to the participant or to the investigator only? Is it impossible to close the precognition door in any study? As mentioned earlier, the team at SRI attempted to do so in a complex feedback investigation. In the 160 trials in that study, 20 of which there were no feedback to anyone either in real-time or in the future. To attempt to block the long-term future,

the results of all individual trials including these special 20, were permanently erased from the computer record, which, of course had not been examined by anyone. Yet, the two most experienced participants showed no significant change of their effect size for these trials compared to those that involved feedback (May, Lantz, & Piantineda, 2014/1996, p. 114). Thus, a counter argument against precognition may have been demonstrated in a laboratory study. However, there remains a future event for the participant at the time of the viewing, that being, the trial feedback information embedded in the computer. While seemingly implausible, nonetheless the precognition door is wide open and cannot be ruled out.

Considering the distinct possibility of precognition, one of the biggest (amongst many others) experimental challenges in a clairvoyance experiment is determining *when* and *where* the putative retrocausal-information was received by the percipient. For instance, the experimental participant may have received the information a few days before or whilst going to the laboratory for the double-blind controlled sessions! In which case, the percipient acquired the information precognitively!

Finally, Steinkamp, Milton, & Morris (1998) addressed the question of clairvoyance versus precognition by conducting a meta-analysis comparing precognition studies versus clairvoyant ones from 1935-1997 and found no significant differences between them (ES = 0.01). As they concluded, 'This database provides no evidence to support the idea that clairvoyance works better than precognition' (p. 208). They further state that 'The results from this meta-analysis suggest that theories about parapsychological phenomena and future experimental designs should not rest on the assumption that require a difference in precognition and clairvoyance effect sizes' (p. 209). Although circumstantial, these results suggest that the precognition channel may have been operating.

**Telepathy or Precognition?**

*Telepathy* generally refers to the anomalous acquisition of information concerning the thoughts, feelings or activity of another conscious being. Procedurally, it is difficult to determine exactly what the target is, as one has to either rely on a pre-recorded note of the target stimulus (a clairvoyant condition) or rely on a post-session narration of the target stimulus (a precognition condition). As far as current neuroscience is concerned, there are no unique CNS signatures of a thought. A thought is significantly different than even an encrypted image contained in the inner workings of a computer hard drive, which could serve as a target stimulus.

Telepathy studies suffer from the same problems that clairvoyant ones do; that is, we are unable to block access to information eventually generated in the percipients' future. There is one case, however, that just might close that channel but one would never be able to verify the result. Suppose an experimenter asks some individual to 'guess' what number the experimenter has in mind. Upon hearing the guess, the experimenter passes away from a massive heart attack. The experimenter carries to his grave the outcome of that single trial. Leaving aside statistical issues (e.g., the response could have been a lucky guess devoid of psi), let's assume for the moment that survival after bodily death is possible, and a skilled medium could contact the deceased and ask whether or not that trial was successful. A procedural problem arises that opens the precognition channel. The moment the medium confirms that the number obtained from the deceased experimenter corresponded with the correct guess, then the original guesser could have had access to that future event—the medium's contact with the deceased. Thus, there appears no need to posit telepathy in the first place. But from where did the medium get the answer? Survival research suggests that the information came from the deceased; however, informing the guesser of the success of the trial, the medium could also obtain the data not from the deceased, but rather from the future feedback to the guesser. This

brings into question both telepathy and the survival hypothesis. Known as the super-psi hypothesis against the survivalist interpretation of mediumship research (Braude, 1989, 1992; Bieschel & Rock, 2009; Sudduth, 2009), it proves to be a major challenge for mediumship researchers. As Irwin (2002) advocates, it is time to relegate 'the survival hypothesis to minor status.' To the degree this argument is true, there is no need to posit survival.

Thus, the first problem we face with telepathy is that of a questionable real-time target as we suggested above. What exactly do we mean by a thought, considering there are no specific neural structures for a single thought? Although there have been studies where elaborate brain recordings and statistical techniques have been used to 'read' the mind (Nishimoto, Vu, Naselaris, et al., 2011; Manning, Sperling, Sharan, Rosenberg, & Kahana, 2012), how do we identify that a thought has occurred, and pin down a singular thought from the stream of conscious thoughts as well as a myriad of unconscious activities occurring during a telepathy experiment. An activity is easier to recognize, considering the possibility of precognition; similarly, an emotion is easier to recognize through precognition of non-verbal behavior.

