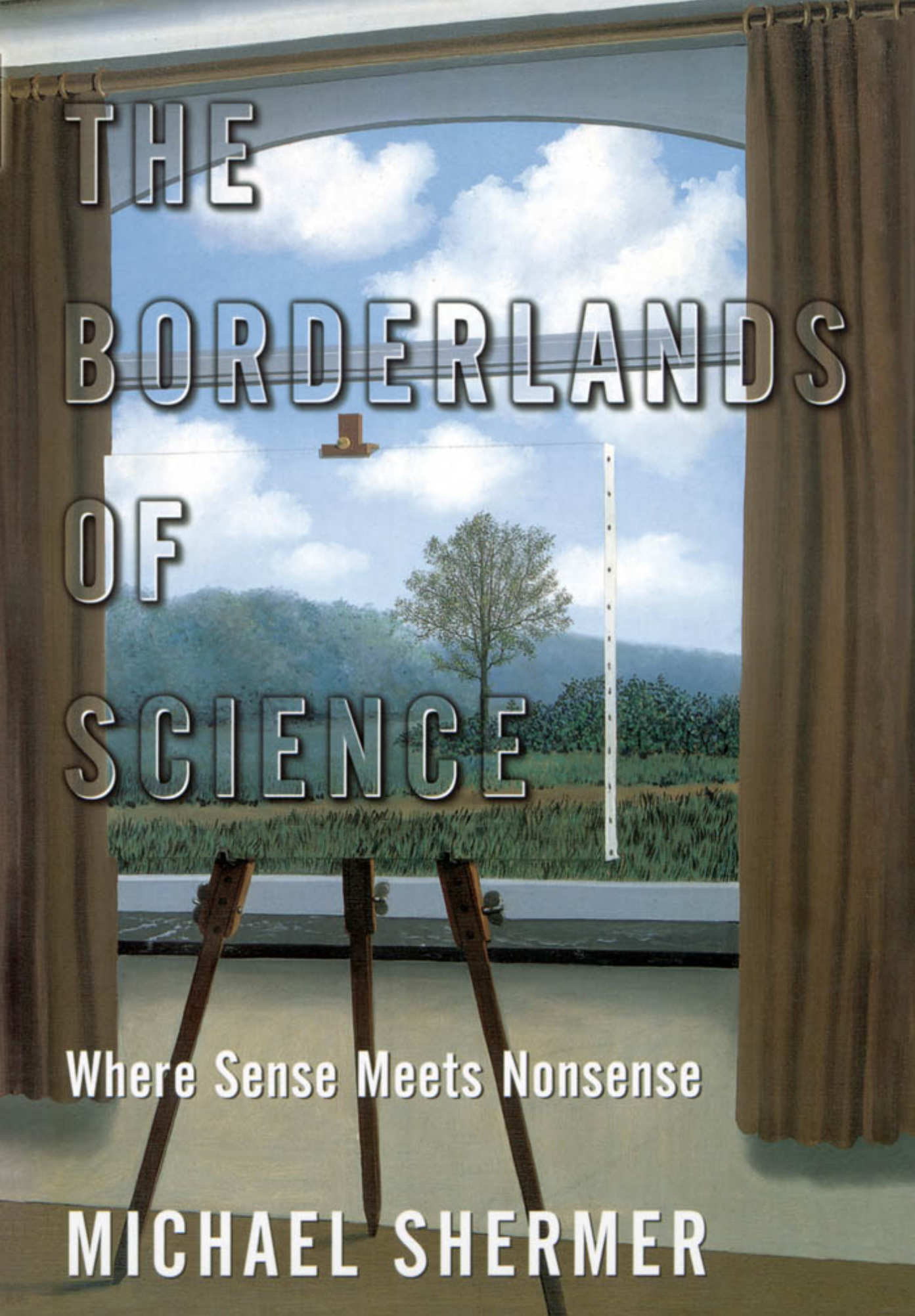
THE
BORDERLANDS
OF
SCIENCE
Where Sense Meets Nonsense
MICHAEL SHERMER

The Borderlands of Science

By the Same Author

Denying History: Who Says the Holocaust Never Happened and Why Do They Say It? (with Alex Grobman; University of California Press, 2000)
How We Believe: The Search for God in an Age of Science (W. H. Freeman, 1999)
Why People Believe Weird Things: Pseudoscience, Supersitition, and Other Confusions of Our Time (Foreword by Stephen Jay Gould, W. H. Freeman, 1997)
Endzeittaumel: Propheten, Prognosen, Propaganda (Edited by Michael Shermer, Benno Maidhof-Christig, Lee Traynor. Berlin: IBDK Verlag. 1998. German only.)
Argumente und Kritik: Skeptisches Jahrbuch. Rassismus, die Leugnung des Holocaust, AIDS ohne HIV und andere fragwürdige Behauptungen (Ed. with Benno Maidhof-Christig and Lee Traynor; Berlin: IBDK Verlag. 1996. German only.)
Mathemagics (with Art Benjamin; Contemporary Books, 1993)
Teach Your Child Math (with Art Benjamin; Contemporary Books, 1991)
Teach Your Child Science (Contemporary Books, 1989)
Race Across America (WRS Publishing, 1993)
The Woman Cyclist (with Elaine Mariolle; Contemporary Books, 1988)
Cycling: Endurance and Speed (Contemporary Books, 1986)
Sport Cycling (Contemporary Books, 1984)

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Where Sense Meets Nonsense

MICHAEL SHERMER

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To
Devin Ziel Shermer

With a father's love and hope that you find that exquisite balance
between orthodoxy and heresy,
between being open-minded enough to consider radical new ideas,
but skeptical enough to not be bamboozled by nonsense,
and discover on the journey the isthmus of your middle state . . .

