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Parapsychological Association 2019 Presidential Address
Making Sense of Psi: Seven Pieces of the Puzzle

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A popular theme of annual presidential addresses to the Parapsychological Association (PA) and the Society for Psychical Research (SPR) is the attempt to make sense of psi. These addresses often assume that most of the audience is satisfied that the ontological question is settled in the affirmative, so the next questions that naturally arise are the *what* and *why* of psi?

I will address this theme in terms of a jigsaw puzzle that, when fully assembled someday, will present a coherent picture that provides a satisfactory answer to these age-old questions. The puzzle we are dealing with undoubtedly consists of thousands of pieces, of which to date we have only identified a few dozen, but perhaps we can make some sense of the tiny fraction of the whole picture that is already visible.

In the process of thinking about these puzzle pieces, I reread many of the presidential addresses, including a 1975 address to the SPR presented by University of Edinburgh's John Beloff. One of the sentences in his talk that caught my eye was the following: "For reasons which I hope will become increasingly clear as I proceed, I see no prospect whatever of making sense of the paranormal in purely physical terms, however unorthodox" (Beloff, 1976, p. 176).

That sentence stood out to me, especially the last two words, because the concept of "purely physical" has evolved so much over the course of the 20th century – from matter, to energy, to information, to nonlocality, to dark matter and energy – that we are now presented with a degree of conceptual fluidity that many scientists in 1975 would have regarded as ridiculous fantasies. The rate of change among ideas that once seemed to rest on solid ground reminds us to remain humble in the face of the ever-expanding unknown, and to not dismiss the possibility that one day physics and psi may neatly converge.

The reason Beloff made that remark is related to the same reason why some scientists today will not even bother to look at the psi literature. That is, many today are trained in the philosophical position of *materialism*, the worldview that assumes that matter (or, after Einstein, energy) is the foundation of everything. It is probably fair to say that fledgling scientists today are not required to know much about the philosophy of science, nor that materialism is a set of assumptions rather than an absolute truth. So if one simply assumes that materialism is obviously the correct worldview, then chemistry is viewed as emerging from physics, and biology from chemistry, and psychology from biology. From this

"upwards causation" perspective, consciousness – meaning subjective awareness – is naturally imagined to be an emergent property of material processes. As such, consciousness is pronounced by some, like Daniel Dennett, to be a mere epiphenomenon. Dennett has planted his flag on this neobehaviorist idea by proposing that we are not really conscious after all, but rather we only give the impression of being conscious, like zombies. He asks and answers, "Are zombies possible? They're not just possible, they're actual. We're all zombies." (Dennett, 1991, p. 406). To Dennett, it is obvious that you are your brain activity, and that is the end of the story. This is today's dogma in the neurosciences, which was enthusiastically supported by Nobel Laureate Francis Crick (Crick, 1995).

This position influences the mainstream view of psi by straightforwardly denying it, because if you are your brain, then how can your brain perceive or influence something distant in space and time? The answer is it cannot, unless we imagine that the brain is ultimately a "smart" quantum system, which many physicists today do not accept as possible. As Max Tegmark has argued, the brain is too warm and wet to sustain quantum coherence for more than a tiny fraction of a second, so appealing to quantum nonlocality to understand psi is a non-starter (Tegmark, 2000).

I do not want to give the impression that I am denying the value of materialism, because it has been proven to be an extremely effective way of understanding the nature of physical reality. But the evidence for psi is also increasingly persuasive, so an *exclusive* reliance on materialism is problematic and suggests that we've overlooked something important.

So, what's missing? It would be nice if the pieces of the puzzle we are looking for provided a neat picture of reality that made psi and materialism easily and obviously compatible. Unfortunately, I suspect that as we slowly discover these pieces, we will be putting together a picture of an elephant, along the lines of the ancient parable of the blind men and the elephant. That is, each of us will resonate with a tiny piece of the whole, so the picture we perceive will inevitably be idiosyncratic. And even if we miraculously put the whole puzzle together correctly in every detail, the picture might well look like a multidimensional Rubik's Cube drawn by M.C. Escher on a psychedelic trip. That is, it might require a 25th century science to even begin to understand.

