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ESSAY

A Tribute to Robert Jahn

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Professional

By now the story of the PEAR lab's founding has been told many times, but it has been long enough since Bob Jahn retired that there may be readers who don't know it. In the 1970s, Dean Jahn of the Princeton University School of Engineering and Applied Science made a speech welcoming freshmen to the engineering program, in which he promised that if they did good work and maintained a good academic standing, they could do their senior thesis (a major project required for graduation at Princeton) on any topic they wished. Three years later a student held him to that promise. That student wanted to do a senior thesis on replicating Helmut Schmidt's experiments in psychokinesis—experiments that had produced positive results. No faculty member was willing to serve as an advisor for such a thesis. So Dean Jahn honored his word and served as this student's thesis advisor himself. Somewhat to his own surprise, the student's apparatus broadly replicated Schmidt's results: an electronic noise generator showed shifts in its output distribution in accordance with human intention. The student graduated, but Dean Jahn decided he couldn't leave matters standing thus. The phenomenon needed deeper investigation. He went searching for somebody with a background more oriented to this field of research in which he was himself a novice, and found Brenda Dunne; together the two of them founded the Princeton Engineering Anomalies Research program—PEAR.

Bob's interest in this research field was not conjured up by a single anomalous result in a student experiment. Not yet 50, he had arguably reached the pinnacle of his chosen profession. He was in charge of the School of Engineering at one of the most prestigous universities in America—his own beloved alma mater, no less—and had established a highly successful Electric Propulsion Laboratory already doing groundbreaking research for NASA. It was hard to see how he could advance further along the same track, save by moving inexorably into administration rather than actually doing science. Like Alexander but more pragmatic, he was already pondering what other scientific worlds there might be for him to conquer when the

student's experiment pointed out an area that seemed ripe for rigorous, systematic investigation.

Bob's choice of Brenda Dunne as collaborator and co-founder for the new research program was unquestionably one of the wisest decisions of his career. A personality very different from himself, Brenda proved complementary to Bob not only in skills but in attitude and intuition. The two of them together made a team far greater than the sum of its parts, and many of PEAR's most essential features emerged from the synthesis of these two highly disparate minds rather than being readily attributable to one or the other separately. Although this essay will continue to speak of Bob Jahn's work, it should be borne in mind that little or nothing happened at PEAR that didn't also bear the imprint of Brenda's attention and efforts. At the same time, and without in any way meaning to diminish the monumental impact of Brenda's career, in this tribute to Bob's memory I have to say that without Bob's deep insight and tremendous good sense in choosing Brenda for his laboratory manager, anomalies research at Princeton University would have yielded few results.

One of the first publications to emerge from PEAR was Bob's seminal paper "The Persistent Paradox of Psychic Phenomena: An Engineering Perspective," published in the *Proceedings of the IEEE* in 1982 (February, *70*(2):136–170). Although the program was barely three years old at that point, the paper shows apparatus for six psychokinesis experiments and sample data from an ongoing experiment in remote perception. Of those six early experiments, two—the REG and RMC—went on to become mainstays of the program, while the Fabry-Perot interferometer, the dual-thermistor experiment, the photoelastic stress experiment, and the glow discharge experiment never generated formal data. One of many baseless accusations aimed at Bob's work is that failed experiments like these were ways of burying null or insignificant results so that the published experiments were products of data selection. Nothing could be farther from the truth; failed experiments were those that could never be brought to a level of stability or reliability that would allow formal data to be collected at all. Bob was keenly aware that any apparatus had to be able to reliably and repeatably generate the null-hypothesis data distribution under null-hypothesis conditions—calibrations, in other words—before it could be used for meaningful experiments. PEAR, over the years, explored many different physical genres of "psychokinesis" experiment, and a fair number of them failed in the above sense of not being able to generate well-qualified calibration data.