Plac'd in this isthmus of a middle state
A being darkly wise and rudely great
With too much knowledge for the sceptic side,
With too much weakness for the stoic pride,
He hangs between; in doubt to act or rest;
In doubt to deem himself a god or beast;
In doubt his Mind or Body to prefer;
Born but to die, and reas'ning but to err;
. . . . . .
Created half to rise, and half to fall,
Great lord of all things, yet a prey to all;
Sole judge of Truth, in endless error hurl'd;
The glory, jest and riddle of the world.

—Alexander Pope, "Essay on Man"

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Part III: Borderlands History

INTRODUCTION BLURRY LINES AND FUZZY SETS

The Boundary Detection Problem in the Borderlands of Science

IN LATE SEPTEMBER OF 1999 I went to Stonehenge, the magnificent Druidical stones laid out in the countryside of southern England. Well, sort of. I traveled to Stonehenge . . . in my mind . . . as part of an experiment on a phenomenon called "remote viewing," the belief that one can, in the words of my remote viewing instructor—Dr. Wayne Carr of the Western Institute of Remote Viewing in Reno, Nevada—"experience, feel, see, and describe, detailed and accurate information on any event, person, being, place, process or object that has ever existed, does exist, or will exist." According to Carr:

> Historically, remote viewing was developed at Stanford Research Institute for the army and the Defense Intelligence Agency. It was used in a secret espionage program for twenty years. This is why few people had heard of remote viewing until about three years ago when the government went public on "Nightline." Protocols have now been refined to allow trained remote viewers consistent detailed accuracy. Remote viewing could be considered a distant cousin to some other psychic disciplines, with the main difference being the extremely high and consistent accuracy. A single remote viewing usually takes about an hour or more. During this time, one can become "bilocated" and have strong "target" contact with all of one's senses. A target can be in the past, present or future. This is not some kind of "psychic network"; rather it is a serious scientific technique for exploration.[1]

Since I am a social scientist and historian of science who studies fringe and borderland claims to determine if they are scientific, pseudoscientific, or nonscientific, and I had seen the *Nightline* report on the CIA's twenty-year experimental program in remote viewing (originally set up to discover, for example, the location of hidden Soviet military bases), I wanted to try it myself. I signed up for Dr. Carr's weekend seminar in remote viewing—touted as "Professional Targeting Services, Corporate Business & Private Consulting & Target Contracting, Guaranteed Quality"—and joined a dozen other hopefuls who were going to be taught how to discover, according to the brochure, "the location and condition of a missing person, child or object, future potential markets in a certain area, the cause of an event or disaster, possible medical diagnostic considerations, personal family history and events, unsolved cases or mysteries, the effects of a personal decision, the location of mineral or petroleum deposits," and much more.[2]

As its name implies, remote viewing involves sitting in a room and "viewing" something remotely, that is, outside of the normal range of one's senses. Some claims for remote viewing's powers are modest, others not so. Science writer Jim Schnabel produced the first full-length volume on remote viewing (by a nonparticipant), tracing the U.S. government's involvement with some of the world's most famous "psychics," including Russell Targ, Hal Puthoff, Uri Geller, Ed Dames, and Joe McMoneagle.[3] Schnabel's tome recounts endless anecdotes, usually confirmed with additional anecdotes by believing eyewitnesses who were themselves in remote viewing, including:

> —A part-time Christmas-tree salesman remote-viewed his way into the heart of a super-secret National Security Agency installation buried in the West Virginia mountains.
> —The same psychic described previously unknown details of a high-tech Soviet military research facility—details that were later confirmed by spy satellite.
> —An Army remote viewer was the first in the U.S. intelligence community to describe the Soviets' new *Typhoon*-class submarine—while it was still indoors, under construction.
> —A woman in Ohio psychically found the location of a crashed Soviet bomber in the jungles of Zaire, helping a CIA team to recover the wreckage before the Soviets got there—and earning praise from President Jimmy Carter: "She went into a trace. And while she was in the trance, she gave us some latitude and longitude figures. We focused our satellite cameras on that point, and the plane was there."[4]

Shortly we shall examine the problem with remote viewing protocols that lead to the mistaken belief that the number of "hits" by remote viewers is above chance. Experimental psychologist Ray Hyman, professionally trained and experienced in proper experimenter protocols and the only outside observer allowed to review the raw data from the CIA's remote viewing experiments, concluded rather definitively: "By both scientific and parapsychological standards . . . the case for remote viewing is not just very weak, but virtually nonexistent. It seems that the preeminent position that remote viewing occupies in the minds of many proponents results from the highly exaggerated claims made for the early experiments, as well as the subjectively compelling, but illusory correspondence that experimenters and participants find between components of the descriptions and the target sites."[5] And as we shall see, these claims for the power of remote viewing are conservative in comparison to what has been claimed for it in recent years, even compared to the following observation by one of the government's top remote viewers, Fern Gauvin:

> The biggest concern is—will I be invaded by evil spirits? Maybe, but I can protect myself . . . Some other people call it, Okay, "cover yourself with the white light," and so on. All that is good intention. And if I have good intention—I don't care if you [a seductive evil spirit] are a whore on Fourteenth Street, I don't want anything to do with you—then you don't stand a chance, I don't care what the price. It's because I don't want to. I think that goes a long way in this line of work.[6]

Such discussions, many this absurd, went on at taxpayers' expense for twenty years under the cloak of national security. And this is comparatively conservative material. For my weekly radio show *Science Talk* on NPR affiliate KPCC in Southern California, I once spent an hour talking about remote viewing with one of its champions of the 1990s, Courtney Brown, a political science professor at Emory University (although I was not allowed to introduce him as such because of a contractual agreement between Brown and Emory that he not mention his affiliation when discussing remote viewing). For Brown, locating crashed planes and missing persons is child's play. He's after bigger targets that include, according to his 1996 book *Cosmic Voyage: A Scientific Discovery of Extraterrestrials Visiting Earth*, Martians and aliens from other planets, multidimensional beings from other galaxies, spiritual leaders such as Jesus and the Buddha, and even God (who, he says, actually resides within each of us). According to Brown, he has even had conversations with