One can use the analogy of a computer, in that one can 'see' into its memory. For instance, in old computers, one could examine the magnetic memory core; however, in the brain what neural structures can we observe for the occurrence of a thought? This is further compounded by the fact that there are no known 'retro-corticocausal' (brain-to-environment) interaction, signals/energy flow emanating from the brain (Marwaha & May, 2015c).

These arguments do not question the validity of the telepathy data as seen in, for example, ganzfeld studies (Honorton, Hyman, Hövelmann, McClenon, Palmer, Stanford, Stokes, & Utts, 1986), as the precognition door is open to account for the response pattern in telepathy experiments. For instance, in the Sheldrake and Smart (2003) experiments in

telephone telepathy, the answer book (the future noted success or failure of the trial) is indeed wide open.

**Micro-Psychokinesis or Precognition?**

The primacy of precognition also brings into question micro-PK (e.g., mental influence on random number generators), which require inferential statistics to observe an effect. Gertrude Schmeidler (1988) had posed the question: 'Is it proper to use psi as a general term for ESP and PK? If it is–if they are alike enough to be classed together–is there any need for the separate terms?' (p. 172). As Roe, Davey, and Stevens (2003, pp. 1-2) analyze, there are various positions with respect to Schmeidler's question. These range from assuming ESP and PK to be unitary with neither primary (Schmeidler, 1994), unitary with PK as the basic phenomenon (attributed by Schmeidler, 1994b, p. 229, to Helmut Schmidt), or unitary with ESP the basic phenomenon (as captured for example in decision augmentation theory by May, Utts, and Spottiswoode, 1995), through to a view associated with William Braud (1985) that sees ESP and PK as complementary phenomena that have quite distinct characteristics and thrive under differing conditions.

The primacy of precognition has been well established by the mathematical formalisms of decision augmentation theory (DAT; May and colleagues, 2014/1995a, 2014/1995b, 2014/2011, 2015). DAT holds that humans integrate information obtained by anomalous cognition into the usual decision process. The result is that, to a statistical degree, such decisions are biased toward volitional outcomes (p. 222). The domain in which DAT is applicable is when experimental outcomes are in a statistical regime (i.e., a few standard deviations from chance) (p. 226; May, Utts, & Spottiswoode, 2014/1995; May, 2015).

Macro-PK refers to the influence on objects by mental means alone, and does not require inferential statistics to observe the physical effects. Precognition cannot address the

process by which large objects can be influenced without the application of force (for examples see Braude, 2007). Assuming that mental activity is considered synonymous with consciousness, Marwaha and May (2015b) have argued that if consciousness is non-material, it cannot interact with matter. For the mind/consciousness to be able to exert some force on an external object, it would require a "retro-corticocausal" (brain-to-environment) interaction, i.e., signals/energy flow emanating *from* the brain, that "can do work." So far, there is no empirical evidence in support of this concept. At present there are only four forces known in nature—strong nuclear, electromagnetic, weak nuclear, and gravity. So far, attempts at discovering others have failed (Adelberger & Nelson 2003; Schlamminger, Choi, Wagner, & Adelberger 2008).

Open precognition channels, which may be impossible to close, calls into question the necessity of the concepts of clairvoyance, telepathy, micro-PK, and survival of bodily death. To reiterate, any experimental study in which some outcome is reported to anyone or exists in a computer memory and reported (on a trial-by-trial basis) to no one still creates an opening in future space-time, and at this time we do not have a mechanism by which we can shield that future time from the percipient.

## Conclusion

As an atypical perceptual ability, precognition may be seen in approximately 1% of the general population (May, Utts, Trask, et. al., 1989). As an unconscious implicit process, precognition is manifested in a variety of ways such as dreams and remote viewing—in real life and the lab—and influencing decision-making in real life (Dean & Mihalasky, 1974; Carpenter, 2012).