Puzzle Piece 1

With the caveat of acknowledging our limitations, let us consider our first, and I think most important, puzzle piece. This piece is motivated by the question of how do we get from nothing to something? This is an interesting question because if you study the esoteric literature of both the East and the West, it basically comes down to what philosophers call *idealism* (Huxley, 1945). This is the flip-side of materialism, meaning it is not matter that is fundamental, but consciousness.

With idealism, rather than placing consciousness at the top of a hierarchy of emergent material properties, you place it at the bottom of the hierarchy, below physics. From this perspective, physics emerges out of consciousness, which we may imagine as some sort of primordial panpsychist "awareness substance," which in turn is inextricably woven into the very fabric of spacetime (Sheldrake, 2013). Now psi is not only acceptable, it becomes easy to explain because consciousness is prior to physicality,

and thus our awareness transcends the limitations of the physical world. Such transcendent experiences are precisely what we call psi.

But how do you go from something as ephemeral and as personally intimate as conscious awareness into the hard, physical world? We do not have a solid answer yet, so we are obliged to speak in terms of metaphors. Let us use the metaphor of an iceberg, which is often used to represent the visible, everyday surface reality, versus a deeper, hidden reality below the surface. At the surface level, we have classical physics, including mechanics, thermodynamics, and so on. Nearly all core technologies from the 18th to early 20th centuries arose out of those concepts. As science advanced, we learned that if you dive below the surface using instruments that expand our ability to perceive, then you end up with new and often completely unexpected phenomena, such as nuclear physics and, later, quantum mechanics. From these latter discoveries, reality becomes increasingly abstracted into four forces, and then into concepts we call fermions, leptons, and quarks. Even deeper, many imagine that there is some kind of super-unified field, from which all of the above emerges in a lawful way.

Now let us draw a parallel between mind and matter. At the surface level, everyday awareness is analogous to classical physics. That is, most people think about their "mind" in everyday classical terms, but through developments in psychoanalysis and neuroscience we have learned about aspects of a deeper mind, including preconscious, subconscious, and unconscious processing (Garcia-Rill, 2015; Tsikandilakis et al., 2019).

There is a third parallel we can draw with mathematics. Mathematics begins with simple, everyday concepts like counting numbers. As we go into mathematics a bit more, we encounter integers and the concept of zero. And then as we dive deeper we find increasingly abstract ideas like fractions, irrational numbers, transcendental numbers, imaginary numbers, and transfinite numbers. Then there are operations that we can apply to these numbers, including algebra, linear algebra, calculus, tensors, group theory, Lie algebra, gauge theory, and set theory. With each advancement these operations become increasingly sophisticated and abstract.

The reason I am including the mathematical parallel is because you could not describe the leading edges of physical theory, such as quantum field theory, without these abstract mathematics. As we continue to dive deeper into increasingly abstract territory, it is not unreasonable to expect that someone will eventually gain the insight that the latest batch of super-abstract math describes whole new realms "below" quantum field theory.

How do these trio of parallels provide a clue about how we get from nothing to something? Imagine the experience of looking up at the stars. How do we understand what is going on from a scientific perspective? Taking the reductive materialistic approach, we might first examine the eye, and then the brain, and then neurons, synapses, DNA, atomic structure, quarks, and before long we discover that we are at a point that can only be known in terms of abstractions. At the presumed bottom of our investigation is aleph null, the smallest set of infinities. In other words, starting from a personal, subjective experience we have looked through the lens of science and found that experience can be traced all the way to infinity.

Now we can reverse this process. Start with concepts of nothing and infinity (which are related to each other within set theory), and from there we emerge into quarks, atoms, neurons, and so on, eventually ending with subjective experience. In short, we start with nothing and *somehow* end up with the everyday physical world as well as our experience of it.

How can we understand this mysterious "somehow" process? Mathematicians and logicians working at the edge of the known are delving into this question. One approach that I have found to be useful in helping me think about this is the book, *Laws of Form*, a "calculus of distinctions" (sometimes also called a calculus of indications) first published in 1969 by George Spencer Brown (Spencer-Brown, 1969).