Jesus about life on earth and the multidimensional life to come. Yet, over and over throughout his books and in my interview with him, Brown insists that he is a scientist and that remote viewing is solid science, as good as anything to be found in the social sciences. In fact, Brown has renamed the phenomenon "Scientific Remote Viewing," or SRV for short, and in his 1999 sequel, *Cosmic Explorers*, he reviews the detailed procedures for proper data collection, identifying target coordinates, SRV protocols, and the classification of categories of remote-viewing data. That claim places this phenomenon squarely in the seat of testable knowledge. And as we shall see, there are some serious flaws in the protocols of remote viewing that lead it to fail all tests.

But failed tests aside, the outrageousness of the claims alone should sound our skeptical alarms. The following passages from *Cosmic Explorers* could have been written by a pulp science fiction writer for 1950s B movies instead of a tenured college professor at a major American university (note the scientistic language and cachet of data-speak):

> Apparently, Buddha and the Galactic Federation are deeply involved in an intense struggle that conveys the sense of a major conflict, perhaps a war. I do not know from the data in this session if the struggle is exactly the same as that associated with the renegade Reptilians, but I suspect that the two conflicts are related.[7]
>
> In my interpretation of these data, it appears that the agenda of the Reptilian extraterrestrials is to use the genetic stock of humanity to create a new race that is partially human and partially Reptilian. There is no indication in the data of this session to suggest what the Reptilians plan on doing with the remainder of humanity.[8]
>
> My reading of these data suggest that the Galactic Federation will defend our right to evolve as a species, to make our own mistakes, and to learn from our own hardships. In essence, their agenda is to leave us alone, to let us find our own way in life. They respect our freedom to learn, to grow, and to err. And I suspect they will be waiting for us with eager anticipation of our abilities to contribute to an expanding Galactic civilization when we once again rise off the surface of this planet, wiser, more loving, and with a deep inner desire to explore, and to serve our gradually maturing universe.[9]

With this background, then, imagine the anticipation I experienced on the eve of trying remote viewing myself. Since we were neophytes, Dr. Carr explained that we could not expect to find, say, the location of Jimmy Hoffa's

body or who killed Jon Benet Ramsey our first day, let alone talk to the Buddha. We had to learn the basics first. On the podium at the front of the room Carr had placed in an opaque envelope a photograph of a famous site somewhere in the world. Our task was to remotely view the contents of that envelope. Carr explained that we could do so not just by attempting to view the contents of the envelope in our minds, but to actually go to this place remotely, to "see" it in our "mind's eye."

To do so we began with a series of short remote viewing "templates" that consisted of a list of descriptive terms followed by an "ideogram," or picture of what it is we were viewing. This was not necessarily the target, Carr continued. In fact, it most likely was *not* the target, but with a series of these descriptive lists and ideogrammatic drawings, we would approximate the target and perhaps, eventually, even nail it down precisely. We're beginners, he reminded us. This is a serious science that takes correspondingly serious practice. We began in "Stage 1" with descriptive words. *Primitive Descriptors* include such terms as "hard, soft, semi-hard, semi-soft, wet, mushy," etc. *Intermediate Descriptors* include "natural, man made, biological, movement, energetics," etc. *Advanced Descriptors* include "structure, subjects, dry land, city, motion, mountain, water, wetland, sand, ice, hills," etc. In "Stage 2" we moved to more detailed descriptions (all the while writing them down and making sketches), such as: *Textures*—"smooth, soft, shiny, rough, matted, sharp," etc., *Temps*—"warm, cool, hot, freezing, frigid," etc., *Dimensionals*—"high, low, tall, towering, deep, flat, wide, open, thick, narrow," etc., and *Energetics*—"vibrating, pulsing, humming, vibration, movement, energy, penetrating, emanating, squeezing, pushing, pulling, attracting," etc.[10] Since we were instructed to allow our imaginations to follow the descriptive terms, this last list of dimensional descriptors led me to the remotely viewed object in FIGURE 1.

In my "Session SummaryPage" that followed the pages presented in FIGURE 1 I wrote: "I started off with something sexual and arousing, as if it were two people, but then switched to a statue, guessed *The Kiss,* then at 500 feet above [we were instructed to move around and above our target] it looked like people at a monument of some kind, perhaps a park in London, Hyde Park with statues, or perhaps at a movie theater. Very nebulous."

We continued to refine our remotely viewed targets, and after about an hour of this Carr was ready to reveal the content of the photograph in the envelope. Before he did this, however, he moved about the room, carefully examining each person's numerous sketches and descriptions. Some he responded to quite favorably, others he explained that as beginners we could not all expect to do