Indian schools of thought such as the Nyāya (~3$^{rd}$ c. BCE), Vaiśeṣika (~300 BCE), Mīmāṁsaka (~4$^{th}$ c. BCE), Sāṁkhya (~800 BCE), and Vedānta (~9$^{th}$ c. BCE) hold a "non-

local" view of perception in that the sense organs '….apprehend their objects when they come into direct contact them.' Whereas, the Buddhist (~450 BCE) and Jaina (~2 BCE) scholars state that the visual and auditory organs 'apprehend their objects at a distance without coming in contact with them.' Jaina scholars hold that only the visual organ 'apprehends its object at a distance with the help of light without getting at it' (Sinha, 1996/1933, p. 21). The "local" view of perception held by Buddhist and Jaina scholars has been empirically established from the early years of experimental psychology and psychophysiology (~1830s). Thus, as the rationale discussed in this paper, and the model of precognition indicate, precognition is similar to the other senses, in that it is a local phenomenon.

To summarize:

1. In the absence of evidence for *distinctive mechanisms* differentiating between precognition, telepathy, clairvoyance, survival hypothesis, or micro-PK, we can state that precognition, which is explained by the mechanism of retrocausal signals, can adequately address these phenomena.
2. The signal-based multiphasic model of precognition, bifurcates the psi problem space into:
    a. The information-centric physics domain, which addresses the problem in terms of retrocausation and retrocausal signals, and is the main stay of the problem of information emerging from a future point in space-time.
    b. The person-centric neuroscience domain, which deals with the acquisition, processing, and cognition of the retrocausal signals, giving rise to the subjective experiences of precognition.

3. Assuming the validity of a signal-based approach, we may consider that while retrocausal signals are emerging from a future point in space-time, from the person-centric perspective, the information signals are present in real-time. This may hold the very concept of precognition (a person-centric perspective) redundant, and consider retrocausation the primary factor in the entire process.
4. Clairvoyance, telepathy, and micro-PK can be subsumed within precognition, as it appears impossible to close the future door for the experimenter/percipient, as we do not know when and where the retrocausal information is acquired.
5. To date, there is no evidence for signal/force emanating from brain-to-environment that can influence external matter (micro-PK).
6. From the perspective of the neuroscience domain, once distant in space-time retrocausal signals—whether emerging in real-time (clairvoyance) or from the future (precognition)—have been received by the transducer, the likelihood of cortical mechanisms being able to differentiate between the temporal origins of the signal, are quite unlikely. Unless we are willing to posit at this stage of the evidence, that the *nature/properties* of signals varies depending on its temporal origins.
7. This implies that, from the person-centric perspective, all perception, regardless of their temporal origin, are local.
8. We continue using the term 'precognition' because of its operational definition (target generated *before* the response), and for historical continuity of the term.

Thus, based on empirical evidence, theoretical models, and arguments presented in this paper, we conclude that precognition is most likely the only form of anomalous cognition, and it is a purely local phenomenon. Taking a parsimonious approach, we have collapsed the

problem space for experimental work and theory building in search for a mechanism for retrocausation/precognition.

## References

Adelberger, E.G. & Nelson, A.E. (2003) Tests of the gravitational inverse-square law, *Annual Review of Nuclear and Particle Science*, **53***,* 77–121.

Akers, C. (1984) Methodological criticisms of parapsychology, *Advances in Parapsychological Research*, **4**, 112–164.

Alcock, J.E. (1991) On the importance of methodological skepticism, *New Ideas in Psychology*, **9**(2), 151–155.

Anglin, W.S. (1981) Backwards causation, *Analysis*, **41**(2), 86–91.

Beischel, J., & Rock, A.J. (2009) Addressing the survival versus psi debate through process-focused mediumship research, *Journal of Parapsychology*, **73**(1), 71–90.

Bem, D.J. (2011) Feeling the future: Experimental evidence for anomalous retroactive influences on cognition and affect, *Journal of Personality and Social Psychology*, **100**(3), 407–425.

Bem, D.J., & Honorton, C. (1994) Does psi exist? Replicable evidence for an anomalous process of information transfer, *Psychological Bulletin,* **115**, 4–18.

Braud, W.G. (1985) ESP, PK and sympathetic nervous system activity, *Parapsychology Review*, **16**, 6–16.

Braude, S.E. (1989) Evaluating the super-psi hypothesis, *Exploring the Paranormal: Perspectives on Belief and Experience. Dorset: Prism*, **25**(38), 28.