This little book influenced developments in mathematics, logic, humanities, philosophy, system theories, and cybernetics. Interestingly, Spencer-Brown was also interested in parapsychology, and in fact he held a Perrott-Warrick Fellowship at Cambridge University, and he published an article in *Nature* about the use of statistics in psi research (Spencer-Brown, 1953).

A calculus of distinctions refers to a way of applying logical rules to the act of making distinctions, i.e. noting differences and similarities. For example, imagine the universe as a void, paradoxically full of nothing. In that void, make a simple distinction like drawing a line to distinguish between this side and that side, or drawing a box to indicate an inside and an outside. Spencer-Brown indicated these kinds of distinctions with a simple symbol he called a "mark." Then he developed a set of rules on how marks interact and combine. One of the more important developments along the way was a means by which complex marks can form recursions – self-similar relations. It turns out that with that feature it becomes possible, as surprising as it may seem, to symbolically create space, time, and ultimately, the universe. Indeed, in the preface of the *Laws of Form* we find this statement:

> The theme of this book is that a universe comes into being when a space is severed or taken apart.... By tracing the way we represent such a severance, we can begin to reconstruct, with an accuracy and coverage *that appear almost uncanny*, the basic forms underlying linguistic, mathematical, physical, and biological sciences (Spencer-Brown, 1969, p. v, emphasis added).

Some of you may know that Vernon Neppe and Edward Close have recently developed a more sophisticated calculus of distinctions that they claim not only explains everything we currently know about physics, but also encompasses everything we know about consciousness and parapsychology (Neppe & Close, 2020).

Most of us are familiar with imaginary and complex numbers. Modern engineering and physical theories are founded on the use of such numbers. But *Laws of Form* introduces even stranger realms, with concepts like imaginary Boolean values. Conventional Booleans are all about true versus false, 1s and 0s. But it turns out that one of the consequences of exploring advanced forms of logic is that there are not only imaginary Booleans, but even stranger things like negative probabilities. These concepts, which are quite foreign to ordinary ways of thinking, may be necessary to develop a theory of everything that includes psi.

Puzzle Piece 2

The second puzzle piece is related to the extraordinary logics developed in *Laws of Form*. The Indian sage Nagarjuna, who lived about 150 to 250 CE, proposed a four-valued logic, whereby the first two values are standard Aristotelian logic: "A exists" versus "A does not exist." Four-valued logic includes those two values, but also includes: "A both exists and does not exist," and "Neither does A exist nor does A not exist" (Ganeri, 2004). Most of us are not used to thinking about logic in this way, so consider the sentence, "The first Pope in the 22nd century will be African." This statement is neither true nor false, because we do not know if the statement is true or not (assuming that the future is indeterminate, or that it is determinate but perfect precognition is not possible). Now consider another statement: "This statement is false." That sentence is both true *and* false at the same time. Through such examples you can see that more comprehensive logics do exist, and you may begin to sense how they capture the complexities of the real world, rather than the "excluded middle" of Aristotelian logic that most of the Western world has adopted as sacrosanct.

Why are alternative logics important for understanding psi? An example is an experiment that was inspired by my colleagues Richard Shoup and Tom Etter. They were both very involved in a branch of physics derived from the forms of logic discussed in *Laws of Form* and proposed by Nagarjuna. They came up with a clever way to investigate the underlying mechanisms in successful experiments involving random number generators (RNG) (Shoup & Etter, 2002).

In RNG experiments, it seems as though the deviations from chance that are observed are causally produced via psychokinesis (PK), i.e., the mind *influences* the RNG in a causal, force-like way. But there is an alternative explanation in which the participant perceives and takes advantage of fortuitous random walks in the output of an RNG. These interpretations are at the root of the debates between explanations based on PK, precognition, goal-orientation, and DAT (decision augmentation theory) (May et al., 1995; Schmidt, 1963).

I conducted an experiment based on Shoup and Etter's idea (Radin, 2006). On the surface, the experiment appeared to be an elementary PK-RNG study: A participant was asked to press a button, which caused an RNG to generate a 0 or 1. If the RNG produced a 1, then the participant heard a pleasing audio clip. If it produced a 0, then they heard a short click tone. This design encouraged the participant to try to make the RNG produce more 1s.