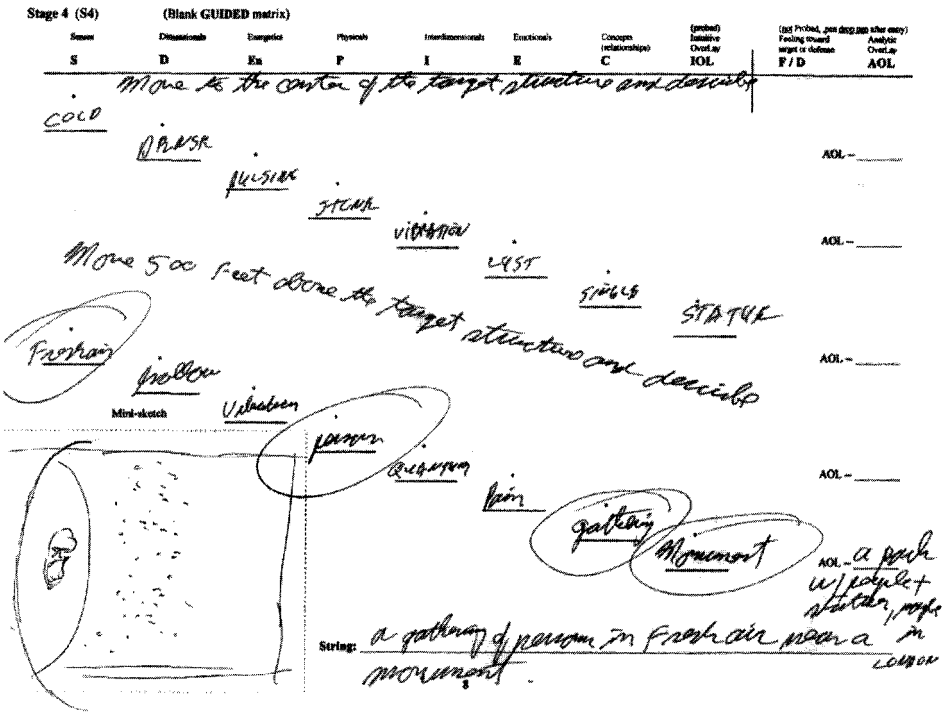
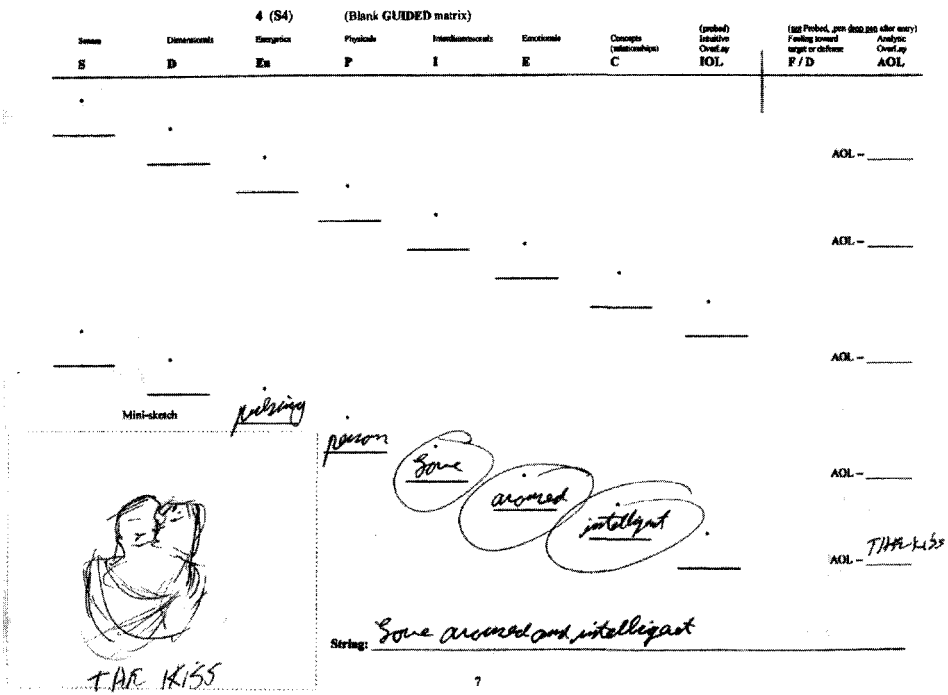


Figure 1. The Author's Remote Viewing Experimental Results

well at first. He seemed especially excited by my drawing and description. Had I mastered remote viewing my first time out?

The target, it turns out, was Stonehenge. I wasn't even close. Or was I? Carr proclaimed that I had great potential as a remote viewer because I had gotten a stone statue in England, which he felt was remarkably similar to Stonehenge. Herein lies the first problem in remote viewing experiments—determining what constitutes a "hit." The answer depends on how much wiggle room is allowed. Operational definitions and advanced selective criteria that are basic protocols in social science research, are all but missing in remote viewing research, or are constructed in such a way as to give the experimenter subjective leeway in determining whether a trial is considered a hit or a miss. Since all of the remote viewing experiments that I know of have been conducted by believers in the phenomenon, this calls into question their protocol criteria.

There was, however, one gentleman in our group whose results needed to be cut no slack at all. He drew a picture of big stones in a circle, and wrote at



the bottom of his drawing "Stonehenge." A hit! There was no subjective interpretation needed for this one. I was befuddled until I discovered that this man is a good friend of Carr's who had, in fact, driven to San Francisco (where the seminar was being held) from his home in Reno earlier that morning. When Carr later asked me to explain the Stonehenge hit I simply said I thought that Carr probably told him the target ahead of time. Surprisingly, and tellingly, he did not abjure my charge. A real test, I explained, would be if no one knew what the target was and then we tried a remote-viewing experiment. This was the next step. I had brought my own sealed opaque envelope with a photograph of a target, so now we would see how well Carr, his expert remote viewer buddy, and another remote-viewer that Carr described as one of the best in the world, would do under controlled conditions.