Braude, S.E. (1992) Survival or super-psi, *Journal of Scientific Exploration*, **6**(2), 127–144.

Braude, S.E. (2007) *The Gold Leaf Lady and Other Parapsychological Investigations*, Chicago: University of Chicago Press.

Brier, B. (1974) Mundle, Broad, Ducasse and the precognition problem, *World Futures: Journal of General Evolution*, **14**(2), 161–169.

Brier, B., & Schmidt-Raghavan, M. (1982) Precognition and the paradoxes of causality, in P. Grim (ed.). *Philosophy of Science and the Occult*, Albany: State University of New York Press.

Broad, C.D. (1937) The philosophical implications of foreknowledge, *Proceedings of the Aristotelian Society, Supplementary Volumes*, 177-209.

Carpenter, J.C. (2012) *First Sight: ESP and Parapsychology in Everyday Life,* Lanham, MD: Rowman & Littlefield.

Carr. B. (2015) Higher dimensions of space and time and their implications for psi*,* in E.C. May & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume II — Theoretical Frameworks.* Santa Barbara, CA: Praeger Publications.

Corry, R. (2015) ESP, causation, and the possibility of precognition, in E.C. May & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume I — History, Controversy, and Research*, Santa Barbara, CA: Praeger Publications.

Dean, D., & Mihalasky, J. (1974) *Executive ESP,* Englewood Cliffs, NJ: Prentice-Hall.

Goertzel, T., & Goertzel, B. (2014). Skeptical responses to psi research, in D. Broderick & B. Goertzel (eds.) *Evidence for Psi: Thirteen Empirical Research Reports*, Jefferson, NC: McFarland.

Honorton, C. (1985) Meta-analysis of psi ganzfeld research: A response to Hyman. *Journal of Parapsychology*, **49**, 51-91.

Honorton, C., & Ferrari, D.C. (1989) 'Future telling': A meta-analysis of forced-choice precognition experiments, 1935-1987, *Journal of Parapsychology,* **53**, 281–308.

Hyman, R., Honorton, C., Hövelmann, G., McClenon, J., Palmer, J., Stanford, R., Stokes, D. M., & Utts, J. (1986) A joint communiqué: The psi ganzfeld controversy, *Journal of Parapsychology*, **50**(4), 351–402.

Irwin, H. (2002). Is scientific investigation of postmortem survival an anachronism? The demise of the survival hypothesis, *Australian Journal of Parapsychology,* **2**(1), 19–27.

Kogan, I.M. (1966) Is telepathy possible? *Radio Engineering*, **21**, 7.

Kogan, I.M. (1968) Information theory analysis of telepathic communication experiments, *Telecommunications and Radio Engineering–USSR*. **3**, 122.

Kogan, I.M. (1969) *The Information Aspect of Telepathy*, Santa Monica, CA: RAND Publication.

Kurtz, P. (1985) *A Skeptic's Handbook of Parapsychology*, Buffalo, N.Y: Prometheus Books.

Manning, J.R., Sperling, M.R., Sharan, A., Rosenberg, E.A., & Kahana, M.J. (2012) Spontaneously reactivated patterns in frontal and temporal lobe predict semantic clustering during memory search, *Journal of Neuroscience*, **32**(26), 8871–8878.

Marwaha, S.B., & May, E.C. (2015a) Rethinking extrasensory perception. Toward a multiphasic model of precognition, *SAGE Open*, **5**(1), 2158244015576056.

Marwaha, S. B., & May, E. C. (2015b) The multiphasic model of precognition: The rationale, *Journal of Parapsychology*, pp.xx.

Marwaha, S.B., & May, E.C. (2015c) A refutation of the dualist perspective in psi research,

*Journal of Consciousness Studies*, **22**(5–6), 70–95.

May, E.C. (2015) Experimenter psi: An expanded view of decision augmentation theory, in E.C. May & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume II — Theoretical Frameworks,* Santa Barbara, CA: Praeger Publications.

May, E.C. & Marwaha, S.B. (2015a) *Extrasensory Perception: Support, Skepticism, and Science, Volume I — History, Controversy, and Research*, Santa Barbara, CA: Praeger Publications.

