

Experimental Parapsychology

This is a general overview of the attempts by scientists and scholars to apply experimental methods to claims of psychic experiences, from spiritualist séances in the second half of the nineteenth century to the statistical methods employed in present-day parapsychology.

The Early Period

The physicist [William Crookes](#), FRS, investigated séances over several years in the early 1870s. One of his subjects was the well-known physical medium [Daniel Home](#), who he brought into his laboratory to try to measure the forces (if any) involved in the production of the physical phenomena – levitations of furniture, musical instruments playing by themselves, and the like – that were being witnessed in Home's séances. Crookes published a detailed report of his experiments, including measurements of deflections on a balance scale that he attributed to Home's 'psychic force', only to be accused of having allowed himself to be hypnotized, such that he misperceived events and instrument readings, or of being deceived by conjuring tricks. To counter that accusation, in fresh experiments Crookes designed recording equipment to provide an objective record of the forces at work.¹

Crookes's experiments, carried out relatively early in his career, were the most exacting of any conducted with physical mediums. Among his many later achievements in mainstream science was the development of the Crookes tube, a forerunner of the technology underlying television.

With the establishment of the [Society for Psychical Research](#) in 1882 there began a sustained period of investigations, many of them experimental in nature. [Edmund Gurney](#) conducted a series of experiments investigating hypnotism and telepathic hypnotism, which he reported in early volumes of the SPR's *Proceedings*. This laid the foundation for understanding hypnotism and hypnotic anaesthesia.

Other early experiments toward the end of the nineteenth century investigated 'thought-transference', soon to be renamed 'telepathy'. Among the more noteworthy was a series carried out in Brighton, which was overseen by [Eleanor Sidgwick](#), a mathematician and one of the SPR's most uncompromising investigators. Subjects were tested under different conditions, primarily using number targets. The results, also published in the *Proceedings*, revealed that some subjects simply produced chance results, others were well above chance, and one consistently produced exceptional scores. This is an early example of what is called *forced-choice* testing, where the subject has to choose among a number of possible alternatives, one of which corresponds to a target, such as a number, playing card, or colour.

In Europe the French physiologist [Charles Richet](#) (later to win a Nobel Prize) was laying the groundwork for what was to become the most common experimental method used in parapsychology. In 1884, he introduced the use of probability mathematics in card guessing-type experiments to calculate chance expectancy and

odds against chance as an explanation for a given result. He later used this method with considerable success in a series of experiments with a special subject under hypnosis.

In the early part of the twentieth century, growing numbers of studies used experimental procedures with statistical evaluations. At Stanford University, John E Coover used a deck of playing cards (with face cards removed) to amass a total of 10,000 trials with over 100 subjects. When the results were published in 1917, Coover claimed that there was no evidence of psychic ability in his data. However years later, a re-examination of his data by Duke University researchers (and others) claimed that Coover had used overly-stringent statistical criteria and had overlooked the possibility of clairvoyance in his control trials. When reanalyzed using more conventional statistical criteria, Coover's results did yield rather strong evidence of psychic ability.²

During this period psychical researchers were blazing new ground with their methods and analyses, which had few precursors. It was inevitable that mistakes would be made; nevertheless, the self-critical attitude that characterizes the field today was evident from the earliest days. As an example, GNM Tyrrell, who earlier had success testing a gifted subject with playing cards, developed a technique to test the subject's personal *forte*, finding objects. The subject pointed to one of five boxes that contained objects. When fellow psychical researcher GW Fisk pointed out that the targets (chosen by the experimenter) were not random, Tyrrell introduced a mechanical commutator to randomize the targets properly, and the subject continued to score significantly.

The Rhine Era

[Joseph Banks Rhine](#) and his wife and fellow parapsychologist [Louisa Rhine](#) attended séances when they first became interested in psychical research, but were not impressed. As trained scientists (both had PhDs in biology), they realized that progress in the field would have to be rooted in the experimental method. JB Rhine was invited to join psychologist [William McDougall](#) at Duke University in North Carolina in 1927; by 1930, Rhine had his own laboratory and began developing the methodology for which he and the Duke Parapsychology Laboratory would become famous. Initially, Rhine followed earlier examples, trying card guessing with numbers stamped on cards sealed in envelopes, but this was not very successful. Rhine then had the idea of asking a colleague, Karl Zener, a perceptual psychologist, to design a new set of target cards that could be easily distinguished and remembered, of roughly equal visual weight. The result was the well-known ESP cards often called Zener cards, although the final designs differed slightly from Zener's.