To select a "good" target for remote viewing, I was given a list of "detailed instructions for target preparation" that explained "it is important that you exactly follow the following procedure in a NONHURRIED relaxed way: You need your PILE of individual target pages (a target page is a photo and description of an individual target) AND a separate CLEARED TABLE or desk

that can REMAIN CLEARED (except for the selected one target page) during the viewing." I carefully followed the nineteen different steps as if they were a ritual of sympathetic magic—an appropriate analogy for this process—and read through the sheet labeled "Ideal Remote Viewing Target Characteristics." These include:

1. They inherently are OF INTEREST and inherently ATTRACT ATTENTION (not boring) Good: Pyramids at Giza, Old Faithful, etc. Bad: a pair of scissors in Dr. Carr's desk, an eraser.
2. They ALWAYS are NAILED DOWN IN TIME AND SPACE, as much as possible, using TIME AND SPACE QUALIFIERS such as THE PLACE, CITY, HEIGHT, DISTANCE, ACTIVITY, COUNTRY, PERSON(S), TIME, THE DATE. Good: The largest Pyramid at Giza. Bad: The Egyptian Pyramids.
3. If the target is an EVENT, then it should have "/event" written after it. Good: The First Human Heart transplant, done by . . . at . . . hospital/EVENT (date). Bad: The first heart transplant.
4. They are DISCRETE, not vague or open ended. Good: Arch de Triumph/Paris/France. Bad: A Roman bridge.
5. You can POINT AT the actual physical target or event. Good: The Empire State Building. Bad: The Stock Market Crash in 1982.
6. They have their OWN DISCRETE BOUNDARIES in time and space. They have more than conceptual boundaries such as state lines or country borders. Good: Alcatraz Island. Bad: The State of Nebraska.
7. There is a good "FIGURE-GROUND" CONTRAST between the target activity or object and the background activity or objects. Good: Mt. Shasta. Bad: The middle of the Pacific Ocean.[11]

This list goes on and on, each step suggesting good and bad targets. Here we see a second major flaw in remote-viewing research—forced choices. Magicians will immediately recognize this for what it is. Many card tricks, for example, involve very careful instructions that force the subject into a situation that either insures the magician will pick the right card, or reduce the choices to a minimum. For example, think of a two-digit number between 50 and 100 where both digits are even numbers (thereby eliminating the 50s, 70s, and 90s and all the odd numbers in the 60s and 80s), like 62 or 82, but not where both digits are the same like 66 or 88 (thereby suggesting that the subject not select *those* numbers, leaving just a few two-digit numbers from which to select). The

illusion is that you have made a free choice. The reality is that the magician has made the choice for you. The purpose of this remote-viewing target characteristics list is to reduce the number of potential targets to, basically, famous buildings, monuments, and locations.

To make this an objective test of remote viewing, therefore, I had to get around this trick, which I did by selecting a target unlike anything suggested in the list, but one that elsewhere in Carr's literature he said he had targeted before: galaxies. As I was sitting at my desk thinking about this problem I looked up and noticed on the wall of my office the Hubble Space Telescope's Wide Field and Planetary Camera 2 photograph taken of the tiny slice of sky 1/140th the apparent size of the full moon near the handle of the Big Dipper, that consists of literally thousands of galaxies. Since Carr said that they could remotely view galaxies, and this is one of the most famous and widely publicized photographs of galaxies ever taken (it graces countless magazine and book covers), I reasoned that this should be a fair target.

A third major problem in remote viewing experiments, and one related to the target selection list, is what types of drawings people make. When producing sketches amateur artists use just a handful of design elements—mostly lines and curves—to attempt to depict, however crudely, the object under gaze. Thus, a handful of sketched lines and curves on a page could be interpreted as almost anything, especially when the list of potential targets is limited to buildings, monuments, and natural objects with striking and recognizable features. In other words, there are only so many variations on a theme and with even a modicum of subjective wiggle room, almost any set of lines and curves could be interpreted as a hit.

The test began with Carr's two colleagues (Carr begged off the formal test) working on their drawings and word lists for over an hour. Each had generated over a dozen pages of sketches and descriptions. When both remote viewers were finished Carr demanded to know the target. "No, no," I explained. "The purpose of this test was for *you* to tell *me* what the target is." Carr then stammered through a disclaimer about how hard remote viewing is, how subjective and nebulous it can sometimes be, how this was not a true controlled test, and so forth. "But," I responded, "your friend here just nailed down Stonehenge by drawing, description, and name. No subjectivity there. No waffling. If this really works he should be able to tell me right now what is in that envelope." This was followed by several minutes of speculative fishing through all the different drawings, explaining that the target could be *this,* it could be *that,* etc. As the time passed they were squirming in their seats in what was clearly a state of

high anxiety. They again asked me what was in the envelope. Again I responded that the onus was on them to tell me what was in the envelope. This went on for another few minutes until I decided to end the suspense.

"Before I open the envelope let me tell you what you are going to do when I reveal the contents. You are going to look through all those dozens of drawings, select the one that comes closest to what is in this photograph, and announce that you got it." To my utter amazement Carr explained that, indeed, this is how remote viewing experiments work! I explained to him that in science it has to work the other way around. This is a fourth problem in remote viewing research—the confirmation bias and the hindsight bias. In cognitive psychology and critical thinking studies, it is well known that subjects only look for confirmatory evidence and ignore disconfirmatory evidence of their preconceived beliefs, and they look back with hindsight to explain how they arrived at their beliefs in a justificatory mode. This is not allowed in science.

With this brief lesson in the philosophy of science over, I opened the envelope and revealed the target. Without missing a beat Carr immediately riffled through the sheets of paper strewn about the table, pulled out a sketch that was described as a "ferris wheel," and announced that this was, in fact, a galaxy! It was at this point that I knew that remote viewing is not normal science or even borderlands science. It is pseudoscience, which I defined in my book *Why People Believe Weird Things* as "claims presented so that they appear scientific even though they lack supporting evidence and plausibility." How did I determine what constitutes pseudoscience? Through a series of questions that I ask about all claims that I investigate for *Skeptic* magazine, a science publication that I edit, and for a television series on the Fox Family Channel called *Exploring the Unknown,* for which I am a cohost and coproducer, and a segment for which we filmed this remote viewing experiment. In exploring the unknown we often find ourselves in the borderlands of knowledge—in that fuzzy area between orthodoxy and heresy—and thus a consideration of some specific claims can help us learn where to draw the boundary line between science and pseudoscience, or between science and nonscience.