May, E.C. & Marwaha, S.B. (2015b) *Extrasensory Perception: Support, Skepticism, and Science, Volume II — Theoretical Frameworks*, Santa Barbara, CA: Praeger Publications.

May, E.C., & Spottiswoode, S.J.P. (2014/2011) The Global Consciousness Project: Identifying the source of psi, in E.C. May, & S.B. Marwaha, (eds.) *Anomalous Cognition: Remote Viewing Research and Theory,* Jefferson, NC: McFarland.

May, E.C., Hawley, L., Chaganti, V.K., & Ratra, N. (2014) Natural anomalous cognition targets: A fuzzy set application, *Journal of Parapsychology,* **78**(2)*,* 195-208.

May, E.C., Hawley, L., & Marwaha, S.B. (in-preparation) Entropy experiment.

May, E.C., Lantz, N.D., & Piantineda, T. (2014/1996) Feedback considerations in anomalous cognition experiments, in E.C. May, & S.B. Marwaha, (eds.) *Anomalous Cognition: Remote Viewing Research and Theory,* Jefferson, NC: McFarland.

May, E.C., Spottiswoode, S.J.P., & Faith, L.V. (2014/2005) A Search for alpha power changes associated with anomalous cognition, in E.C. May, & S.B. Marwaha, (eds.) *Anomalous Cognition: Remote Viewing Research and Theory*, Jefferson, NC: McFarland.

May, E.C., Spottiswoode, S.J.P., & Utts, J.M. (2014/1995) Applications of decision augmentation theory, in E.C. May, & S.B. Marwaha, (eds.) *Anomalous Cognition: Remote Viewing Research and Theory,* Jefferson, NC: McFarland.

May, E.C., Utts, J.M., & Spottiswoode, S.J.P. (2014/1995) Decision augmentation theory: Toward a model for anomalous mental phenomena, in E.C. May & S.B. Marwaha (Eds.), Anomalous *cognition: Remote viewing research and theory,* Jefferson, NC: McFarland.

May, E.C., Utts, J.M., Trask, V.V., Luke, W.W., Frivold, T.J., & Humphrey, B.S. (1989) *Review of the Psychoenergetic Research Conducted at SRI International (1973-1988)*, SRI Project 1291, Menlo Park, CA: SRI International.

McMoneagle, J.W. (2015) Evidence for precognition from applied remote viewing, in E.C. May, & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume I — History, Controversy, & Research,* Santa Barbara, CA: Praeger Publications.

Mossbridge, J., Tressoldi, P., & Utts, J. (2012) Predictive physiological anticipation preceding seemingly unpredictable stimuli: a meta-analysis, *Frontiers in Psychology,* **3**.

Nishimoto, S., Vu, A.T., Naselaris, T., Benjamini, Y., Yu, B., & Gallant, J.L. (2011) Reconstructing visual experiences from brain activity evoked by natural movies, *Current Biology*, DOI: 10.1016/j.cub.2011.08.031.

Parker, A., & Brusewitz, G. (2003) A compendium of the evidence for psi, *European Journal of Parapsychology*, **18**, 33–52.

Puthoff, H.E., & Targ, R. (1976) A perceptual channel for information transfer over kilometer distances: Historical perspective and recent research, *Proceedings IEEE*, **64**(3), 329–354.

Radin, D. I. (1987). Precognition of probable versus actual futures: Exploring futures that will never be, *Research in Parapsychology*, 1–5.

Radin, D.I., & Nelson, R.D. (2003) Meta-analysis of mind-matter interaction experiments: 1959-2000, *Healing, Intention and Energy Medicine,* 39–48.

Rhine, J.B., & Pratt, J.G. (1957) *Parapsychology: Frontier Science of the Mind*, Springfield, IL: Charles C. Thomas.

Ryzl, M., & Otani, S. (1967) An experiment in duplicate calling with Stepanek, *Journal of Parapsychology*, **31**(1), 19–28.

Schlamminger, S., Choi, K.Y., Wagner, T.A., H., & Adelberger, E.G. (2008) Test of the equivalence principle using a rotating torsion balance, *Physical Review Letters,* **100**(4), 041101.

Schmeidler, G.R. (1988) *Parapsychology and psychology: Matches and mismatches*, Jefferson, NC: McFarland.

