

On the fringes of credibility: The boundary question between science and non-science ; Trocco, Frank; ;
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In 1980, as a field trip of sorts, I took my students to visit Sister Hedwig, the last living member of the Koreshan Unity, in the town of Estero, Florida. Like so many of the utopian movements in the late 19th century, the Koreshans held ideals of community, society, and interpersonal relationships that were incompatible with the surrounding culture. But there was an important difference.

The Koreshans believed that we live on the interior crust inside a hollow Earth. The stars, planets, sun, and moon-- the entire universe in fact--are enclosed within this womb-like sphere. Only because of a complex visual illusion do we perceive the universe as "out there." In 1894 there were 4,000 followers of this belief system. They bought a small tract of land in southern Florida and carried on experiments to prove their starting cosmology, including the development of an apparatus that demonstrated how the Earth's surface curved up as one moved towards the horizon.'

I visited Sister Hedwig over a period of three or four years, and I distinctly remember my first impression of her. It was something in the nature of "Goodness, what is this woman talking about? We live on the inside of the Earth? Right." Over the years something changed. Certainly my continued exposure to her must have contributed to it, but there was also something changing in my capacity to accommodate her ideas. I recall the last time I saw her. She was sitting in a chair, and the class was sitting in front of her on the floor. I was standing behind them, watching her over their heads as she talked about her life.

The thing I remember most about Sister Hedwig was her eyes. She was an elderly woman, living on the original property in the original community buildings. I ran over the thoughts I had about her throughout the years, thinking to myself, "What do her eyes see? They see a world not merely different from the world that I see, but a world that is absurd. It is a universe that, according to my understanding, could not exist. Her cosmology is a delusion, and she and others have fooled themselves. How could 4,000 people believe such silliness?"

But as I continued to listen, I wondered, "What if her eyes can see what mine cannot? what if it is I who does not see?" In my last visit, I realized what I needed to know. Even if my lines curve down towards the horizon, and Sister

Hedwig's curve up, that did not demonstrate that her world does not have meaning. Suddenly, I wished that for just a moment I might see the world through Sister Hedwig's eyes.

There is a major battle being waged in the epistemic world. It has to do with the division between what science is, and what it is not. This is a rift so fundamental it divides scholars along a line as dramatic as that between those who believe we live on the surface of the Earth, and those who believe that this is an illusion. The surface dwellers say the interior crusters are relativistic, lack critical skills, and utilize magical thinking. Those in the interior of the Earth view the benighted surface dwellers as scientific, reductionist, and linear thinkers. Each group fails to find meaning in the other's premises and conclusions, and common ground remains elusive, because, as Thomas Kuhn explained, "To the extent.. that two scientific schools disagree about what is a problem and what a solution, they will inevitably talk through each other when debating the relative merits of their respective paradigms.¹¹² There is no clear compromise in this dispute.

A troublesome complication for the surface dwellers is that after a century of intense disquisition over the "boundary question"-the exact demarcation between science and not science-they have been unable to agree on what science is.³ As recently as April, 1998, the members of the American Physical Society were unable to formulate a satisfactory definition of their discipline. The governing council rejected the first draft of a statement defining science for the public, which the society's public affairs panel worked on for three

years. According to one official, some members were concerned by a proposed reference to "other approaches" to understanding nature.⁴



Illustration by Jean Paul Buquet

The Magical Flute Although a clear definition for science may be elusive, many scholars are quite confident they know what science is not: "Weird things are like pornography—difficult to define but obvious when you see them," says Michael Shermer.⁵ In practice, however, it is difficult to calculate agreeable boundaries around even tangible artifacts, which makes issues of demarcation implausible when delineating boundaries around abstract disciplines.

Case in point: in 1996, a 43,000-year-old bone flute, pierced by playing holes on opposing surfaces, was discovered in a European cave. It appeared to be a segment of a flute, and it became the earliest known musical instrument. In 1998 two archaeologists

claimed that the holes on the "flute" were created by the gnawing of a carnivore, pressure by upper and lower teeth accounting for the opposing holes. In an instant, an artifact of immeasurable value in understanding human history, art, and culture was transformed into an old dog bone.