Having raised the topic of baseless accusations, this is a good place to mention that the PEAR program met with bitter hostility from its

earliest days. While many people (including, thankfully, some generous philanthropic donors) thought it was marvelous that a laboratory at Princeton was seriously investigating these phenomena, many others reacted with horror, fury, or some blend of the two. Eyewitness accounts attest that one prominent faculty member (who shall remain nameless here) could be reduced to red-faced, incoherent rage by the mere mention of Bob Jahn's research. Part of this was simple academic politics and jealousy; Bob won no friends at Princeton by his insistence on funding PEAR exclusively through philanthropic gifts rather than grants, so that the Administration could charge no overhead expenses to PEAR's budget. Much of it, however, was the outrage of people already convinced beyond any argument or evidence that the kinds of phenomena Bob Jahn was studying couldn't possibly be real, and furious with him for daring to claim otherwise. Bob's patience, restraint, and endurance in dealing with these attacks were in themselves a testament to his character.

I don't know whether Bob was taken by surprise by the viciousness and determination of the attacks on his work. I hadn't met him in those early days. Many scientists with successful careers in mainstream fields do get surprised by the vituperation that greets them when they become interested in psychic phenomena or other anomalous fields—unless, of course, they report uniformly negative or null results in those areas. Any number of interested researchers have backed away from such research after learning how many enemies it will create for them. Bob, to his credit, did not.

One beneficial consequence of Bob's encounter with organized hostility was that it helped motivate him to create the Society for Scientific Exploration. In an alliance with eminent researchers who had had their own encounters in other fields with observations that didn't fit the consensus paradigm, Bob became one of the visionaries who created the SSE and established its *Journal* as a place where sound scientific research could be published regardless of its adherence to consensus scientific opinion. Having helped found the SSE, Bob continued to shepherd and guide it for the rest of his life, serving for many years as Vice-President of the Society and continuing to show up for Annual Meetings after his nominal retirement. There is every reason to hope that the Society he helped create will remain an enduring refuge for sound science that faces illegitimate rejection.

Sadly, some of the hostility to Bob, Brenda, and PEAR came from the parapsychological community. One might have hoped and expected that parapsychologists would have appreciated the value of a prominent research program that was presenting hard evidence in support of a number of long-held parapsychological claims. In fairness, many parapsychologists took exactly that attitude, but far too many subjected Bob and PEAR to

calumnies second only to those received from self-proclaimed "skeptics." Some of this, as far as I can tell, was pure personal animosity, which it would be useless to dissect here. But a portion, sadly, was a consequence of Bob's (and Brenda's) groundbreaking insights that shaped PEAR's research from the very beginning of the program. This resulted in PEAR's adoption of practices that differed sharply from parapsychological norms in a number of areas. The most crucial of these practices were:

• **PEAR studied the phenomena, not the people**. PEAR worked from an engineering perspective, not an explicitly psychological one. The target of inquiry was the anomalous phenomenon, not the people who produced it. The consequences of this shift of emphasis pervaded the entire experimental practice of PEAR. A minor consequence was PEAR's insistence on referring to the participants in experiments as "operators" rather than "subjects"—a simple way of reminding everyone involved that the human participants were not the subjects of investigation. A major consequence was that PEAR never subjected operators to any kind of psychological testing or screening. I can attest from firsthand conversations that some parapsychologists regarded this as obstructive and damaging to the field, by "hiding" data they considered to be essential.

• **PEAR operators were strictly anonymous**. From the viewpoint of some parapsychologists this was adding insult to injury; not only did PEAR refuse to test their operators, no one else could test them either, because no one knew who they were. In fact, the anononymity rule served a dual and very valuable purpose. Along with the principle of studying the phenomena rather than the people, it meant that PEAR experiments were a "safe space" for operators; their privacy was assured and they could not suffer any social consequences for displaying unconventional talents. It also eliminated a primary motivation for operator fraud. Over the years PEAR was approached by many self-identified psychics who wanted to have their abilities confirmed or certified by a prominent laboratory, but such people always lost interest when the anonymity rule was explained to them.