Schmeidler, G.R. (1994) PK: Recent research reports and a comparison with ESP, in S. Krippner (Ed.), *Advances in Parapsychological Research 7,* Jefferson, NC: McFarland.

Schmeidler, G.R., & Lewis, L. (1968) A search for feedback in ESP: II. High ESP scores after two successes on triple-aspect targets, *Journal of the American Society for Psychical Research*, **62**(3), 255–262.

Sheehan, D.P. (2006). *Frontiers of Time: Retrocausation: Experiment and Theory, San Diego, California, 20–22 June 2006*, Melville, N.Y: American Institute of Physics.

Sheehan, D.P. (2011). *Quantum Retrocausation: Theory and Experiment: San Diego, California, USA, 13-14 June 2011*, Melville, N.Y: American Institute of Physics.

Sheehan, D.P. (2015). Remembrance of things future: A case for retrocausation and precognition, in E.C. May & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume II — Theoretical frameworks,* Praeger Publications.

Sheldrake, R., & Smart, P. (2003) Experimental tests for telephone telepathy, *Journal Society for Psychical Research*, **68**, 184–199.

Sinha, J. (1996/1933) *Indian Psychology: Cognition.* New Delhi, India: Motilal Banarsidass.

Steinkamp, F. (1997) Backwards causation, precognition and the intervention paradox, *The Parapsychological Association 40th Annual Convention*, Proceedings of Presented Papers, Brighton, U.K., pp. 410-425.

Steinkamp, F., Milton, J., & Morris, R.L. (1998) A meta-analysis of forced-choice experiments comparing clairvoyance and precognition, *Journal of Parapsychology*, **62**, 193–218.

Storm, L. (2006) Meta-analysis in parapsychology: II. Psi domains other than ganzfeld, *Australian Journal of Parapsychology,* **6**(2), 135–155.

Storm, L., Tressoldi, P.E., & Di Risio, L. (2010) Meta-analysis of free-response studies, 1992–2008: Assessing the in parapsychology, *Psychological Bulletin,* **136**(4), 471.

Storm, L., Tressoldi, P.E., & Di Risio, L. (2012) Meta-analysis of ESP studies, 1987–2010: Assessing the success of the forced-choice design in parapsychology, *Journal of Parapsychology*, **76**(2), 243–273.

Sudduth, M. (2009) Super-psi and the survivalist interpretation of mediumship, *Journal of Scientific Exploration*, **23**(2), 167–193.

Targ, R., May, E.C., Puthoff, H.E., Galin, D., & Ornstein, R. (1976) *Sensing of Remote EM Sources (Physiological Correlates)*, *Final Report: Project 4540*, Menlo Park, CA: SRI International.

Targ, E., & Targ, R. (1986) Accuracy of paranormal perception as a function of varying target probabilities, *Journal of Parapsychology,* **50**, 17–27.

Tart, C.T., Palmer, J., & Redington, D.J. (1979) Effects of immediate feedback on ESP performance: A second study, *Journal of the American Society for Psychical Research*, **73**(2), 151–165.

Utts, J.M. (1991) Replication and meta-analysis in parapsychology, *Statistical Science,* **6**(4), 363403.

Wagenmakers, E.J., Wetzels, R., Borsboom, D., & Van Der Maas, H.L. (2011) Why psychologists must change the way they analyze their data: The case of psi: Comment on Bem (2011), *Journal of Personality and Social Psychology*, **100**(3), 426–432. DOI: 10.1037/a0022790.

Wagenmakers, E.J., Wetzels, R., Borsboom, D., Kievit, R., & Van Der Maas, H.L. (2015). A skeptical eye on ESP, in E. C. May, & S. B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume I — History, Controversy, & Research,* Santa Barbara, CA: Praeger Publications.

Werth, L.F. (1978) Normalizing the paranormal: A philosophical feasibility study of precognition, *American Philosophical Quarterly*, 47-56.

Zingrone, N., & Alvarado, C.S. (2015) A brief history of psi, in E.C. May, & S.B. Marwaha (eds.) *Extrasensory Perception: Support, Skepticism, and Science, Volume I — History, Controversy, & Research,* Santa Barbara, CA: Praeger Publications.