Equipped with the new cards, and using simple probability statistics to evaluate the results, Rhine began testing students. A few subjects emerged who could consistently guess the cards better than chance. Having accumulated thousands of trials with exceptionally high odds against chance as an explanation, the Duke team felt justified in concluding that 'extrasensory perception' (ESP), as Rhine dubbed it, had been demonstrated, and they went on to explore the topic in relation to the

effects of certain drugs, stimulants, fatigue, etc. Their results suggested that psychic ability seemed to follow natural laws similar to other psychological phenomena, evidence that Rhine used to argue that ESP was a natural ability, not a miracle. Eventually a total of eight special subjects were identified, and these contributed thousands more trials in experiments designed to investigate possible differences between clairvoyance and telepathy, and the importance or otherwise of the distance between the agent (who saw the cards) and the subject.

From the start, the Duke researchers were aware that their results would attract intense critical scrutiny. Fundamental to the card-guessing method is the requirement that there can be no sensory leakage from the targets (the cards) to the subject, nor can there be any manner in which the subject could infer even one correct guess in a standard run of 25. In typical experiments, the target cards were enclosed in opaque envelopes, held behind screens, or kept in separate rooms. There were some mistakes: notoriously, the researchers realized that the first batch of ESP cards that had been commercially printed by the letterpress method allowed the symbols to be read from the back, if held to the light at an angle. As soon as this was discovered all cards used during experiments were placed in envelopes, or were otherwise kept from the subject. Subsequent printings by means of offset lithography eliminated that problem, but by then the standard method was to keep the target cards out of the subject's sight. At an early stage, therefore, the possibility of subjects cheating by reading the back of the cards, or by using marked cards, was eliminated. Although testing was typically structured in runs of 25 cards, the target cards were drawn from large pools and effectively randomized, which meant that card-counting was not possible either.

The culmination of the improving methodology came with a series of experiments known as the Pearce-Pratt series, which sought to eliminate even the possibility of fraud or collusion on the part of the experimenters. This series took place in different buildings on Duke's West Campus. [J. Gaither Pratt](#) served as the agent, located in what was then the physics building, while [Hubert Pearce](#), the subject, sat in the library about a hundred yards away. Pratt picked up a card from a pre-shuffled deck at the rate of one a minute and, without turning it over or looking at it, placed it face down on a book (this was a clairvoyance test so there was no need for the experimenter to look at the card.) Timing the trials with a synchronized watch, Pearce tried each time to perceive which symbol was represented on the card lying on the book. At the conclusion of the testing session, without meeting, both men deposited the records of their participation with Rhine. Over 300 trials, Pearce averaged 9.9 hits per run of 25, where chance expectancy was five. In further experiments he was relocated to the medical school over 250 yards away. Four separate experiments were done with a total of 558 hits out of 1,850 trials, where 370 would be expected by chance. The odds against chance as an explanation for the results were 22 billion-to-one.³

The publication in 1934 of Rhine's book [Extra-Sensory Perception](#) is widely regarded as the start of modern experimental parapsychology.⁴ Here Rhine introduced the terms 'extrasensory perception' and 'parapsychology' (borrowed from an earlier German term), and went on to outline the methods and the results of the first few years of research at Duke University. The Duke lab quickly began to get word of

independent replications at other US universities and from Europe. Equally quickly, the work began attracting critical and even hostile reactions from other academics. Eventually in 1938, the [American Psychological Association \(APA\)](#) arranged for a session at its annual convention to debate 'Experimental Methods of ESP Research'. The panel included Rhine, his statistician, and [Gardner Murphy](#), a well-respected psychologist in support of the research, and three leading critics. Rhine's team was able to defend their methods and rebut much of the criticism, and the many examples of continuing methodological improvement won applause.

This APA debate made it clear to Rhine and his colleagues that a comprehensive presentation of the methods and findings of parapsychology had to be prepared in order to win the approval of professional psychology. This came several years later with the publication of Rhine's and his co-authors' comprehensive work *Extra-Sensory Perception After Sixty Years* (sixty years referring to the founding of the SPR in 1882).⁵ All the work of the preceding ten years was included, along with detailed explanations of the mathematical and statistical treatments. The book took on in great detail the main criticisms that had been levelled at the work – 32 by Rhine's count – and demonstrated how the six 'best' experiments could not be explained by any combination of the criticisms. All this was then given to the leading critics, whose replies were included in the volume. On publication the book was widely reviewed in the professional press; the reception remained mixed, but for the most part it was no longer hostile, and while some reviewers were not prepared to accept the existence of ESP, at least they allowed that the methods of the Duke team were sound.