• **PEAR rejected the term "paranormal" and all related vocabulary**. The word "paranormal" was coined in the early 20th century as a neutral term for referring to various kinds of "psychic" pheonomena without the baggage of existing terminology. Unfortunately, as with all euphemisms, the public perception of the word became contaminated by its referent and by the late 20th century it was seen by "skeptics"and many mainstream scientists as a pejorative term just as offensive as its predecessors. Moreover, "paranormal" by its construction refers to things aside or apart from the normal course of nature. In contrast, a tremendously important part of PEAR's philosophical underpinning was the premise that *if these*

phenomena exist, they are entirely natural and part of the normal range of human abilities. Bob, in other words, completely agreed with mainstream scientists that there are no paranormal phenomena; the only point of disagreement was that he was willing to consider "normal," and seriously investigate, observable phenomena that were not explained by any currently accepted theories.

• **PEAR never sought out "special" or "gifted" operators**. Part and parcel of the premise of normality was the expectation that all human beings should exhibit these abilities to a greater or lesser degree. The only qualification for being a PEAR operator was the willingness to commit to generating data—one complete experimental series, at a minimum, although operators were always welcome to come back and generate more.

Each of these represented a substantial departure from common parapsychological practice, and each of these was sharply criticized within the field. Although PEAR never achieved some of Bob's fondest ambitions, I feel that the record of what the program did accomplish speaks for itself. A large part of that success is attributable to these fundamental principles and approaches. To the extent that the parapsychological community rejected and attacked them, rather than understanding and adopting them, the field impoverished itself.

Other practices and policies established by Bob (and Brenda) were also departures from typical parapsychological practice, but didn't carry the philosophical depth of these major innovations. To encourage operator productivity, for example, an operator's total contribution to most experiments was not capped; an operator could return to generate a new experimental series as often as desired, as long as the operator was committed to finish any series he started. Adopted due to essentially social considerations regarding operator treatment and interaction, this policy was frequently criticized on statistical grounds, but the criticisms were fallacious.

As mentioned above, the ambitious program described in Bob's 1982 IEEE publication contained six active experiments in psychokinesis, four of which never reached the point of generating formal data. This multiplicity of experiments had its origin in one of Bob's deepest interests for PEAR: characterizing what kinds of physical systems could be affected by human intention, and to what extent. The two early experiments that went on to generate large formal databases were the REG or "random event generator" and the RMC or "random mechanical cascade." The REG converted quantum noise in a diode to a stream of digital values that were collected and summed in groups of 20 to 2000 to form binomially distributed random numbers. The RMC dropped nine thousand polystyrene balls through an

array of nylon pegs into a row of 19 collecting bins; balls were counted by photoelectric sensors at the top of each bin as they arrived. The REG was a direct outgrowth of the original student experiment, which sought to replicate published parapsychological research using electronic noise sources. The RMC was the first fruit of Bob's ambition to test the possibility of intentional effects on other physical systems; here was a device where the basic element was, rather than a microscopic circuit buried inside a complicated electronic device, a macroscopic plastic ball that could be watched with the naked eye as it made its way through the apparatus. Nevertheless, the RMC also showed intentional effects. Indeed, although neither balls nor bins were made up of bits, if one analyzed the Shannon information content of a single ball's selection of one final bin out of 19 it was found that the anomalous effect per bit in the RMC was on about the same scale as that in the REG.

Over the years PEAR continued to explore different physical systems, as well as constructing variant versions of the electronic REG for various specialized purposes. After some years, a friction-damped pendulum and a vertical water jet had been added to the set of new physical systems that could be calibrated and generate formal data, and had produced some statistically significant results. By this time Bob (along with Brenda and everyone else at PEAR) had at least tentatively concluded that any physical system with a significant random component could at least in principle be affected by human intention, and the focus shifted at least partly onto methods of eliciting that response to intention which might be stronger and/or more reliable. This was at least in part the reason for the last years of the laboratory placing more emphasis on REG-driven experiments rather than attempting to develop yet more physical paradigms for experimentation.