Scientists on both sides condensed their positions, calling in musicologists to support their technically abstruse

claims.⁶ It seems reasonable that an intelligent observer could look at this bone and determine whether it is a human artifact or a wolf's last meal. However, in science reality is shaped by the evidence, and evidence points in multiple directions coincident to the aptitude of the observers: "Claims about the natural world are always claims about the humans (the scientists) who report on what's in the natural world. Nature never speaks for itself. Judgments of competence are inseparable from judgments about the reality of the phenomenon."¹¹⁷ Although generally not conspicuous, the "reality of the phenomenon" is always subject to judgments about scientific competence, as in the case of John Nash.

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Nash, a distinguished mathematician who became schizophrenic and finally recovered his sanity, was asked "how, as 'a man devoted to reason and logical proof,' he could believe that extraterrestrials were recruiting him to save the world." He replied: "Because..the ideas I had about supernatural beings came to me in the same way that my mathematical ideas did. So I took them seriously."⁸

In a world of subtly shifting evidence, outrageous truth claims, and precarious scientific competence, it is exhausting to evaluate which ideas to take seriously, and whose expert judgment to trust. Are those who see a flute in an ancient artifact properly interrogating reality, and therefore surface dwellers, or are they simply naive residents of the interior crust who can construct apparatus to measure anything that confirms their worldview? Is there a way to integrate both accounts which does not obliterate sense by making all versions of reality comically identical?

The science/not science controversy--on the surface a discussion about laboratory methodology, academic discipline, and theoretical rigor-- contains a deeper challenge about the nature of reality. One way to approach it is to consider scientists who manage to credibly work in both the surface and interior worlds. By straddling these domains, these researchers might help us to bridge the gap between science and not science. Their studies take them places that orthodox scientists are unwilling to explore, or have given up as pseudoscience. These scientists may be encouraging superstition, wasting their time, or initiating a resolution of the boundary question.

Science or Not Science? In 1997 I walked into a psychiatry building on a large university campus. It was a characteristic academic setting and I was pleasantly greeted by the

departmental secretary. As I explained that I was there for an interview, I looked above her head and noticed a map of an unfamiliar island, peppered with colored push-pins. "What's that map?" I asked.

"That's a map of Sri Lanka," she replied. "What are all the pins?" I inquired. "Oh, those are all the locations where Dr. Stevenson is investigating cases of reincarnation." I was startled. Any undergraduate student could have walked into this outwardly conventional office and found herself exposed to a world that many academics, even some on the same campus, would find heretical. A member of this department admitted: "I will say that we maintain a fairly low profile at the university. There are many people who are proud that we are here, there are many people who are ashamed that we are here."⁹

A quiet version of the demarcation controversy is emerging, with relative accommodation, in university laboratories and research centers across the country. The work of the unorthodox scientists in these locations is unknown except within a small circle of colleagues. Their funding comes from individuals, corporations, and academic grants. They may be on the frontiers of knowledge, although critics would pronounce them over the edge into the realm of pseudoscience. The objects of their studies duplicate words from tabloid headlines: remote healing, alien abduction therapy, near death experiences, precognition, and psychokinesis.¹⁰ These scientists believe that their results could radically reorganize the parameters of orthodox inquiry; however, it is questionable whether they are actually studying anything. Scientists who search for subtle and inexplicable entities quickly run into a version of the "experimenter's regress."¹¹ If a researcher is looking for something that does not exist, she is a good experimenter if she does not find it, and a poor one if she does. However, since it is impossible to prove the non-existence of many phenomena (ghosts, God, telepathy), it is also impossible to state unequivocally whether these researchers are actually studying anything. They may be experts who know a lot about exquisitely subtle phenomena, or they may know a lot about nothing. One could say that they know a lot of nothing about nothing, since any "findings" they "discover" would not actually exist, at least in reference to the nonthing they are studying.