The Duke lab and its methods largely dominated parapsychology in the late 1940s and 1950s. At Duke and other universities the ESP card-guessing technique was used as an assessment tool to investigate a wide range of largely psychological questions about ESP ability. These included cognitive issues, such as the relationship between memory and ESP ability, also personality questions aimed at trying to identify the characteristics of individuals who did well in ESP tests.

ESP card-guessing proved to be a simple and, when correctly executed, reliable method of assessing ESP ability, but had one drawback: it had become very boring for experimenters and subjects alike. Today ESP cards are no longer used in serious experimentation, although computerized card-guessing experiments with similar images and statistical evaluation are widely available.

Diversifying Methods

ESP in Dreams: The free-response method

The 1960s have been characterized as a period of ferment and experimentation. The 'new generation' of scientists that were attracted to parapsychology as a research problem were not content to follow Rhine's path. New developments in psychology and neuroscience suggested other ways in which ESP could be investigated.

Dreams has always been one of the most common states in which people experience ESP. Kleitman's discovery that rapid eye movements (REM) were a

reliable indicator of dreaming-periods opened up the dream state for ESP research. In the mid-1960s at the Maimonides Medical Center in Brooklyn, New York, a team of researchers led by [Stanley Krippner](#) and [Montague Ullman](#) developed a new methodology to investigate [ESP in dreams](#). Subjects spent the night in the hospital's sleep laboratory wired up for REM monitoring. In a room located elsewhere in the hospital a staff member served as the agent, equipped with a set of targets in sealed envelopes, usually four in number. When the investigator in the sleep lab noticed that the sleeping subject was entering a REM period he signalled the agent by means of a one-way intercom. The agent then used a randomizing process to select one of the envelopes, take out the content and begin trying to communicate the target material to the sleeping subject. When the REM record showed signs of ending, the investigator woke the sleeper and asked for a description of the dream that he or she had just been having. These details were recorded. Throughout the night the process was repeated (except that the target remained the same) for each dreaming period.

To take advantage of the rich imagery of dreams, the researchers used art prints as targets initially, but later turned to more elaborate immersive experiences. They adapted the 'free-response' method used in the early days of psychical research, in which the subject responds freely, reporting whatever images, memories and feelings, come to mind. In the case of dreams, the subject simply reported whatever he or she was dreaming about, no matter how strange or bizarre. To ensure that the other elements essential for ESP testing were present, once the target was randomly selected there could be no communication or sensory leakage of the target back to the sleep lab. To assess whether there was any evidence of ESP in the subject's dreams, outside judges – usually psychologists familiar with dream interpretation, but who of course had no knowledge about which picture of the four that had been used in the session was the actual target – ranked each dream transcript according to its similarity to each of the target pictures. These rankings were then subjected to statistical analyses.

The Maimonides Dream Lab closed in 1978 when funding expired. Over a dozen formal studies had been completed, many with strikingly successful results. A latter assessment of the whole programme, including pilot and screening data – in which a hit was defined as a ranking in the upper half of the possible range of rankings – found that there were 233 hits in 379 trials, an accuracy rate of 83.5% where chance would predict 50%. The odds against chance for that result were better than a quarter of a million-to-one.⁶

Because dream-lab studies were inherently very expensive to conduct, they were not continued in parapsychology, and there has been only a single, small independent replication effort; this differed markedly from the original studies and failed to find evidence of ESP.

More common in recent years have been ESP dream studies in which participants sleep at home and record their dreams at the bedside or in the morning. The dream reports are later brought to the laboratory where they are compared with the target or targets that had been randomly allocated for their session using appropriate blind judging techniques. While such studies cannot offer the same degree of

precision and control as sleep labs, results continue to demonstrate that dreams are a valuable source of ESP evidence.⁷

The Ganzfeld Technique

The free response method proved to be a methodologically and statistically sound approach, one that could be adapted to a variety of situations unsuited to forced-choice card-guessing approaches. The use of targets rich in visual and emotional content was seen to approximate to the apparently spontaneous occurrence of ESP.

