

Invited Address

EVIDENCE AND IMPLICATIONS OF MIND- MATTER INTERACTIONS¹

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ABSTRACT

The belief that mind has “power” over matter can be traced throughout history. The belief is deeply entwined into mythology and the origins of religion, and is central to the concept of spiritual or distant healing. As a result, science regards such beliefs as quaint superstitions at best, and as dangerous anathemas at worst. In modern times, mind-matter interaction has been repeatedly tested in the laboratory, and despite scientific disquiet, the evidence suggests that there may indeed be some sort of genuine physical phenomenon associated with the act of intention. The evidence further suggests that such interactions are probably pervasive, that they occur unconsciously, that the concept of mental “power” is probably misleading, and that our ontological assumptions about “objective reality” may need to be revised.

KEYWORDS: pk, psi, mind-matter, ganzfield, mind-mind

Imagine a deeply interconnected world. A holistic world where concepts like isolation, separation and parts don't exist. Where interconnections transcend time and space. Where concepts like objective and subjective are complementary. What would human experience be like in that world? The histories of shamanism and stories of mystical experience suggest what it might be like, as do contemporary reports of psychic phenomena. From the scientific perspective the generic term used for these reports is "psi." This term was coined by British psychologist Robert Thouless in the 1940's as a neutral way to describe these phenomena. Psi is not an acronym; it's simply the first letter in the Greek word for *psyche*, meaning mind or soul.

One commonly reported way that psi manifests is when information, often in the form of emotion or attention, appears to transfer between people's minds. The traditional term for this is telepathy. Another way is when information appears to transfer from a person to the environment; we call this psychokinesis or PK. A third way are cases in which objects or events in the distant environment appear in peoples' perceptions, called clairvoyance. When clairvoyance slips in time it's called either retrocognition or precognition, depending on which direction in time it slipped. All of these classes of experiences involve anomalous flows of information that don't require the use of the ordinary senses and transcend the usual boundaries of time and space. There are certainly lots of stories about such phenomena. What does science have to say about them?

Let's look first at PK, direct mind-matter interactions. In the public's mind, PK is usually associated with ideas like levitation or bending spoons. These are cases of self-evident PK, sometimes called macroscopic or macro-PK. I'm quite skeptical about claims for such effects. Instances of genuine macro-PK have proven to be nearly impossible to observe under controlled conditions, and so if you were asked to make a case for macro-PK in the court of scientific opinion, I believe that even a sympathetic jury would still be out. On the other hand, with a slight touch I once bent the bowl of a heavy soup spoon all the way over. This was an effect I had heard about and wanted to see for myself, as I know it would be extremely difficult to do without applying serious leverage or using tools. I don't know how I did this, although I suspect that this type of phenomenon is ultimately due to microscopic changes in the metal, and not to the mysterious appearance of large-scale forces. So while I know

from first hand experience that these things *can* occur, they're so difficult to repeat on demand that I place them in a special category of "spontaneous phenomena worth watching."

Because macro-PK effects are rarely observed under controlled conditions, in the laboratory we look at microscopic or micro-PK. These effects are tiny as compared to the claims of macro-PK, and as such they require the use of statistics to detect any effects at all. In these studies we look at mental intention not so much on matter *per se* as on the probabilistic states used to describe the behavior of matter. We may think of micro-PK as the mind influencing probabilities, which ties in nicely with modern physical theory because quantum mechanics is ultimately all about probabilistic states, and not about chunks of matter.

One of the largest classes of micro-PK experiments focused on what happens when you toss a die while maintaining an intention to "cause" a certain number to land face up. These studies were conducted mainly from 1935-1987. During that time, some 2.6 million dice were thrown by 2,500 people in 148 experiments conducted by 52 investigators. When you examine the overall results of these studies using a statistical technique known as meta-analysis, you find that the overall odds against chance are in excess of a billion to one in favor of micro-PK.

How do we explain this non-chance result? One possibility is selective reporting. This refers to the fact that scientists usually publish positive studies but not negative studies. This introduces a bias into the overall estimate of success. Another bias can arise because experiments are conducted at different levels of methodological quality. A comprehensive meta-analysis will assess not just the odds against chance (or in more precise terms, the overall effect size), but also the impact of potential selective reporting and experimental quality variations.

Psychologist Diane Ferrari and I completed such an analysis some years ago. We found evidence suggesting that to a small but real degree, if you toss dice while keeping an intention for certain numbers to land face up, then the dice will indeed comply. It takes an enormous amount of data to demonstrate this, but these experiments do appear to demonstrate a type of mind-matter interaction.