For example, Ian Stevenson, Professor of Psychiatry and Director of the Division of Personality Studies at the University of Virginia (home to the Sri Lanka map) has been working for 30 years documenting cases of apparent reincarnation.¹² Is his work a phenomenological inquiry (reincarnation is a fact that we can study) or a sociological one (it is intriguing that all these people believe in reincarnation)?¹³ Most of the

phenomena on the edges of science can be scrutinized in this way, which causes these scientists to maintain a low profile, although their departments may have an established presence: "Our division, the Division of Personality Studies, is entirely devoted to what you'd call unconventional studies-studies that bear on the question of survival of some aspect of personality beyond death. We are an integral part of the medical school of the department of psychiatric medicine."¹⁴ Some of these scientists wish that more of their colleagues would integrate their research into the scholarly activities of their academic venues. This is the opinion of Jessica Utts, a professor in the Division of Statistics, University of California, Davis, who explicates parapsychological problems using conventional statistical methods: "I think part of the problem is parapsychologists are their own worst enemies, because they treat it as if it's a fringe science. It takes people like Daryl Bem, and me, and Ian Stevenson who say, 'No, I'm a regular academic and I'm going to do this in my regular academic career and I know the rules and I'm going to play by those rules, but that's okay'.¹⁵

The professional and career stakes are high when individuals acknowledge unconventional research pursuits. It may not be a surprise that operating openly can determine one's future as a scientist. Daryl Bern, a professor at Cornell University specializing in personality psychology, works on orthodox experimentation on one floor of his building, and ESP on another. When asked, "if you had a graduate student who wanted to write a thesis on parapsychology what would you tell her?" he replied: "What I would say is, I think what you should do is be more conventional, or at least get published, get established, and on your own as an avocation do whatever research you want. There are only two kinds of people who should work on this: undergraduates and tenured professors. Everyone else is at risk.¹⁶ It is a popular supposition that science is impartial and open to all inquiry, and that scientific decisions of validity and truth are based on objective results and methods, not on a prior/ assumptions about the phenomenon being studied. However, when orthodoxy judges unconventional

research, scientists often feel that data are not considered. G. L. Yount recounts the reactions to his decision to pursue joint positions in a conventional hospital and at an institute studying complementary medicine: "I did five years of post doctorate training at UCSF My mentor there, as I was arranging to take this position, just couldn't have been more discouraging. He felt that it was the biggest career mistake I could ever make, that I was throwing away my career, and that all of this type of science is garbage, and not to get near complementary medicine."¹⁷ Regardless, these researchers believe they are conducting good science. While investigating the wildest topics, they uncover anomalous results, like R.D. Nelson, working on the interaction between random number generators and human consciousness at the Princeton Engineering Anomalies Research (PEAR) lab: "Most people don't have the privilege that I do of actually being involved in the experiments from beginning to end. I'm involved in conceptualization, the question that we want to learn, the design of the experiment, the analytic strategy, and even the possibility of participating in the experiment myself as an operator, as we call it, or subject. So, I have an absolutely spectacular opportunity to see and know what the content and the quality of the evidence is."¹⁸ According to Stae and Griesmoer, researchers who work on conventional and unconventional research simultaneously can be seen as individuals who "inhabit several intersecting social worlds... and satisfy the informational requirements of each of them." They are "plastic enough to adapt to local needs and the constraints of several parties employing them, yet robust enough to maintain a common identity across sites."¹⁹ Yount is a classic example of a scientist intersecting oppositional research sites: "The methodology is fundamentally the same. The difference between the two labs is that in the Complementary Medicine Research Institute, when I'm doing psychokinesis experiments I recognize that I will face a double standard when I try to publish this work, so the rigorousness of scientific methodology is far more intense because of skepticism that will hit this kind of data when it comes out." For example: At UCSF when I'm studying chemotherapy and I want to test all these cell lines, and I have any number of independent samples, I will treat some and have controls. I put them in an incubator to allow them to grow or the and see what happens to them. And then at a later time I would take them out and score them for some kind of outcome measure. At UCSF I just put them in the incubator.