The first large-scale application of free response testing that followed Maimonides employed the [ganzfeld ESP experimental design](#) developed by [Charles Honorton](#), a researcher at the Maimonides dream lab, and others. The key element was the creation of a mild state of sensory isolation in the subject through the use of uniform visual and auditory fields. 'Ganzfeld' is a German term meaning 'whole field'; the concept was first used by psychologists in early Gestalt perception work. The subject relaxes in a reclining chair with translucent hemispheres (usually shaped ping-pong ball halves) placed over the eyes, headphones delivering white noise to the ears; red light is directed on the eye covers creating a uniform pink visual field. The experience is not unpleasant, often described as lying on the beach with eyes closed listening to the distant sea. The purpose is more or less to cut the subject off from sensory stimuli so as to encourage a focus on inner feelings, images and thoughts.

The rationale derives from several sources. Dream researchers saw the dream state as one of complete isolation from sensory input that is conducive to ESP experiences: spontaneous instances are often reported on the verge of sleep, or in daydreams and reveries. Another influence is the literature on the meditational state, which eliminates sensory distractions from the environment while focusing attention inward: this too is associated with reports of ESP. Finally, gifted subjects with whom psi researchers had worked from the earliest years typically described their strategy for success as a process of 'clearing the mind' or 'creating a blank space' on which impressions would appear. Honorton described this as the 'noise reduction' approach to ESP research, where 'noise' refers to the common mental activity and sensory input that might drown out ESP 'signals'.

A typical early ganzfeld experiment session involved a subject and an agent. The subject is prepared in the ganzfeld condition, usually in a dedicated room; the agent is placed in another room, effectively isolated from the subject. There may be a fifteen-minute relaxation exercise for both participants. Then the subject is instructed to describe any images, thoughts, feelings that come to mind. At the same time the agent is presented with a target image randomly chosen from a pool of four, which in turn have been randomly selected from a much larger set of images. The agent is instructed to try to communicate the target image to his or her partner by ESP. For thirty minutes an experimenter records the subject's comments.

At the end of the session the experimenter brings the subject out of the ganzfeld state and reviews the mentation that he or she has produced, prompting for any elaborations or clarifications. Eventually the experimenter presents the subject with all four of the possible targets from a duplicate set. The subject reviews these

in the context of his or her experiences and then rates them or ranks them on a scale ranging from 'most like my imagery and experiences' to 'least like them'. The agent is then invited to bring in the target picture and discuss the results. It is important to note that at this stage, and right until the end of the experiment, the experimenter working with the subject never knows the identity of the target.

As with any experimental methodology, potential weaknesses were quickly identified and rectified. For instance, if an agent had been handling a target picture for thirty minutes this might still be warm, or greasy, or otherwise capable of providing clues to the subject. So duplicate sets of targets were used for the judging stage.

The use of the ganzfeld experiment quickly spread to other laboratories, being modified and improved along the way. Various types of target images were used, varying in thematic content and presentation. As soon as technology made it possible, Honorton's team automated the entire experimental sequence using early desktop computers (Apple II) to ensure that the target selection was random and that the rigorous protocol and timings were enforced. Other labs quickly followed suit. Labs that could afford it placed the subject, and sometimes the agent, in industrial grade acoustically and electromagnetically shielded rooms.

Ganzfeld ESP methodology is still in use, though not as commonly as in earlier decades. To date, well over a hundred experiments from various laboratories have been reported, and the results have been subjected to several critical assessments and meta-analyses over the years. Overall, the assessment by parapsychologists has been that the ganzfeld ESP methodology has delivered reliable evidence that ESP exists, and even some insights into how it might work,⁸ though some critics have argued that the adoption of an alternative statistical approach means that the results need not be taken at face value.⁹

Remote Viewing

[Remote viewing \(RV\)](#) is the name given to a free-response method for testing ESP developed by scientists working in the US government-funded 'psychic spying' programme known as Star Gate. This started at Stanford Research Institute (later SRI International) in the mid-1970s and was later transferred to another contract research organization, Science Applications International Corporation (SAIC). Government funding ended in 1995, at which time the records were transferred to the Laboratories for Fundamental Research (LFR), a privately funded laboratory that continues remote viewing research to this day.

The programme had its roots in Cold War concerns on the part of the US government that the Soviet Union might be developing a programme of psychic spying (which turned out later to be true)¹⁰ and its desire to see what was possible in this regard. Physicists [Harold Puthoff](#) and [Russell Targ](#) led the initial effort, joined later by physicist Edwin C May, who directed the government programme for its second decade, eventually taking the research to LFR, of which he is director.

Remote viewing shared the main elements of free-response methodology that was already in use in dream ESP and ganzfeld research, but it developed a number of

additional techniques. A main difference was its use of subjects: participants were highly selected individuals who were treated as valued collaborators. Another was that targets were often actual locations, specified by various government agencies. Later protocols used carefully selected collections of photos and automated computer administration of the experiments to enable fine-grain analyses of target characteristics that might contribute to success.