Two generations of new electronic sources were developed under Bob's guidance: the "portable" REG, a much smaller and simpler device which still, however, required a mains power supply, and the "microREG," an even smaller device that drew its power from the same serial port that received its data. A third source was developed in the late 1990s for the "MegaREG" experiment, which was intended to explore the consequences of a ten-thousand–fold increase in data generation rate.

In addition to the new physical REG sources, PEAR also generated substantial databases from deterministic, pseudo-random sources that mimicked REG output. One of the more striking results of the late 1980s and early 1990s was the conclusion, from these databases, that while random sources could be affected by human intention, pseudo-random sources could not. Retrospective reanalyses shortly before PEAR's closure in 2007 suggested that this conclusion may have been premature, but these

could not be developed into a rigorous publication before PEAR closed.

The variety of new experiments was considerably greater than the variety of sources. Bob wanted the laboratory to explore any available venue for the dual purpose of searching for experiments with larger and more readily replicated effects, and exploring how operating conditions (possibly including the nature of the target) might modify the scale and replicability of the effect. Some of the more notable experiments and results are listed below.

• FieldREG explorations used the portable REGs and later microREGs. The conclusion of several years of FieldREG studies was that some types of group activities would detectably distort the behavior of nearby random sources. Moreover, the results of the first set of FieldREG studies led to a hypothesis that could be tested, and was confirmed, in later studies: The type of group activity that produced the observed effect was one where there was a shared state of strong emotion and at least some sense of community of purpose in the group. Primarily intellectual gatherings and groups with divided purposes (such as sports events with portions of the crowd rooting for opposed teams) produced no measureable effect. It is worth mentioning that the FieldREG studies helped to inspire Roger Nelson's Global Consciousness Project, although that project was never part of PEAR.

• The above-mentioned MegaREG found the still-puzzling result that increasing the bit rate by four orders of magnitude led to a strong, consistent anomalous effect with reversed intention (the intentional runs were meanshifted contrary to the operator's stated intention rather than in accordance with it), and a net effect size that was much stronger on a per-series basis but much weaker on a per-bit basis.

• "ProbREG" used a modified source that had a probability per bit of 0.125 (or 0.875), rather than the 0.5 of all the standard REG sources. The motivation was to test among several candidate models for the nature of the effect, which led to different predictions for an underlying process with a baseline probability far away from the symmetry point of 0.5 where $p = (1 - p)$. Results were unfortunately inconclusive, although the most radical of the proposed models could be ruled out.

• "ArtREG" used a completely different basis for operator feedback, with the random data stream driving an initially mixed, double-exposure–like image on the screen to be dominated by one or the other of the two images making it up. This experiment displayed the rather peculiar behavior that formal experiments managed by PEAR staff produced no significant overall results, while student projects using it as a basis (and also under the supervision of PEAR staff) generated highly significant results.

• "Yantra" produced a strong confirmation of its hypothesis by seeing

significant undirected changes in the REG output distribution while the operators observed a display of images intended to foster a meditative state rather than an intentional one.

• "Robot" used a modified microREG to drive a toy robot on a 2D random walk on a tabletop. It differed sharply from other REG experiments in that the recorded data for the experiments consisted not of the REG output itself but of the x and y positions of the robot as recorded by an overhead camera. This experiment showed a striking difference in performance between male and female operators.

• A competitive experiment ("circus" or "race") pitted two operators against each other in a video-game–like interface that split REG output into two streams, each directing the progress of a notional "racecar" on a figure-eight track on the screen. This experiment showed null results except in a variant protocol where a single operator could race against the computer: in that mode, the human operator consistently won, but an analysis of the underlying REG data showed that the human operator's data were null and victory had been achieved because the REG data directing the computer's car were shifted strongly in the direction that would slow it down.