EXPLORING THE UNKNOWN

As even casual purveyors of the little screen know, the Fox television network is not known for sticking closely to a truth-in-advertising policy when it comes to its so-called "reality programming." If their alien autopsy film wasn't farcical enough, they followed that two years later with another special, this one de-

bunking their own autopsy footage, which itself was a bait and switch—the "secrets revealed" was actually on a different alien film altogether, one not even aired in the original show! But then, this is the same network that gave us the world's deadliest animals, the most dangerous car chases, the powers of the paranormal "put to the test" by a boxing commentator, and, as a metahoax, a special about machines that seek revenge on their owners, including an angry automobile that purposely drove its owner off a cliff!

Reality programming, in reality, means low production costs (other people's video footage is vastly cheaper than union camera crews) coupled to good ratings ("if it bleeds, it leads"), resulting in robust profits. Television, to be blunt, is a series of commercials with blank spots in between that have to be filled with programming compelling enough to keep the viewer watching until the next commercial. "Don't go away," "stay tuned," and "when we return" are carefully crafted phrases that mean "don't touch the clicker." Clicker phobia lies hidden just beneath the surface of the television business. No show segment should be longer than seven or eight minutes—the perceived attention span of the American public. Interviews are chopped up into sound bites—nothing more than three to four sentences. Background music must be upbeat. Edit cuts are quick and abbreviated—no long, slow pans across mountain ranges or lakes as one might see in a Ken Burns PBS documentary. "Long" segments—fourteen to fifteen minutes—are chopped up into two-parters where, at the end of the first part, teasers of what is coming up in the second part keeps your fingers away from the clicker.

Television is a business and television executives are in business to make money, plain and simple. It's the American way. So let's not unfairly target Fox. When NBC aired a "documentary" hosted by Charlton Heston in which it was claimed that the Egyptian pyramids were actually built by an ancient civilization some ten thousand years ago, we should not be surprised that not a single archaeologist, scientist, or skeptic of any academic or mainstream credibility appeared on the show to present even an iota of dissent. This is because the show was not a documentary. It was what I call an *entertainmentary*—an entertainment show gussied up to look like a documentary. NBC is not alone. In 1993 CBS aired an entertainmentary produced by Sun International Pictures entitled *The Incredible Discovery of Noah's Ark*. The show's producer, David Balsiger, explained the timing philosophy: "What happens is that we attempt to keep as many interviewees in as possible, so we have to shorten their pieces. Maybe they were speaking for a minute, they get shortened to thirty seconds. A sentence or two is cut off the end or somewhere, not to change their point

of view or anything, but to let them make the longest point they are making in a shorter period of time."[12] Had Sun Pictures spent a little more time in actually listening to what the interviewees said, perhaps they might not have been taken in by George Jammal, a Long Beach, California actor who convinced the producers he had a genuine piece of the ark—actually a hunk of wood he knocked out of a railroad tie near his home that he subsequently soaked in teriyaki sauce and other spices on his stove. Any archaeologist would have spotted the hoax in a second, but none were consulted. Balsiger responded to the sting in anger, particularly at the media attention it generated: "There is something wrong with the ethics of the news media when they glorify the acts of humanist hoaxers who intentionally and successfully deceive 40 million TV viewers; and then blame the show producer and CBS for not discovering their elaborate hoax."[13] Elaborate? One would have thought that even without consulting experts they might have spotted Jammal's clues that it was all a setup, such as the names of his phantom assistant "Mr. Asholian," his bogus Polish friend "Vladimir Sobitchsky," and his nonexistent son-in-law "Allis Buls Hitian."[14] As the good book warns, there are none so blind as those who will not see.

Bashing television and bemoaning programming is a favorite pastime of scientists and skeptics, and I've not shied away from launching my fair share of salvos against the little screen. But in the spirit of lighting a candle instead of cursing the dark, since the founding of the Skeptics Society and *Skeptic* magazine in 1992 I have been shopping around a skeptical reality show. To nearly every producer I met on nearly every show I appeared on I talked up my idea of a series in which both the believers' *and* the skeptics' points of view would be presented. In 1994 and 1995, I made several appearances on NBC's daytime paranormal show called *The Other Side* (hosted by an amiable stand-up comedian and one-time minister—such multifarious career combinations are common in the always-uncertain entertainment business), and got to know the producers. A few years later I made a formal pitch to their production company (networks rarely produce their own shows—they almost always purchase them or hire them to be produced by independent production companies of which there are dozens in Southern California), but it didn't fly.

Several years later, however, one of the executives of this particular production company moved to the newly formed Fox Family Channel (Rupert Murdoch, the owner of Fox, purchased the Family Channel from Pat Robertson, and as part of the deal Robertson got to keep his nightly 700 Club show, which, ironically, airs immediately after *Exploring the Unknown*!). This executive liked my show treatment and asked me to pitch it again to Fox Family, which I

enthusiastically did. After months of negotiations (television contracts are complex enough to require the services of entertainment attorneys, a legal specialty of sizable proportions in Hollywood), the deal was sealed, and the company that produced over 200 episodes of the paranormal series, *Sightings,* was selected to produce what came to be called *Exploring the Unknown.* (This maximally equivocal name was chosen so as not to tip our hand to either viewers or potential guests as to the skeptical nature of the show—imagine the response of potential guests to a call from a show researcher that begins "Hello, we'd like to know if you would appear on our Fox Family show called *Debunking the Unknown.*")