Although there were differences in the protocol details, common characteristics should be noted. The data collection phase was an almost ritualized procedure, one that is still adhered to in formal RV research. The subject spends some time preparing for the session by relaxing, meditating, or just 'clearing the mind.' As the trial starts, the person serving as the monitor engages the subject in casual chat. After a while, the monitor says, 'target' – a signal for the subject to focus attention on 'seeing' what is at the target location. The subject sketches and labels whatever images come to mind, although attempts to interpret them at this stage are discouraged. When the production of imagery appears to slow down, the monitor declares a pause, during which more casual chat ensues. Then the monitor says, 'target', and the process begins again.

This sequence is repeated several times until the subject feels that no more information is likely to emerge. The sketches and notes are given to another person, who serves as the judge (or 'analyst' in RV terminology) and in due course rates the material against a pool of possible targets, as in other free-response protocols. Unlike some of these, such as the ganzfeld, RV subjects never judge their own productions and, very importantly, are never shown the alternative targets. At the appropriate time the subject is shown the correct target as feedback on the trial.

In the earliest experimental series, an 'outbounder' would actually visit a location (within the San Francisco Bay area) and serve as a beacon for the subject. However, this was abandoned as targeting became global and the research team (including the subjects) found it unnecessary.

As with any experimental protocol, there were some starting hiccups. Although there were procedures in place to keep the roles of target selector, monitor, subject and analyst strictly separated, in order to eliminate any sensory leakage of target information, a possible means of information leakage slipped past the investigators in their first publication. A participant might carry out a series of trials, and it was noticed that occasionally the subject's notes referred to something that had happened in a previous session. Given the way the targets were selected, such information might inadvertently provide the analyst with clues about the identity of the target on a certain trial. Subsequently, the methods of target selection were changed and such cross-referencing (which was discouraged) could not compromise the integrity of the trial.

In all subsequent work, the RV technique proved to be a robust and flexible method of assessing ESP (or Anomalous Cognition, as it was later known in the programme). Today RV is used to investigate aspects of the target system that may contribute to a better theoretical understanding of how psi operates, as well to investigate a wide range of subject and target factors that contribute to successful ESP performance. The most recent description of RV methodology, as utilized by

the LFR researchers, was published by May, Marwaha and Chaganti¹¹ and a technical review of methods and findings is available in a recent volume by May and Marwaha.¹²

In addition to laboratory research, the team of remote viewers was on call for operational tasks that arrived regularly from various US government intelligence and military agencies. These included locating downed spy planes, abducted generals, secret Soviet submarine factories and many others, some still classified.¹³ By their nature, such operations could not observe the protocols that were used in formal ESP studies, but the overall structure of remote viewing trials was usually followed.

Critics have claimed that the RV programme was not in fact useful to the military. When funding eventually ceased, the CIA commissioned an overall assessment of the programme, which proved generally negative.

Against this, supporters of the programme point out that the military would hardly have continued to provide funding for a continuous period of twenty years if the officers commissioning remote viewing tasks had not been satisfied with the results. With regard to the review, it was directed by a vocal sceptic of psychic phenomena, effectively determining the outcome in advance; his judgement of the programme was sharply at odds with that of one of his two collaborators who concluded: 'It is clear to this author that anomalous cognition is possible and has been demonstrated. This conclusion is not based on belief, but rather on commonly accepted scientific criteria.'¹⁴ Project director Edwin May refuted the report's claims in detail, noting among other things that the reviewers never even examined most of the technical documentation that the programme had produced.¹⁵

Psychokinesis (PK)

Experiments with Dice

During the SPR's early years there were occasional efforts to examine experimentally the reported psychokinetic abilities of mediums. However, the first systematic experimental work in [psychokinesis](#) began at Rhine's Duke University laboratory soon after the beginning of ESP work. Inspired by the claims of a visiting gambler, Rhine's team devised methods of investigating whether the human mind could influence the fall of dice. They realized that the same probability statistics used for ESP research could be applied to dice, and the factors that had to be controlled were the possibility of physical influence (for instance by handling) or bias in the dice themselves. To deal with the possibility of physical influence, throwing-cups were used initially, soon followed by mechanical tumblers or release systems. High quality casino grade dice were used to minimize bias, while the practice of specifying the target face systematically, so that all faces were targets with equal frequency, removed the potential for residual bias in evaluating the results.