At the Complementary Medicine Research Institute I use a random number generator to assign their

positions on the shelf in the incubator, because I've already received criticisms from the pilot work that, well, "Yes, we agree that something happened to those cells, but it's probably because you just happened to put them in the back corner of the incubator and the CO₂ concentration in the back corner is slightly less than the front corner." They'll really stretch it just to keep it within their own paradigm.²⁰ When asked why it was that scientific critics didn't accept his results as compelling evidence, Greyson speculated: "I think it's a fervent religious belief. This is the way they believe the universe works. And like other religious beliefs it's immune to data that contradict it."¹¹²¹

Often the lack of a coherent theory to explain unconventional results is used as an argument for their fallibility, even though other areas of recognized science have operated with weak or non-existent theoretical foundations. Sociologist Marcello Truzzi explains: "All the sciences have at one time or another studied hypothetical variables that later turned out to be judged nonexistent; and many accepted sciences today dispute the reality of central constructs present in some other sciences."²² Dean Radin, who has conducted experimental studies of psychic phenomena at Princeton University, the University of Edinburgh, and the University of Nevada, agrees: People who work within conventional science have it relatively easy. In the sense that you already have theories which help guide what you do, and help explain what's going on, it makes it more comfortable for everyone, and the science game within that realm is then pushing the frontier, pushing the boundaries, starting from what's already known.... The vast majority of what remains to be discovered lies outside the realm of existing theory which means that those of us who have chosen to look outside that bubble are always going to be faced with the problem of not having a way of connecting what we see with what is already known.²³ Some of these scientists, trust their research because they are led by data that convince them that they are studying real phenomena. Jessica Utts argues, "if we're going to apply the same standards here that we apply in other areas of science, which I think we should, then the data [in support of Parapsychology] is very convincing."²⁴

A central maxim of skeptical criticism is Hume's argument about miracles, elevated by Shermer to a maxim for skeptics: "That no testimony is sufficient to establish a miracle, unless the testimony be of such a kind, that its falsehood would be more miraculous than the fact which it endeavors to establish."²⁵ If it is more difficult to believe an unusual phenomenon (e.g., angels or perpetual motion) than not to believe it, choose the likelier (i.e., less miraculous) conclusion. This has evolved into the challenge, repeated throughout the skeptical literature, that "extraordinary claims demand extraordinary evidence."²⁶

However, the scientists described here believe they have extraordinary evidence for certain unconventional phenomena. It is certainly a greater miracle not to believe that something is happening when extensive documentation is available. Many of these scientists are so convinced by the amassed evidence that they have stopped trying to collect further experimental demonstrations, choosing instead to focus on constructing a suitable theoretical model.²⁷

The scientists working at the fringes of credibility are either pushing the margins of scientific knowledge, or wandering towards scientific caricature. One could casually label them pseudoscientists, but they would argue, as Greyson does: "I think my research is scientific in every way, And, by that I mean that we adhere to the basic principles of scientific research. We demand verification of all our data, use appropriate methodologies that most people would agree are scientific, we try to evaluate them by appropriate techniques. Basically everything we do here is scientific."²⁸ One could claim that they are producing methodologically flawed science; however, this is an untenable assertion when directed at tenured and frequently published faculty at prestigious institutions. One cannot say that these scientists are not doing science.

Inevitably, extremely bizarre investigations will pass for research at some universities. Courtney Brown at Emory University, for example, in *Cosmic Voyage* claimed to use remote viewing to observe Martians and uncover evidence that two races of aliens are living inside Earth.²⁹ It would be a mistake to disregard the efforts of reputable investigators simply because of outrageous examples like this.

In fact, legitimate scientists working on fringe topics all know how to distinguish science from endeavors pretending to be science. As paranormal researcher Dean Radin observed: "Pseudoscience is something that has the appearance of science but which is not science.... In my view, science, at least at the empirical level, is the use of well-understood statistics, methodologies, and controls. If you use that, then, as a way of saying these are well-understood methods of understanding the natural world, then that's what I do."³⁰

Although their subjects are unconventional, these researchers are legitimate scientists, and their experiments are scientific. That creates problems in evaluating their results, since they are claiming to uncover supportive evidence for the extraordinary phenomena they study. There is no recognizable discontinuity between how Bem, for example, is operating during his ESP studies, and how he is fashioning experiments in his orthodox psychology laboratory.³¹ Bem is using identical protocols. He has designed a replicable experiment that he believes demonstrates ESP, with results published in a peer-reviewed journal.³² How could one experiment be science and the other pseudoscience? Why is one set of results respected and the other ignored? These questions insinuate the existence, claimed by these scientists, of prejudice aimed at the phenomena they study.