Experiments with dice eventually gave way to experiments involving random number generators (RNGs). These are electronic “coin-flipping” devices based on truly random events like radioactive decay or electronic noise. The shift from dice to RNG studies came about not so much because the dice studies weren’t working, but because they were time and resource intensive. For example, one of the most recent dice experiments involved a dice-tossing machine that threw and then photographed the result of each toss. While methodologically sound, this experiment was expensive to run and time-consuming to later analyze. By contrast, RNGs are controlled by computers, and this makes it relatively easy to automate and analyze an experiment. Instead of asking a participant to throw dice, you ask the person to wish for certain kinds of random bits, like sequences of ones, and then you predict that the RNG will be biased accordingly.

These experiments started in 1959 and they continue to the present day. They appear in over 160 publications reported by at least 73 different principal investigators. When you look at the results of thousands of such trials, you find that the overall odds against chance, across all such experiments, are about 50,000 to one. There are different ways of interpreting this non-chance result, but after taking into account alternative explanations like selective reporting and differences in experimental quality, the bottom line is that something interesting is going on that looks like mind-matter interaction.

This conclusion about micro-PK, which is quite a radical claim from the mainstream scientific perspective, is based on 70 years of increasingly sophisticated experiments. I mention this because every time somebody does one of these experiments, there are plenty of critics who feel compelled to explain why the results can’t possibly be true. Occasionally (although increasingly rarely) one of those criticisms will point out a potential flaw. In that case the next series of experiments are designed to eliminate the supposed flaw. After 70 years of attracting criticisms, researchers today generally have a good idea about how to run a valid micro-PK experiment. And the results of the newer experiments still show results suggestive of mind-matter interactions.

Today, informed criticism tends not to focus on methodological issues, but rather on how to interpret the results. That change in focus is important, because it reflects the expected evolution in the acceptance of new ideas: First,

a claimed effect is declared flatly impossible. Then as more evidence accumulates, the effect is acknowledged to exist, but it's thought to be weak and is therefore uninteresting. Finally the effect is viewed as obviously real and important, but the wrong people are given credit for discovering it.

The micro-PK effects we see now are independently repeatable. They're not trivial to repeat, and the effects are small, but nevertheless we can predict that if you selected a random group of people who were both competent experimenters and interested in this sort of phenomenon, then as a whole that group would eventually be able to duplicate these effects.

These effects are controversial not only because they postulate a connection between mind and matter, but because the effects appear to act more like final cause rather than efficient cause. Efficient cause is what we're used to when thinking about mechanistic, clockwork, forward-in-time causes. Final cause (using Aristotle's term) is when the end state of a process is an essential part of the cause of that process. Something like this seems to be involved in the process of getting random numbers to comply with our wishes. This curious transtemporal cause may be one of the reasons why these effects are so difficult to replicate: Future outcomes may be influencing what happens in the present.

What about the evidence for another form of mind-matter interaction, that involving mind to mind? I'll skip over a century of experimentation and just focus on one type of study called the ganzfeld experiment. The way it works is that you ask a person (usually called the "sender" for the sake of convenience) to watch a one-minute video clip. Over the course of 20 minutes that video clip is repeatedly played ten times. The sender is asked to send his or her experience of that video clip, including the emotions, the images and so on, to a "receiver" located at a distance. The receiver knows that their friend will try to send them something, but they don't know anything about the content. The receiver is put into the ganzfeld state, which involves placing halved ping-pong balls over their eyes, and asking them to keep their eyes open while a red light shines onto their face. They also wear headphones that play white noise, and they relax in a comfortable reclining chair.

If you imagine yourself in this condition, you'll soon see that it's not a state of sensory deprivation, but rather a low level of unpatterned sensory *stimula-*

tion. Because your eyes are open and you're looking through ping-pong balls at a red light, after a few minutes you can't tell if your eyes are open or closed. This unusual condition tricks your brain into thinking that it *ought* to be seeing something, so it tends to produce visual hallucinations. Likewise, the white noise tricks your ears into generating audio hallucinations. This simple method creates a hypnagogic, dream-like condition very quickly, and the reason we seek to produce this state is because when you examine spontaneous cases of psychic phenomena, you find that the majority of them take place not in the ordinary state of awareness, but in altered states like dreams.

Once the receiver has relaxed in the ganzfeld for a while, we ask him or her to speak aloud whatever comes to mind; we call this process *mentation*. The mentation is carried by a one-way audio link back to the sender, so while the sender is looking at the video clip and trying to send it, he or she can hear what the receiver is saying and use the mentation to adjust the mental sending strategy to try to cause the receiver to have imagery that matches the video clip.

To judge the results of the experiment, you take the receiver out of the ganzfeld state, you play back his or her mentation to remind them what was said, and you also show four video clips: the real one and three decoys. These pools of four video clips are devised in such a way that the images and feelings evoked by the clips are as different as possible. The chance probability of the receiver correctly choosing the "correct" video clip in this experiment, if there's no telepathy, is one in four, or 25 percent.