When the Duke researchers had become confident about their methods, they experimented systematically to see if subjects could cause the dice to give designated target faces more often than chance would predict. A large number of

experiments provided statistically significant evidence of PK. However, Rhine delayed publication so as not to add to the controversy stirred up by his ESP research. Later analyses of these stockpiled dice studies revealed a surprising feature: the scoring rate significantly *declined* across each experimental session. A similar [decline effect](#) had been noticed in the ESP studies, and was attributed to natural factors such as fatigue or boredom. Its discovery in the PK data confirmed for Rhine the presence of a genuine effect, one that could not be explained by some as yet undiscovered experimental artefact.

The studies were published, and successful replications followed. However, other researchers using similar techniques were unable to reproduce the early success. With the occasional exception, PK research with dice (or similar mechanisms such as falling metal balls) more or less disappeared by 1960.

Micro-PK Research

In the 1960s a number of attempts were made to automate card-guessing type experiments through the creation of electromechanical or electronic target selection and display systems. Physicist [Helmut Schmidt](#) developed a successful method of testing precognition by using radioactive decay as a source of randomness in the selection of targets. In these very successful experiments, subjects pressed a button to indicate which of four lamps would be lit, and seconds later one of the lights, selected by the atomic decay process, was illuminated. However, Schmidt realized that it was not possible on theoretical grounds to distinguish whether the subjects were *predicting* which light would come on next or rather were *causing* that light to come on by psychokinesis, as seen in the dice studies.

In 1970, Schmidt adapted his atomic source of randomness (called the 'atomic random number generator', or RNG) to use in automated psychokinesis experiments. In its simplest form the RNG was used as an atomic 'coin flipper' that was purely random. Later versions used electronic (noise diode) sources of random variation. The term 'micro-PK' came into use to describe these PK experiments on atomic processes. In schematic form the output from the RNG was used to govern a display, such as a red lamp and a green lamp, and the subject would be asked to make one light come on more than the other. In practice, Schmidt used various engaging displays such as circular light displays, audio clicks to left and right ears, or number displays. Simple probability statistics were used to evaluate the results.

Over a series of experiments, Schmidt not only provided robust statistical evidence that subjects could sometimes influence the output of these random devices, but also that the complexity of the device did not matter, and, most surprisingly, that the effect could seemingly operate retroactively. To demonstrate this last effect Schmidt pre-recorded the data for entire experiments (automatically and unseen by anyone). At a later time, subjects (who generally thought they were participating in a 'live' experiment) were given instructions and the recorded data were played back to them. These recorded experiments were as successful as Schmidt's real-time experiments, leading him to conclude that PK could operate retroactively – backwards in time.

Schmidt's methodology was so robust that critics were left with little alternative but to insinuate that he must be engaging in some sort of fraud. To counter this, Schmidt eventually used his technique of pre-recording the data as the basis of an experimental protocol that effectively put an independent observer in control of the experiment, with the result that fraud could be ruled out absolutely. The protocol was simple. The data, structured into runs for pre-determined numbers of subjects, was generated and recorded, and a copy of the data delivered unseen to an independent observer. The observer then determined what the targets would be for the set of runs and Schmidt instructed his subjects accordingly. At the end of the experiment Schmidt analysed the data and the observer could confirm that analysis on the copy of the data that he or she held. This led to a very successful series of experiments designed to confound the critics.[16](#)

Schmidt's innovations effectively launched a second revolution in parapsychology research to match Rhine's card guessing. RNGs could be designed and produced relatively economically and could be coupled with computers to automate the experiments, record data securely, provide engaging displays for subjects, and exhaustively test the RNG for randomness. In short order almost every parapsychology laboratory was engaged in micro-PK research of some sort.

In the ensuing decades hundreds of RNG-based micro-PK experiments were conducted at dozens of different laboratories. The largest number of studies came from the now closed [Princeton Engineering Anomalies Research \(PEAR\)](#) laboratory at Princeton University,[17](#) where research focused on obtaining large databases from small numbers of participants using standardized protocols. At other university and private laboratories, studies ranged from simple computer graphic displays to micro-PK experiments being embedded into computer games. The overall success of the micro-PK approach has been evaluated using meta-analysis by Radin and Nelson[18](#) who conclude that there are weak but highly significant effects in the data. A meta-analysis by Bösch, Steinkamp and Boller[19](#) considers the results non-significant; a subsequent paper by Kugel[20](#) argues that this meta-analysis is flawed.