Another exploration launched in the late 1990s was the three-laboratory replication of the basic REG experiment, using portable (second-generation) REG sources throughout. This "MMI Consortium" experiment failed to replicate the basic intentional results of the original REG, although it contained substantial internal evidence for idiosyncratic performances by individual operators. It is perhaps instructive to consider that of the five individual operators who participated in both the original REG experiment and the MMI replication, four exactly repeated their performances between the two, while the fifth, who resented the replication but volunteered to generate data for it in response to PEAR's request, reversed a strong positive effect in the original REG to a strong negative effect in the MMI replication.

In addition to the conclusions discussed above, some features of the phenomena could be inferred broadly from the experiments in aggregate:

• **Operators are idiosyncratic**. The notion of distinctive "signatures" for individual operators appears quite early in Bob's (and Brenda's) writings. Later experiments designed under their guidance explicitly took this into account, using a primary statistical measure that looked for idiosyncratic individual effects either in addition to, or in place of, an overall collective-average effect. Moreover, operators who had one signature on one experiment might have a completely different signature on another. At least one operator with a null signature on the REG, for example, displayed

a strong contra-intentional effect on the RMC. Other operators showed signatures that depended strongly on "secondary parameters" within a single experiment: The REG allowed several options for the mode of data generation (length of run, intention assigned by the machine vs. free choice by the operator, manual vs. automatic advance to the next trial in a run, and, in later years, style of feedback).

• **The ability to affect physical random processes is broadly distributed in the population**. This was mentioned as one of PEAR's philosophical starting points but it was confirmed by experience. While there are some operators whose "signature" consists in the absence of any apparent anomalous effect, a substantial proportion of PEAR's operator population had some impact on data generated under their attention.

• **The experimenters who supervise experiments in consciousness must, themselves, participate in data generation.** Everyone who worked at PEAR was an operator as well as an experimenter. This was partly to emphasize by the most direct of demonstrations that the operators were co-experimenters. They were collaborators in the science, not mere "subjects." At least equally importantly, it meant that the experimenters who designed (and sometimes redesigned) the experiments had the experience of sitting through those same experiments to inform their decisions in protocol design.

• **Anomalous effects will not appear unless the operators feel a sense of security and trust.** Operators who feel that the environment is hostile to them, hostile to the phenomena, or who feel that the experimenters are suspicious of them, do not in general produce detectable anomalies. This applies even to internal mistrust; operators who are uncomfortable with the concept of psychic abilities, or who are comfortable with the abstract concept but distressed by the notion of personally having such abilities, tend not to produce detectable effects.

• **Replication is much harder than we would like to think.** Unfortunately, the atmosphere of trust and security mentioned in the last point may be a necessary condition for affecting random processes with conscious intention, but it proved not to be a sufficient condition. Recent discussions of replicability have revealed the fact that the replication rate in all sciences is much lower than researchers would like. "Decline" effects in which an initial strong departure from the null hypothesis grows weaker over time appear in many different fields, as SSE members learned from an invited presentation at the 2011 SSE Annual Meeting. From this perspective, the level of declines seen at PEAR becomes less frustrating than it felt at the time. I am grateful that Bob lived long enough to become aware of these intriguing results.

Remote Perception

In addition to many PK-type experiments discussed above, PEAR also maintained an active program in "PRP" or precognitive remote perception. This phenomenon is generallly known as "remote viewing" in parapsychology, but Bob and Brenda both felt that that term was a misnomer, since the process often invoked sensory modalities other than vision. Of course, the "precognitive" part of "PRP" was also a slight misnomer, since about as many trials were retrocognitive as precognitive.

I note this program only briefly here, because PRP was very much more Brenda's brainchild than Bob's. Although he worked wholeheartedly in every part of the experiment—designing descriptors, designing statistical tools, generating data as an agent or as a percipient, building up target pools, and so forth—it was apparent that PRP captured Brenda's heart and enthusiasm more than it did his.