Behind the scenes, the experiment was more complicated. Rather than having the RNG make one random decision per trial, we programmed it to make a sequence of random decisions. This allowed us to trace how the random decisions unfolded through time. The experiment began with a random process generating a 1 or 0 with equal probability. We called those two possible decisions as resulting in a 1 or 0 *State*. After arriving in one of those States, a second RNG decision generated a decision with an 80/20 probability, meaning if you started out in the 1 (or 0) State the system remained in that state 80% of the time, and it switched to the 0 (or 1) State 20% percent of the time. This decision process was symmetric so it would not bias the RNG's output. Now a third random decision was made using the 80/20 rule, and the result was again either a 1 or a 0. What is described so far is a single trial. A run consisted of

a collection of 100 trials, and an experiment of multiple runs. The outcome of interest in an experiment was the number of 1s produced after the third decision divided by the total number of trials.

The random sequential decisions in each trial were made very quickly, so the participants were only aware that when they pressed a button they immediately obtained an interesting feedback audio clip or a short click, corresponding to the final 1 or 0 State. This design is based on a mathematical structure called a Markov Chain, a mathematical way of modeling probabilistic processes in time.

What the experiment showed is that through this design one can obtain statistically significant deviations in RNG outputs that look very much like typical results reported in previous PK-RNG experiments. But now we could trace the temporal sequence of the random decisions, so we could test if the results were better explained as an ordinary *efficient cause* (in Aristotelian terms), i.e. a force-like forward-in-time influence, or as a retrocausal, *final cause* (again in Aristotelian terms), i.e. a goal-directed, teleological influence. The results clearly supported the latter explanation.

I conducted many more unpublished experiments based on similar designs. What they suggested is that final cause appears to be a more viable explanation for the effects observed in PK-RNG experiments than efficient cause (at least within designs using sequential random decisions). This implies that intentional influence – if *influence* is even the right word here – "ripples backwards" in time to retrocausally manifest what participants or experimenters intend. I hasten to add that some of these Markov Chain experiments produced RNG deviations opposite to what was expected. Those outcomes were valuable reminders that experimental models are simplistic cartoons of the real world, so surprises should not be unexpected. The lesson learned was that, by paying attention to more sophisticated logics, it may be possible to develop novel ways of studying the mechanisms of psi and to occasionally evoke surprises.

Puzzle Piece 3

Our third puzzle piece involves possible relations between psi performance and brain morphology and genetics. The first part of the puzzle piece is a study by Morris Freedman (Freedman et al., 2018), who found that certain brain-damaged patients with frontal lobe brain damage were able to repeatedly obtain successful results in PK-RNG studies, suggesting that some aspects of the frontal lobes might get in the way of effective psi performance, which in turn seems to support the "filter theory" of the brain/mind relationship (Kelly et al., 2007, p. 603-643).

That is, if illness or injury destroys a portion of the frontal lobes, perhaps what is also inhibited is the analytical filter that normally prevents us from being able to see the world the way it is, rather than what our learned biases present to our awareness. As another way to test this idea, with support from the Bial Foundation, Bierman and Jolij used transcranial magnetic stimulation (TMS) to momentarily inhibit the frontal lobes in healthy participants. That test (not yet published as of this writing) did not show significant results, so either the TMS approach needs to be refined to hit exactly the right spot in the frontal lobes, or perhaps the Freedman outcome was a fluke. We do not know yet, but it is a promising area worthy of continued investigation.

The second part of this puzzle piece is that there might be a genetic component to psi talent. Some years ago Shari Cohn conducted a study of possible inheritance of Scottish "second sight," which suggested the presence of a genetic factor (Cohn, 1994, 1999). More recently, supported by a Bial Foundation grant, we began a study of the genetics of people who claim to have psychical ability and who come from families of psychics. We first identified 3,500 psychic candidates from a worldwide Internet search, and then we passed the candidates through multiple stages of questionnaires, performance tests, and interviews to confirm that they had some discernable psychic ability, that others in their families reported similar skills, and that they were psychologically well-grounded.