PK on Living Systems

During this period a similar line of research emerged to see if human intention could influence biological systems. A scattering of studies investigated whether human intention could influence the rate of germination in seeds, the speed with which mice recovered from anaesthesia, or the haemolysis of human blood cells. Eventually the work of [William Braud](#) led to a standardized research approach, inspired to some extent by claims of healers to be able to cure illnesses at a distance. Eventually known as [Direct Mental Influence on Living Systems](#) (DMILS) studies,[21](#) these experiments are typically designed to monitor an individual for a physiological response of relaxation or alertness, typically skin conductance or heart rate, while a distant agent attempts to exert a mental influence on their physiology. Unlike ESP or micro-PK studies that rely on results that deviated from chance expectation, the biological studies require careful use of appropriate control conditions and appropriate methods of allocating the control and influence conditions.

The DMILS studies spawned a related research approach in which subjects attempted to detect when they were being stared at (thus emulating a commonly reported sensation). In a design similar to DMILS studies, the staring person is instructed to stare or not stare at the subject for randomly allocated or systematically counterbalanced periods. This is typically done via one-way glass mirror or video link, to ensure isolation. The subject's response can be behavioural, such as simply reporting a feeling of being stared at, or it can be physiological (skin conductance). Sometimes both are used together. Although not as large as the micro-PK database, the DMILS and remote staring studies constitute a sizeable number of studies that have been subjected to careful meta-analysis,²² with the conclusion that there is a small but significant effect that warrants further investigation and theoretical integration. (See [Sense of Being Stared At: Experimental Evidence](#) and [Sense of Being Stared At: Theories of Vision](#)).

Contemporary Approaches

While studies of the types already discussed continue to this day, several new approaches have arisen in recent years.

Presentiment

It is quite common for people to report 'gut feelings,' or hunches, of being warned of some danger in a way that normal sensory cues could not explain. To investigate whether some of these may involve a bodily sensitivity to future information, [Dean Radin](#) developed a particularly clever approach. The subject is monitored for skin conductance, then begins viewing a series of randomly selected pictures with varying time intervals. Some of the pictures are pleasant and calm; others are shocking, such as accident scenes, portrayals of violence, or eroticism. The normal course of events is that within a couple of seconds of seeing a shocking picture the subject's skin conductance rises rapidly – a well-known indicator of the 'fight or flight' response of the emotional system. Radin's innovation was to examine the skin conductance record several seconds *before* the computer decided whether to show a calm or a shocking picture to see if there was any sign that the subject's emotional system was anticipating the shock it was about to get. In a series of studies Radin found significant differences between the calm pictures and the shocking pictures in the skin conductance record, several seconds *before* the picture was selected and shown to the subject. It was as if the subjects' emotional systems were preparing for the shock. Radin termed this [presentiment](#).

Very quickly, other researchers undertook studies to replicate the presentiment effect and to explore whether other physiological responses, such as heart rate and brain blood flow (fMRI), would show similar evidence of presentiment. A recent meta-analysis examined 26 presentiment studies and found a weak but highly significant effect²³ that could well have practical applications.²⁴

Anomalous Retroactive Influence

The presentiment research demonstrated that a well-known emotional response is apparently reversed in time, so that it happens – or starts to happen – prior to the

stimulus that would normally trigger the response. Inspired by the simplicity of this experimental design, psychologist [Daryl Bem](#) developed a methodology to explore whether well-established effects in cognitive psychology could similarly be reversed. Bem initiated and eventually published a series of nine experiments in which four different cognitive effects were reversed: approach-avoidance, priming, habituation, and recall facilitation.

A consideration of the priming effect illustrates the general design of Bem's experiments (priming effect experiments are common in cognitive psychology, a staple of research methodology classes). Participants typically are asked to judge, as fast as they can, whether a picture is pleasant or unpleasant, and their response time is recorded. Before each picture appears a word is flashed on the screen. The word is either positive or negative (for instance, 'beautiful' or 'ugly') and is called the prime because it primes the response. If the prime word is congruent with the tone of the picture, the response is faster, but when the prime word is incongruent with the picture the response is slower. To create a time-reversed version of the prime experiment, Bem simply arranged for the randomly-chosen priming word to appear *after* the subject had judged the picture. In two separate experiments using this design the forward (normal) priming effect was very robust, as expected, but the time-reversed priming effects, though not as robust, were also highly significant. Bem's experiments demonstrated that even when the prime came *after* the judgement it could still cause a priming effect. Bem's initial report of nine time-reversed cognitive and affective psychological effects produced highly significant results.[25](#)