Working on this show has been a wonderful educational experience, not only for learning how television series are produced, but in the actual investigations we have conducted. The show is a direct extension of the work we do at the Skeptics Society and *Skeptic* magazine, but with a budget of a couple of hundred thousand dollars per episode (normal for cable, cheap by major network standards) we can do a lot more than we have ever been able to afford to do through the society. And we can reach a lot more people. *Skeptic* magazine, for example, is distributed to nearly every bookstore and a majority of newsstands in America and has a respectable circulation of 40,000 people—an order of magnitude larger than most scientific journals and an order of magnitude, or two, smaller than the largest of magazines. And my books, by book publishing standards, have done well. *Why People Believe Weird Things,* for example, sold about 30,000 copies in hardback and is at about 50,000 in paperback at the time of this writing. My publisher, W. H. Freeman, is very pleased with these numbers that are, like *Skeptic,* an order of magnitude larger than most books that are published, and an order of magnitude, or two, smaller than the very best of the best-selling books on the market.

But compare these figures to the ratings of our little television series on an average cable channel. Airing Friday nights at 10 P.M.—not an especially good time slot—we typically get a .7 or .8 share, which translates to 700,000 to 800,000 homes that watch our show on any given week! That's an order of magnitude larger than both my magazine and my books, and these ratings, by television standards, are paltry compared to some shows, such as *Who Wants to be a Millionaire?,* typically watched by over twenty-five million people every night. The first series cycle of seven hours of *Exploring the Unknown* ran seven times, which translates to roughly five million people who watched the show. The simple and powerful fact is, if you want to reach a lot of people with your message you've got to do it through television.

Given this reality, I have worked hard to translate the message from my

magazine and books into the most powerful medium of communication in history. What is that message? There is a method known as science that can help us answer questions, solve mysteries, and understand our cosmos, our world, and ourselves. Science cannot solve *all* mysteries (thus, *Solved Mysteries* was rejected as a potential show title), but it can solve a lot more mysteries than most people realize, although most television producers know it. (Yes, most people that work in the television business realize that most of the claims presented on these paranormal shows are utter nonsense. They know but they don't care because they are in the business of selling commercials, not ideas. Those of us in the ideas business must face this reality and work around it.) I am grateful to the good folks at Fox Family for giving us the green light not only to explore the unknown, but to explain it fully and, where appropriate, debunk it thoroughly (although always in a polite manner so as not to embarrass the guests). Interestingly, the researchers and producers for our production company were also glad to have their hands untied and be allowed to actually reveal or explain mysteries. It turns out that most of them have known all along that many of these claims are bunk, but they were restricted by the networks from saying so on the air. (Network executives approve all show ideas before production begins, and often read through, edit, and have final approval over voice-over scripts.) So, for *Exploring the Unknown,* we have been free to tell it like it is, to give the full explanation if we have one, and to say whether something makes sense or is nonsense.

THE BOUNDARY PROBLEM AND ITS FUZZY SOLUTION

Here's the rub: how do we know if a claim is sensical or nonsensical? How do we tell the difference between science and pseudoscience, or between science and nonscience? Can we always and clearly distinguish between reality and fantasy, fact and fiction? The opening line of every episode of *Exploring the Unknown,* dramatically read by actor Mitch Pileggi (who plays FBI Assistant Director Skinner on *X-Files,* a show that itself explores these themes in a dramatic format, albeit with far less skepticism) is: "Things are not always what they seem when you are exploring the unknown." Things are not always what they seem because we do not live in a black and white world of unambiguous yeses and noes. We are faced here with a "boundary problem"—where do we draw the boundary between orthodoxy and heresy, between orthodox science and heretical science, or between science and pseudoscience, science and nonscience, and between science and nonsense?

The boundary is the line of demarcation, or the border to be drawn between these geographies of knowledge, these countries of claims. The problem with this geographical/political analogy is that it does not fully hold. Where rivers and mountain ranges, and deserts and seas help geographers and politicians demarcate (however artificially) the boundaries between geographical areas and countries (necessarily cleanly drawn for legal reasons and sometimes right down the middle of a featureless landscape), knowledge sets are fuzzier and the lines between them are blurry. It is not always, or even usually clear where to draw the line. Whether a particular claim should be put into the set labeled science or pseudoscience will depend on both the claim and the definition of the set. Here fuzzy logic, as opposed to Aristotelian logic, may help us resolve this classic problem for philosophers of science.

Aristotelian logic says that A is A. A cannot be non-A. A male is defined by a set of characteristics—XY chromosomes, a penis and testicles, high levels of testosterone, a deep voice, beard and body hair, and so forth—and thus so defined cannot also be a nonmale. Yet even this classic and simple example runs aground in the fuzzy borderlands between the sets male and nonmale. Granted, most individuals falling into these two sets are clearly and distinctly either male or nonmale (female). But there are individuals who are not clearly in one or the other set and who, in fact, may even be represented by a third set called transgender. There are also hermaphrodites. There are males with an XXY genetic condition (Klinefelter's syndrome) that makes them sterile and significantly more feminine in physical appearance. On the other extreme there are XYY "supermales" who allegedly exhibit high levels of violence and aggression.[15] There are some males whose levels of testosterone are so low that their bodies are soft, their skin smooth and hairless, and their voices effeminate. Correspondingly, there are females whose levels of testosterone are so high that they do not qualify as females as defined by the International Olympic Committee's gender criteria, where a simple chromosomal check for an XX or XY will not suffice for their competitive definitions. (For example, in the bicycle Race Across America, which I cofounded, raced in five times, and directed or codirected for thirteen years, we used the IOC drug lab at UCLA to test for drug and steroid use. One year we had a close call when our female winner tested dangerously close to male levels of testosterone, which would have disqualified her as a female in the race. She was not taking testosterone; her levels were just naturally high.) And these examples only include physical definitions of maleness. There are behavioral examples as well, such as males who cross-dress as females and enjoy playing the role of female

more than male. Such social and psychological factors blur the boundaries even more.