We then matched the resulting candidates against individuals who did not claim any psychic abilities, were not from psychic families, and who performed at chance in simple psychic tasks. We obtained DNA from the resulting 27 individuals and sequenced their full genomes. By comparing the psychic cases against the non-psychic controls, we found some intriguing genetic differences. As of this writing, these results are extremely preliminary because our sample size was so small, so before we publish anything about our findings we are pursuing another approach that will significantly expand our sample size using a method that is less expensive than sequencing full genomes. We hope before long to be able to discuss what we have found.

Puzzle Piece 4

The fourth puzzle piece is what I might call the "replication non-crisis." This refers to the great gnashing of teeth in academic psychology today about how difficult is it to repeat effects observed in conventional psychological experiments. We see articles with titles like, "Psychology's replication crisis is running out of excuses" (Yong, 2018), which complain that only half of previously reported conventional psychological studies can be repeated, even after all of the usual explanations given for such failures are controlled. Such reasons include the assertion that the investigators were sloppy or incompetent, or that the effects sizes were too small so the replication had insufficient statistical power, or the results reported were actually false-positives, or due to *p*-hacking, file drawer effects, experimenter differences, participant differences, and so on.

Does this sound familiar? They are the same set of criticisms often used to dismiss positive results in psi studies. But unlike conventional psychological research, after decades of criticism, psi research has been forced to pay attention to and control for such problems. As a result, we have also paid more attention to another factor that may be the actual explanation for replication difficulties, namely *tacit knowledge*.

Consider, for example, a study by sociologist Harry Collins, who explored difficulties in replicating the Transversely Excited Atmospheric pressure CO2 laser, otherwise known as a TEA laser (Collins, 1974). The first lesson Collins learned was that no one succeeded in building this laser by only using information found in publications. Second, he found that no one succeeded in building a laser where the informant had not personally built a working TEA laser. In other words, if one simply read about the TEA laser, or even if one were present when someone else built one, it was still virtually impossible to build a working model. Everyone who was successful in building that laser attained crucially important

tacit knowledge from direct personal contact with somebody who actually built one. But even then, not everyone who tried was guaranteed to succeed.

Again, does this sound familiar? We are all aware that the experimenter is critically important in psi research. Probably the best-known modern example is the Schlitz-Wiseman "feeling of being stared at" series of experiments (Schlitz et al., 2006). Caroline Watt interviewed Marilyn Schlitz and Richard Wiseman to see if she could discern why Schlitz's study outcomes were positive twice but Wiseman's were not (Watt et al., 2002).

What Watt found is that when Schlitz began a staring study, she would pray, focus, create rapport, and prime the participants for success by using words like "divine," "grace," and "magic." By comparison, Wiseman made no preparations, did not customize his interactions to the participants, maintained a cool, businesslike attitude, and did not attempt to establish rapport or prime for success. Such obvious interpersonal differences are not often reported, so independent attempts to replicate these effects based solely on what is found in publications might well have overlooked the most important factors.

Jule Eisenbud, who thought deeply about these interpersonal factors, pointed out that psi experiments are typically conducted assuming that participants would not use their psi abilities until they stepped into the lab, and then they would only use their abilities within the strict confines of the roles that they were assigned (Eisenbud, 1983). Likewise, experimenters are expected to not use their psi abilities, and everyone involved in the study would agree to stick to their assigned roles and take no notice of what anybody else was doing. Such assumptions are very likely wrong, and it is not difficult to see why making believe that the assumptions hold creates a huge amount of variance among replication attempts.

Fortunately, from a meta-analytic perspective parapsychology is not in a replication crisis after all unless one insists that robust psi effects should be produced by anyone, regardless of training, talent, motivation, or interpersonal styles.

Puzzle Piece 5

The fifth puzzle piece is quantum weirdness, which I would argue is not just associated with the weirdness of psi, but cut from the same cloth. Psi is considered peculiar because it suggests that there are aspects of human experience that transcend the classical boundaries of space and time, and that observation influences the physical world. Is it a coincidence that these features are also why quantum mechanics is considered weird? It is not fashionable in polite society to talk about these two topics in the same breath, because someone will invariably complain that it is illegitimate to use the weirdness of one realm to explain the weirdness of the other. To that I would say hold on a moment, because we are talking about *exactly* the same kinds of weirdness in both cases. So no, I do not think it's a coincidence.