Bem's research programme also contained a feature rarely seen in any branch of science. As already noted, all of the experiments were simple demonstrations of well-known psychological effects, reversed in time. They are simple experiments to copy and execute, and to make it even easier Bem made the computer programmes and source code available to any researcher who wished to replicate his work. As a result, in just a few years dozens of replications in laboratories around the world had been completed. A soon-to-be published meta-analysis of ninety experiments shows highly significant results overall, and yields an effect size close to Bem's original nine experiments.[26](#)

Concluding Observations

In addition to the experiments described above, there exist a vast number of smaller programmes or solitary experiments, many of which are ingenious and as sound as the best programmatic research. Over a century of experimentation, parapsychology has produced research that is both methodologically sound and statistically significant.

However, there remain troubling concerns even for many of parapsychology's most dedicated researchers. Chief among these is the matter of repeatability. Sceptics tend to argue that there are no replicable experiments in parapsychology, a claim which an unbiased review of the literature demonstrates to be false. Many lines of parapsychology research actually demonstrate impressive replicability, in surprising contrast to mainstream psychological research, which is increasingly

acknowledged to suffer from serious replicability problem (see, for example a recent special issue of *Perspectives in Psychological Science*)²⁷. Nonetheless, many parapsychologists concede that experimental parapsychology has not yet produced an experiment or research finding that has *predictive replicability*, that is, an experiment from which the findings can be used in appropriate statistical formulae to design a replication experiment with a given confidence level of success. Others, on the other hand, argue that parapsychology has already achieved this with some lines of research, such as Bem's retroactive influence experiments or the ganzfeld. This is an ongoing debate among parapsychologists.

Given the many meta-analyses that demonstrate a degree of consistent evidence for some sort of anomalous information transfer (psi), the apparent lack of *predictive replicability* does not point to an absence of underlying phenomenon to study, as sceptics often argue, but rather that we do not yet understand the relevant variables that control the operation of psi abilities. This points to a second weakness, the lack of a theory or model that identifies the relevant variables or predicts the conditions in which psi should occur. There are a number of promising theories, primarily based in physics, but they are difficult to operationalize, especially into experiments that parapsychology, with its scant resources, is in a position to carry out.

A pessimist might despair that so little has been achieved during the history of experimental parapsychology that helps us to understand the phenomena. An optimist, on the other hand, taking into account that the field has always been chronically under-resourced – and offers such poor career prospects to its practitioners – might find it amazing that so much *has* been achieved. Either way, experimental parapsychology has provided science with a formidable collection of data that demands attention.

Richard Broughton

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Endnotes

Footnotes

- [1.](#) Crookes (1874).
- [2.](#) Thouless (1935).
- [3.](#) Rhine & Pratt (1954).
- [4.](#) Rhine (1934).
- [5.](#) Pratt, Rhine, Smith, Stuart, & Greenwood (1940).
- [6.](#) Ullman, Krippner, & Vaughan (1989).
- [7.](#) Roe & Sherwood (2009, 2003).
- [8.](#) Bem & Honorton (1994); Bem, Palmer & Broughton (2001); Storm, Tressoldi & Di Risio (2010); Storm & Ertel (2002).
- [9.](#) E.g., Rouder, Morey, & Province (2013).
- [10.](#) May, Rubel, McMoneagle & Auerbach (2015).
- [11.](#) May, Marwaha & Chaganti (2011).
- [12.](#) May & Marwaha (2014).
- [13.](#) McMoneagle (2002).
- [14.](#) Mumford, Rose & Goslin (1995).
- [15.](#) May (1996).
- [16.](#) Schmidt, Morris, & Rudolph (1986).
- [17.](#) Jahn, Dunne & Nelson (1987).
- [18.](#) Radin & Nelson (1989), Radin & Nelson (2003).
- [19.](#) Bösch, Steinkamp, & Boller (2006).
- [20.](#) Kugel (2011).
- [21.](#) Braud (1994).
- [22.](#) Schmidt, Schneider, Utts, & Walach (2004).
- [23.](#) Mossbridge, Tressoldi & Utts (2012); Schwarzkopf (2014); Mossbridge, Tressoldi, Utts, Ives, Radin, & Jonas (2015).
- [24.](#) Mossbridge, Tressoldi, Utts, Ives, Radin, & Jonas (2014).
- [25.](#) Bem (2011).
- [26.](#) Bem et al. (2016).
- [27.](#) Pashler & Wagenmakers (2012).