In the early days of the PRP program, Bob and Brenda jointly developed an innovation that was eventually adopted in some form by a number of other research programs: analytical judging. Rather than having a human judge rank transcripts of perception sessions against a number of target scenes, both perceptions and targets were analyzed into a set of descriptors specifying salient features of the scene. A score could then be generated from the descriptor values for each possible pairing of perception and target, and the population of scores for perceptions against targets other than their own provided a ready-made empirical background distribution for the degree of correspondence between arbitrarily chosen scenes.

Although the analytical judging concept was unquestionably a brilliant innovation, in many ways it made the PRP program a victim of its own success. Over the years the descriptor systems became more refined and nuanced, but the actual perception transcripts grew briefer and less informative. In the earliest PRP experiments, the operator had a perception experience and described it in as much detail as possible, while a committee of people not otherwise involved in the trial read the resulting transcript and evaluated it in terms of the descriptors. By the last days of the program most PRP operators were scarcely troubling with a free-response transcript, treating a PRP trial as a matter of filling out a descriptor questionnaire. It is perhaps not surprising that the experiment showed a steadily shrinking effect size with each attempt to improve the protocol.

Theory

Construction of theoretical models was another major concern of Bob's, which will again receive only a brief consideration here. While Bob labored

mightily on several theoretical models over PEAR's history, they cannot be evaluated as neatly as the experiments can be. The fundamental problem is that these models, which necessarily attempted to model consciousness itself as one of their primary constructs, inevitably referred to variables that we currently have no idea how to quantify, let alone measure.

Lacking quantitative inputs, none of these models could ever make testable quantitative predictions. The first major theoretical model, the Quantum Mechanics of Consciousness (QMC), was the subject of a major monograph, and informed experiments through the 1980s and early 1990s. Its fundamental concept was to analogize consciousness to a quantum mechanical system, and in particular to model anomalous interactions between consciousness and its environment using the paradigm of a covalent chemical bond. It was this model that led to the frequent use of the term "resonance" in PEAR papers. While it was never successfully quantified, its qualitative guidance suggested mental strategies for participation in anomalies experiments which some operators were able to apply with considerable success.

Dissatisfaction with shortcomings of the QMC model led to the exploration of a number of ideas which culminated in Bob's and Brenda's publication of the "M^5" model, a shorthand term for "Modular Model of Mind/Matter Manifestations." The salient operational feature of this model was its premise that anomalous interactions were necessarily, as part of their very nature, mediated by the unconscious mind. As with QMC, quantitative tests of the M^5 model are lacking. It did display some usefulness, as experiments designed with M^5 concepts specifically taken into account proved generally more successful than others during PEAR's later years.

After PEAR

Bob's complete retirement from the University and the closing of the PEAR lab marked the end of his career as an active experimenter but not the end of his interest in and support for the field. As noted, he remained the Vice-President of the SSE for several years afterward. He was also vitally involved in the ongoing work of ICRL (International Consciousness Research Laboratories), which was founded about midway through PEAR's existence and is now primarily a small-press publishing house focused on anomalous phenomena. ICRL is another of Bob's co-creations that will continue past his death, in this case under the able guidance of Brenda Dunne.

Overview

Bob Jahn's insights into novel ways of rigorously researching "anomalous" topics, and his insights into who could best help him conduct that research, led to a program that spent just under 28 years extending our understanding of the powers of human consciousness. Along the way he helped found the SSE, which continues his efforts to call attention to sound research outside the currently popular paradigm. We may regret the fact that PEAR, unlike Bob's Electric Propulsion laboratory, did not become a permanent institution to be taken over by another faculty member after his retirement. For all his accomplishments, Bob was human and mortal, with a limited ability to overcome resistance and narrow-mindedness. Nonetheless, his achievements were extraordinary, and if they were not as great as he or we might have hoped he may still serve as an inspiration to others who will follow in his footsteps.