I must add that this does not mean that quantum mechanics, as we understand it today, adequately *explains* psi. That is like mistaking my finger for where I am pointing. Instead, I would say that quantum mechanics reveals that physical reality, as best as we can tell today, is *compatible* with the core

features of psi experience. That is, quantum mechanics is physics pointing in the right direction. By comparison, classical mechanics would argue that psi is physically impossible, and thus it is only understandable in terms of delusion or illusion, because nothing in classical mechanics would lead one to the existence of nonlocal connections, or to reality being dependent on observers.

Puzzle Piece 6

Until very recently, many mainstream physicists dismissed the possibility of a quantum-psi relation because of their belief that the fragile state of quantum coherence could not be sustained in the warm, wet environment of living systems (Tegmark, 2000). But that belief is beginning to dissolve as we find more and more realms of biology where quantum mechanics might not just exist, but be *required* for living systems to work the way they do. We see quantum effects associated with the rate of catalytic effects and protein folding, with how photosynthesis works in plants, and with magnetoreception in birds (Ball, 2011). New advancements in understanding quantum biology may well lead to evidence for a quantum brain processes, and when that happens – and I predict it will – the missing link in the quantum-psi connection will "suddenly" become acceptable, as proposed decades ago by investigators like Evan Harris Walker (Walker, 1976).

Puzzle Piece 7

My last puzzle piece is Indra's Net, the metaphor derived from ancient Indian lore, which proposes that reality consists of an interconnected, holistic web of relations, interactions and influences that transcend space and time. Some physicists have interpreted the meaning of quantum mechanics in these terms (Kafatos & Nadeau, 2000). From this perspective, it is a major miracle that we find any evidence for psi at all. That is, in a holistic medium it is not possible to completely isolate one location in space-time from another. But that is precisely what psi experiments attempt to do (as alluded to by Eisenbud, among others). Thus, if psi is a reflection of a universe described metaphorically as Indra's Net, then we are severely limited by our epistemology, and we will need much more clever ways to transcend holism – if that is even possible – to provide robust scientific evidence for psi.

This suggests that we may be overly myopic in the way we think about psi. This nearsightedness is not something that will be easy to overcome, because we are forced to be myopic when we design and conduct an experiment. Perhaps one way to get around this problem is to consider psi in terms of systems. Some years ago I conducted a few psi experiments that kept track of dozens of variables (Radin, 1996), similar to the von Lucadou quantum-inspired correlation matrix studies (von Lucadou, 1995; von Lucadou et al., 2007). The results of these complex system experiments were (and continue to be) promising and suggest that thinking of psi in holistic ways may be fruitful ways to study the nature of psi.

Conclusion

I could have mentioned more than seven puzzle pieces, but even with this small subset of clues in hand, what picture begins to arise when we put the pieces together? My best guess – and it is only a

guess – is that just below the everyday world of appearances, where the world seems to be made of separate objects, in fact we do reside in a holistic medium that is either composed entirely of consciousness, or where consciousness is an inextricable part of that medium. Of course, speaking of "parts" does not make sense in a holistic context, but that is a limitation of language and perhaps why mystical experiences are invariably described as ineffable, despite the millions of words used to attempt descriptions. I recognize that this is not a scientific way to talk about psi, but at this stage that is the best I can do.

A related picture that comes to mind is a reminder that the analytical approach to understanding hypercomplex topics is the time-honored scholarly tactic, but there are other ways of apprehending reality, for example through emotion, music, dance, and, in general, art. So, I will end with this artistic reminder, modified from a poem by Walt Whitman (Whitman, 1867):

> When I heard the learn'd parapsychologist;
>
> When the proofs, the figures, were ranged in columns before me;
>
> When I was shown the charts and diagrams, to add, divide, and measure them;
>
> When I, sitting, heard the psi researcher where he lectured with much applause in the lecture-room,
>
> How soon, unaccountable, I became tired and sick;
>
> Till rising and gliding out, I wander'd off by myself, In the mystical moist night-air, and from time to time,
>
> Look'd up in perfect silence at the stars.

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