Over the past three decades, over three thousand sessions of the ganzfeld experiment have been reported by about fifteen laboratories around the world. The overall observed hit rate is about 32%. The odds against chance for this small increase over chance is well beyond a billion to one. The nice thing about this particular type of study is that it's been scrutinized very carefully over the years, so researchers are aware of all of the studies that have ever been conducted. So there's no selective reporting problem. The question of experimental quality has also been beaten to death in debates. After assessing all the pros and cons, in my opinion the positive results of these studies cannot be plausibly attributed to flaws or to selective reporting. This means that information can indeed transfer between people in ways that defy conventional expectations.

So we have evidence for mind-matter and mind-mind interactions. What about mind and body? I don't mean my mind and my body; I mean my mind and *your* body. The bodily systems most frequently associated with these transpersonal sensitivities include the brain, the heart, the gut, and the skin.

Let's first see what happens when we monitor the electrical resistance of the skin (technical called electrodermal activity). In the usual experimental protocol you record a person's (say Jill) skin resistance (or more often, the opposite of resistance, called conductance) continuously. These measures provide a good reflection of the activity of her autonomic nervous system. You have a closed-circuit TV camera looking at her, and she knows that over the next thirty minutes that someone at a distance will be trying to mentally interact with her, but Jill doesn't know when this will happen, or how long each interaction may be. So she just sits there and relaxes. Meanwhile, a distant "sender" is given randomly-timed instructions to either stare intently at the live video image of Jill, the "receiver" or to not stare and think about something else. A computer is used to randomly switch between the staring and non-staring conditions so the receiver can't guess what is happening, and even the experimenter is unaware of the conditions during the experiment.

An experiment of this type might employ 20 staring periods and 20 non-staring periods. At the end of the experiment, we take the average of all the skin conductance measures recorded during the 20 staring periods, and the same measures for the 20 non-staring periods. Overall, we'll find that there's more autonomic nervous system activation during the staring periods than during the control periods. To formally assess the results, we perform a statistical analysis to determine the probability associated with the observed differences. A meta-analysis of these types of studies, published recently in the *British Journal of Psychology*, concluded that considering all studies of this type published so far, that there was a real distant mind-body effect.

What about direct interactions between distant brains? This story begins in the 1890's. A young man named Hans Berger was riding his horse. The horse slipped, Hans was thrown, and he fell down a small embankment, ending up sprawled flat on a road just as a cannon battery drawn by four horses was rapidly approaching. Hans stared at the advancing horses with horror, sure that he was

about to be killed. At the same moment, many miles away at his family's home, Hans' sister somehow knew that he was in mortal danger. She insisted that their father send a telegram to Hans to ask him if he was okay. This was the one and only time that his father ever sent him any sort of telegram.

As it turned out, Hans Berger was not harmed in this misadventure, and he later grew up and became a doctor, specializing in the brain. He became obsessed with understanding how his accident was perceived by his sister many miles away. In the process of his investigations, he was the first to record the human electroencephalogram (EEG). Most neuroscientists today don't realize that their field was spawned as the result of a telepathic experience.

One of the many interesting aspects about studies looking at correlations between isolated brains is that most of the publications have appeared in mainstream journals, including *Science*, *Nature*, *Proceedings of the IEEE*, *Neuroscience Letters*, and the *Journal of Alternative and Complementary Medicine*. In our lab we've conducted the brain-to-brain interaction experiment as follows: We place one person, the "receiver," in a heavily shielded chamber. Then we place a sender in another room at a distance, and we flash a light at them at random times. Each time you do this you get a predictable event-related response in the sender's brain. What we look for is whether a corresponding response arises in the receiver's brain at about the same time.

Our experiment involved thirteen pairs of people, mostly friends but also some mother-daughter pairs, as the senders and receivers. Overall, we found a significant correlation in the responses of the two brains. In similar studies, Leanna Standish and her group at Bastyr University have investigated this same phenomenon, but with the use of a functional magnetic resonance imaging device (fMRI) rather than an EEG. They found a location in the receiver's visual cortex that responded, in a statistically significant way, when the sender was seeing the flashing lights. So far, about a dozen experiments have examined distant brain correlations, and the results are consistent with both the ganzfeld and the electrodermal studies.

What about interactions between one person's mind and another's gut? The gut is an interesting bodily system to study because it's highly sensitive to

emotions, and the phrase “gut feelings” is virtually synonymous with intuitive feelings. To explore this similarity, we conducted an experiment looking at one person’s gut feelings as a detector of a distant person’s emotions. We used an electrogastrogram (EGG) to take the recordings, which is a way of monitoring the electrophysiology of the gut. We asked receivers to relax for 30 minutes in our shielded room while we measured their EGG. Then we asked a sender to look at the receiver’s video image while also watching a series of multi-media slide shows. Each slide show lasted for two minutes and was designed to evoke one of five types of emotions: positive, sad, angry, calm, or neutral. The sender also wore headphones that played music that complemented the emotion. The positive emotions were accompanied by a Beatles tune or a Little Richard tune, the sad emotion was accompanied by Samuel Barber’s “Adagio for Strings,” and so on. We ran 26 pairs of people and found statistically strong EGG changes in the receiver while the sender was experiencing positive and sad emotions.