Personal

Before proceeding with this more personal memoir I wish to quote a brief tribute sent to me by Cara Richards, long-term SSE member, professor emerita of anthropology at Transylvania University, and invited speaker at the 2002 Annual Meeting:

> Robert George Jahn, or Bob Jahn as I knew him for some 25 years, was a remarkable human being. When I first heard of him, he was Dean of the Engineering School at Princeton University. He was a scientist, of course, but also a man of wisdom. When he was researching an article about anomalies that were bedeviling his field, he discovered something of concern. Despite evidence of poor scientific research and even outright fraud and dishonesty, some anomalies remained unexplained. As a true scientist with integrity and considerable courage, he followed the evidence of those cases, refusing to ignore or simply dismiss information that violated the knowledge of the science he knew. He said that as our scientific instruments became more sensitive, these anomalies deserved serious research. Despite opposition, he founded the Princeton Engineering Anomalies Research lab (known as PEAR) and continued carefully designed research with a varied number of colleagues for more than two decades. The results are available in a large number of publications. When the results of these studies are more widely accepted, as they should be, his name will be mentioned as one of those individuals who have changed the paradigms of science. Despite all the opposition he encountered, he remained a kind and delightful individual, and a good friend. We miss him. — C. E. Richards

Bob came into this world on April 1, 1930. Given the vicious personal attacks directed at him in later life, I was mildly surprised that none of the

people who impugned his judgment and ethics tasked him with living up to the promise of birth on April Fools' Day. It can't have been restraint or civility; most of Bob's attackers showed neither. Perhaps they simply didn't know.

I first saw Bob Jahn on a TV screen, in a NOVA special about psychic research. One brief segment of that program showcased the PEAR lab and had Bob talking about the experiments. I saw it while pursuing a graduate degree at Princeton, and I was impressed that the Dean of Engineering at my own school had chosen to research such a topic. The impression I got from NOVA, however, was that Dean Jahn had become intrigued by the phenomenon, launched a research program, had answered his questions about the matter to his own satisfaction, and had shut the program down.

Fast-forward to 1985. I was still a graduate student, and saw a flyer for a campus lecture by Dean Jahn about his ongoing research into psychic phenomena. I attended that lecture in a near-trance of fascination, trying to commit every wonderful detail to memory. He was still conducting his research! There were multiple experiments and they were all showing significant effects! Within a week I had made an appointment to talk to the Dean about his research program. In fairly short order I had been shown the lab premises and current experiments, introduced to Brenda Dunne, and recruited as an operator.

My period as an operator involved little contact with Bob, but that changed in 1987 when I completed my degree and was looking for a job. Two realizations struck me: a member of the PEAR staff who was a physicist by training was leaving, and the research at PEAR was far more interesting to me than any of the postdoctoral positions I saw advertised for a newly minted physicist. After some intensive lobbying, I was hired for a one-year postdoctoral appointment that soon phased into a permanent staff position.

Working for Bob afforded much more and closer interaction than being an operator who visited his lab occasionally, when convenient. PEAR had a two-level management: Brenda managed the day-to-day running of the program, while Bob was our primary fundraiser and interface to the wider University, and had the ultimate authority to set policy and direct our efforts. That org-chart analysis, however, doesn't capture the crucial dynamic of PEAR. From its inception, the collaboration between Bob Jahn and Brenda Dunne was a partnership in which both participants were deeply and equally involved in the development of fundamental concepts and the design of future research, no matter how the University had them dividing up the administrative tasks.

Over the course of almost exactly twenty years as Bob's employee, I witnessed much of his personal life and personal style in addition to our

professional interactions. I've heard claims that Bob was cold and distant with his family. What I saw of him couldn't be more different. I saw a man who loved his children intensely and who positively doted on his grandchildren. He mourned deeply when his daughter Dawn succumbed to cancer some years ago. Perhaps his stoic upbringing left him unskilled at displaying his feelings in ways everyone could notice. Although slightly younger than the "Greatest Generation," Bob had fully imbibed that era's values of reticence about problems and uncomplaining diligence.