Perhaps these scientists on the margins of traditional belief are practicing bad science. This is possible, but there is a crucial difference between bad science (e.g., methodological flaws) and pseudoscience (i.e., fake science): one is science and the other is not. Controversial scientists may be poor scientists, but they are not non-scientists, as Truzzi explained: "The scientist who works on a perpetual motion machine may be playing the longest shot of all, and he may be conducting stupid science, but it is not necessarily false or pseudoscience."³³

If scientists are uncovering real results about genuine things by rigorously following the scientific method, their colleagues should be interested in their experiments. In practice, orthodox investigators are seldom convinced by unconventional data: "I think everyone is really what we call a Bayesian statistician, which is that they combine their own personal beliefs about things with the data that they observe," Utts (1997) explained. "Bayesian statisticians know that if somebody starts out with a prior probability of zero of something being true, then no amount of data will change that position."³⁴

Not all scientists who study unconventional areas are persuaded by this accumulation of supporting data, including those who began as sympathetic investigators. Susan Blackmore, a Senior Lecturer in Psychology at the University of the West of England, who has investigated unconventional subjects since the 1970s, found that even as an experimenter who had great affinity for paranormal topics she was constantly frustrated in her attempts to replicate the confirming laboratory findings of her parapsychological colleagues. As a result, although her opinions and research are highly respected by both parapsychologists and skeptics, she has given up the field: If I look at the published data and if I look at how the experiments are being done now, they look excellent. They look as if they cannot be fraud because of all the safeguards (therefore there must be ESP because they are claiming statistically significant results), but that's the way Sargent's experiments looked. But when I went there and spent a great deal of effort to investigate them I found that they were not ESP at all. They were either extreme carelessness or fraud. So that leads me to conclude, "How can I know without going into every one of these labs and really pursuing it?" Since I cannot do that I cannot know.... All I can say is that those [current] experiments look really good. Do they convince me that there is ESP? No, because of my experiences over all these years. Whenever I really look into these claims they turn out to be something other than what is claimed, so I think we are wise to be skeptical.³⁵ Although they search for truth in different terrains, scientists examining unconventional topics are not automatically poorer observers of reality than their orthodox cousins. Using recognized standards of evidence, they challenge us to find meaning in areas that have been labeled worthless. This suggests that following restrictive boundary definitions for science to determine the content of reliable knowledge is less important than considering the epistemic benefits that impartial research offers.

The history of the demarcation problem consistently uncovers discontinuity between the intellectual convictions of scholars and the opinions of the majority of people, "between the elite conceptions of the

intelligentsia-scientists, theologians, dogmatists-and the masses at large for whom intellectual hairsplitting was less important than the tasks of practical living and of everyday realities," writes S. Tambiah.³⁶ While this does not prevent unusual ideas from being suggested, they are summarily dismissed, and driven below the surface of the public's imagination, by individuals and institutions who have the ability to make these judicatory decisions.

Asking the Right Questions We are asking the wrong questions as we try to determine the boundaries of science. Consequently, we scrutinize ostensibly obliging methodological issues rather than confounding ontological ones. "Thus, the battle over whether or not skeptics and orthodox scientists will ever accept research on psi as part of the proper purview of science may ultimately rest on cultural assumptions about the nature of the world-whether it is materialistic or dualistic, reducible or holistic-rather than on evidence."³⁷