So various forms of mind-matter interactions appear to exist. What about collective mind and matter? Could mass-mind-matter effects spread out and affect the environment at large? To ease into this topic, imagine that we’re not talking about mind-matter interactions, but about mind-body interactions. Say you sit down to meditate and your body feels agitated; your mind is likely to be agitated as well. As you continue to meditate your body will begin to calm down, and then your mind will follow. Likewise, if mind and matter are complementary, like two sides of the same coin, then when the mind is agitated we postulate that matter too will be agitated, and when the mind becomes calm matter too will become calm. To test this idea, we need something that might detect, or perhaps a better word is reflect, the degree of “agitation” in matter. We use electronic random number generators to do this, because these devices are designed to generate maximum agitation (the technical term is maximum entropy, or randomness). If it turned out that entropy declined from theoretical expectation (or equivalently that unexpected order appeared in the random generators) during periods when many minds were focused on the same object or event, then this would suggest a mass-mind-matter interaction.

An example of an early experiment of the “field consciousness” type, as these studies are called, was when the O J Simpson murder trial verdict was read. Before, during and after this event I ran five random number generators

simultaneously—three in Las Vegas, one in Princeton, NJ, and one in Amsterdam. Something like a half a billion people were paying attention to this event as it unfolded. What we observed was that when the TV pre-shows began at nine o'clock that morning the composite randomness among the five generators began to decline. It peaked at odds against chance of about 500 to 1, then quickly settled back down to chance levels, perhaps because viewers realized that nothing interesting was happening yet. Then, just before the verdict was read the TV switched over to Judge Eto's chambers, and a few minutes later the verdict was read. For these events the composite results peaked at odds against chance of 800 to 1, then it immediately dropped down back to chance after the verdict is read. This outcome provided a striking, single case illustration of the possible effects of mass mind.

A few years later, Princeton University scientist Roger Nelson launched the Global Consciousness Project (GCP, started in 1998). Today, the GCP has nearly 70 random number generators located all around the world, each running 24 hours a day. Every five minutes each generator sends its data over the Internet to a web server in Princeton. The website <http://noosphere.princeton.edu> is a repository of all the data and also contains most of our analyses and reports. The kinds of events that are studied include predictable events like New Years celebrations and big sporting events, and also unpredictable events like earthquakes and terrorist attacks.

We've looked at 174 global events over the course of the project so far (as of 2004). Overall the odds against chance are a few hundred thousand to one. Something interesting is going on, suggesting a connection between large scale world events and the behavior of these random devices.

A particularly memorable event occurred on September 11, 2001. On that day 37 generators were running, and we found numerous statistical anomalies in the GCP data. One of the interesting findings was that the data statistically peaked a few hours before the attacks unfolded, which hints that there might have been a mass mind premonition that something important was about to unfold. I wrote a popular-level article about this that you can find on the IONS website (see www.noetic.org/publications/review/issue63/r63radin.pdf), entitled "For Whom the Bell Tolls," and I also coauthored (with Roger Nelson,

Richard Shoup and Peter Bancel) a technical article about our findings that appeared in the physics journal, *Foundations of Physics Letters* in 2002.

In summary, overall there is a growing body of data suggesting that mind and matter interact in ways that are not well accounted for by conventional theories of perception or action. This conclusion is not widely accepted by the scientific mainstream, partially because the data are not well known, and also because observations that run counter to prevailing theories are regarded as suspicious. This is an understandable reaction, so it's useful to keep in mind that these data have been produced and evaluated by the same standards of evidence used in conventional disciplines. And when viewed without prejudice, overall it provides a strong case that something interesting is indeed going on.

Eventually someone's going to come along with an adequate theory that begins to explain these effects. The new idea will eventually gel, and then retrospectively all of the existing data will fall into place. It seems likely that this new idea will be a radical departure from our present scientific view of who we are and what we are capable of, and it may well have consequences that reverberate significantly throughout society. By that time, former skeptics will have magically forgotten that the idea of mind-matter interaction was once considered controversial, and they'll undoubtedly find new things to criticize.

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REFERENCES & NOTES

1. In 2004 Dean Radin presented an invited address at the ISSSEEM Fourteenth Annual Conference "The Essence of Subtle Energies in Science & Practice: The Inner Source of Healing." This article is drawn from that address.

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