Despite the hostile treatment that Bob got from many people at Princeton, he retained a deep and lifelong affection for the institution where he had gotten his undergraduate education, and to which he returned after completing his advanced degrees to join the faculty. Rooting for Princeton sports teams, scattering tiger memorabilia around his house (though he personally liked giraffes rather better), he was almost the archetype of a devoted Princeton alumnus. I suspect that the vicious personal attacks he suffered from some in the University community hurt him badly—but I can't be sure, because of the same stoicism mentioned earlier.

Some of the features that come most strongly to mind as I reminisce about Bob are minor but distinctive quirks. He was the only academic I have ever seen use the word "discombobulate" in a formal paper. Despite the ubiquitous presence of cumulative deviation graphs in PEAR publications, Bob always used a nonstandard pronunciation of "cumulative," rhyming the first syllable with "hum" rather than with "fume," a variant that I have not found attested in any linguistic source. His commonest expression to describe something as inadequate for its purpose was to declare that it "doesn't feed the bulldog," a phrase that I must have heard hundreds of times.

Bob was a dog lover, but a choosy one: All of the dogs that shared his home were Labrador retrievers. In later years he also provided hospitality to a family of feral cats who took up residence in his backyard, but he was responsible about it, making sure that they were trapped for veterinary visits and neutering, and seeing the kittens to good homes if they were captured young enough to adapt to living in a human household.

Bob imbued PEAR with a strong sense of mission, a sense that the research we were doing was of paramount importance and was essential to extending human understanding of the world we live in. Brenda, of course, contributed greatly to that same sense of mission, which was no accident. As far as I can tell, she didn't learn it from him; rather, the fact that she shared that sense of mission was one of the important considerations in his choice of her to be his partner and chief lieutenant in trying to unravel some of the mysteries of consciousness. Despite that inspiration, they were challenging

bosses to work for. Both possessed of strong opinions and hot tempers, they frequently argued over matters both large and small, with each other or with their staff. A calm disposition and a thick skin were important survival tools at PEAR.

As a leader and supervisor, Bob frankly admitted that he had been raised and trained in a stoic tradition that did not lavish praise on successes but did sharply address and correct failures. Nonetheless, he always strove to be gracious and considerate, however much of an effort that might have been for him. In 1988, when I was transitioning from a one-year postdoctoral appointment to a long-term staff position, Bob was careful to warn me about the damage that a longer association with PEAR would do to my career prospects. Bob was always solicitous of the well-being of those who worked for him, and often expressed his regrets that he couldn't do more for us due to the limitations imposed by PEAR's budget and by University policy.

Working for Bob was in many ways a continuation of my education. I had learned to be a physicist in the process of getting my degree; solving the problems that were thrown at me in PEAR obliged me to learn multiple computer languages, user interface design, statistical analysis, experimental design, and more. The PEAR staff spanned several professional disciplines, and Bob wisely required that all of us participate in major ventures such as the design and launching of a new experiment. That practice in collaborating across disciplinary lines helped all of us to grow, both as professionals and as people.

In an interview years ago, at one of the media events that PEAR hosted over the years, I declared that what I saw as Bob's most important trait was his integrity. With years of additional hindsight, I stand by that declaration. Bob was never willing to lie about his scientific observations, not even to himself. In an environment filled with people ready to declare on a priori grounds that Bob's research results could not possibly be real no matter what evidence he produced, he stood firm and reported what his experiments showed. "Integrity" is probably too weak a word for a transcendent devotion to truth and honesty that fueled a boundless moral courage.

Bob became both a mentor and an inspiration to me during my years at PEAR. With his passing, I feel that I have lost a second father. One thought gives me solace in the void left by his absence. It is common for the grieving to declare of the deceased, "we will not see his like again." On the contrary, for all his great virtues and skills, the fact that Bob was so thoroughly human, never pretending to a perfection he didn't possess, inspires me to hope that we will see his like again, and the sooner the better.