To most people, a scientific truth value for ideas and phenomena is less important than whether these have meaning in their lives. This is not a relativistic, shifting meaning available only to individuals embedded in a particular culture, but a practical meaning that can be measured. People rarely deal with quantified truth values, as a logician or experimentalist thinks of them, but they do consider whether something has meaning, and we may move further in the demarcation debate if we acknowledge our lack of sophistication in recognizing our disparate foundational assumptions: "It may be true.. that the Azande do not have the categories of science and non-science.... A much more important fact to emphasize is that we do not initially have a category that looks at all like the Azande category of magic," writes P. Winch. "Since it is we who want to understand the Azande category, it appears that the onus is on us to extend our understanding so as to make room for the Azande category, rather than to insist on seeing it in terms of our own readymade distinction between science and non-science."³⁸

Recognizing the research of unconventional scientists, even those ideas which appear absurd, must be done beyond an ethnographic stance that declares, "Well, it only works if you're a member of that culture." If my aunt visits a nurse who provides Therapeutic Touch (TT) and she feels better afterward, for her that is the "evidence" she requires to trust IT, regardless of its obvious empirical flaws and occult foundation. Why is her confirmation, and that of many others, for the effectiveness of TT, not compelling evidence? As Greyson says: "I think doctors and nurses will accept things if they're shown to work, or if there are applications for their patients, whether or not they understand them."³⁹

The debate over TT escalated to the fantastic when Emily Rosa, an 11-year-old student prompted by skeptical parents, completed a debunking study of TT for a school science project. Her experiment, which found that TY practitioners could not detect the "human energy field" (HEF), and therefore undermined practitioners' claims to effect successful treatment through HEF manipulation, was published in the Journal of the American Medical Association (JAMA).⁴⁰ Besides the cynical question of whether a study with a positive outcome for TT performed by an eleven-year old would have been published in a prestigious medical journal, the rancorous debate forces the public to choose between competing claims for scientific reality.⁴¹

It is a tricky question whether practitioners, theorists, academics, or the public can have sovereignty over the definition of science. Certainly, through political maneuverings and public money, society has circumscription over the direction of research, but is it possible there is something hidden in extraordinary beliefs that is noticed by the public, but which escapes conventional scientific scrutiny? In some cases, it has been demonstrated that non-scientists can extend scientific knowledge, as they develop complex versions of technical scientific disciplines in, for example, medicine, pollution control, and ecology.⁴² We are left wondering whether the mountain of pseudoscientific claim-is holds any undiscovered bits of truth. Therapeutic Touch may have a truth value of zero by orthodox measurements, but immense applicability for those who use it and say they feel better.

Intuitive Boundary-Making Everyone practices intuitive boundary-making, drawing their lines in a different place. An individual can believe that the idea of aliens abducting someone from her locked bedroom is

ridiculous, accept the possibility that there may be validity to some of the claims of acupuncture, but be wary of the breakthrough announcements of chemical oncologists. Simply because someone thinks acupuncture "works" does not indicate that she believes it is scientific.

Intuitive boundary-making will remain an epistemological puzzle as long as skeptics continue to insist that an irreconcilable separation exists between the surface dwellers and those who inhabit the inner crust; as long as we hold on to the belief that certain categories of knowledge are not scientific. When we ignore the incongruous results of research by unconventional scientists, we may be unable to recognize those results because of the filters of our disciplined rationality. We then believe, as Carl Sagan did, that "In the popular imagination, at least, the bad science drives out the good.... If you are awash in lost continents and channeling and FOs...you may not have intellectual room for the findings of science. You're sated with wonder.",⁴³

Sagan identified an unresolved category problem. There are no undisputed categories of "bad science" and "good science." There are simply more or less reputable domains where research is carried out, and more or less reputable researchers. At issue is the limited way we draw our immaterial maps of knowledge. Collins and Pinch were not completely correct when they claimed: "Controversies

... are settled in science as they are settled in other walks of life-by negotiation, not revelation."⁴⁴ Although data and theories are frequently negotiated, it will take revelatory effort for the arbitrators of scientific boundaries to integrate the diverse and enigmatic meanings embedded in our world. The scientists described here, walking between the worlds of two scientific regions, personify a focus for disciplined consensus. They illustrate that conventional science can be applied to unconventional phenomena to arrive at responsible, albeit inexplicable, conclusions. Eventually, this research may help those living on the surface to freely visit the interior, and allow all of us to come out into the light. V

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