The fuzzy logic solution to this problem is to avoid the binary sets altogether and assign subjects a fuzzy fraction. USC engineering professor and fuzzy logic pioneering guru Bart Kosko uses the color of the sky as an example.[16] Aristotelian logic demands that it must be either blue or nonblue, but not both. Yet the sky cannot properly be characterized as either-or. By fuzzy logic reasoning, depending on the time of day and the patch of sky to be evaluated, a fuzzy fraction is a more accurate description. At dawn on the sunrise horizon the sky might be .1 blue and .9 nonblue (or, say, .9 orange). At noon overhead the sky might be .9 blue and .1 nonblue (or, say, .1 orange). At dusk on the sunset horizon the sky might be .2 blue and .8 nonblue (or, say, .8 orange). Likewise, most males could be assigned a fuzzy fraction of, say, .9 or .8. But, depending on the criteria used in a definition of maleness, we all know men who would be better classified as .7 or .6 males, and even a few who would be best described as .2 or .1 males.

When we move away from such simple sets as skies and males and into much more complex and socially influenced phenomena as knowledge claims, the sets overlap considerably more, the borderlands between them are wider and fuzzier, and the boundary lines of demarcation are much more difficult to draw. Fuzzy logic is critical to our understanding of how the world works, particularly in assigning fuzzy fractions not only to the knowledge sets and their inhabitants, but to the degrees of certainty we hold about those individuals and claims. Here we find ourselves in a very familiar area of science known as probabilities and statistics. In the social sciences, for example, we say that we reject the null hypothesis at the .05 level of confidence (where we are 95 percent certain that the effect we found was not due to chance), or at the .01 level of confidence (where we are 99 percent certain), or even at the .0001 level of confidence (where the odds of the effect being due to chance are only one in ten thousand). This is fuzzy logic at its best, and such fuzzy thinking (in the good sense) will help us solve the boundary problem in science.

In my book *Why People Believe Weird Things*, I discussed the problem of defining what constitutes a "weird thing." After all, one individual's weird thing may be another's cherished belief. Defining weirdness is like defining art, or pornography—I know it when I see it from a deep and vast experience of studying it, but a definitive definition is difficult to formulate. I can define neither weirdness nor the boundary between weirdness and nonweirdness with semantic precision in a single definition that would cover all phenomena,

because of the variation and complexity of the claims being made and the diversity of the knowledge sets in which the claims may fall. It simply is not fair to the claims or the claimants to shoehorn them to a single categorical definition. Nevertheless, we can get our minds around this problem by examining in detail a number of specific claims and attempt to glean some principles from these examples of what we might look for in attempting to draw the boundary. We did this with remote viewing and it became clear that this claim is definitely not science. We will shortly examine another claim where the boundary is not so clear.

In my book *Denying History* (coauthored with Alex Grobman), I outline some questions one might ask about a claim in an attempt to distinguish between legitimate historical revisionism and illegitimate historical denial (in this case, Holocaust denial). I called this a Denial Detection list.[17] We can use the same list to detect pseudoscience, nonscience, or just plane nonsense. That is, this set of questions, when applied to any knowledge claim, can help us determine where to draw the boundary between fuzzy sets, or what sort of fuzzy fraction to assign a particular claim. In his book *The Demon-Haunted World*, Carl Sagan presented what he called his Baloney Detection Kit.[18] Since in *The Borderlands of Science* I will be dealing with a lot of claims that cannot be fairly categorized as baloney, with deference to Carl let's call this the Boundary Detection Kit.

THE BOUNDARY DETECTION KIT

Like any kit to be properly built and used, one must read the instructions carefully to receive the full benefit of the product. The Boundary Detection Kit requires the user to examine each claim in great detail, and to get to know the subject deeply enough to have a good feel for how to answer these questions. In so doing there is an implicit commitment to be honest and fair, and to not go into the investigation with a prearranged verdict in mind. This is difficult to do, of course, since none of us comes to the data with unvarnished thoughts free of theory. Science is theory laden. We all bring to the table a set of preconceptions born from the paradigms in which we were trained or raised.

Nevertheless, we can rise above our biases, if not to an Archimedean point of unsullied objectivity, at least to a level at which the claimant under investigation might feel he or she got a fair shake. In fact, a principle of fairness in our Boundary Detection Kit might be to ask this question—what I call the *fairness question*—before all others: *If I were to ask the holders of the claim if they feel that they and their beliefs were fairly treated, how would they respond?* Where

possible, in fact, why not ask them? I have done so on a number of occasions and to my considerable surprise I discovered that I had not been fair in my analysis, particularly in truncating someone's beliefs to a handful of simplified tenets that could be more easily analyzed (and, usually, debunked). This is sometimes called the "straw man" fallacy in logic, where one sets up a straw man that can be easily toppled but does not represent anyone's actual position. I find that I learn a lot more in the process when I bear in mind the fairness question. In many cases questioning the belief holder is not practical, but the fairness question still works as a hypothetical standard toward which to aim.

Given these caveats, here are ten useful questions to ask in determining the validity of a claim:

1. *How reliable is the source of the claim?* People like Holocaust denier David Irving appear quite reliable as they cite facts and figures; but often, when examined more closely, these details are distorted, taken out of context, or occasionally even fabricated. Scientists are usually reliable. Pseudoscientists are often not reliable. This is a matter of degree, of course, since everyone makes mistakes. As Daniel Kevles showed so effectively in his book *The Baltimore Affair,* in investigating possible scientific fraud there is a boundary problem in detecting a fraudulent signal within the background noise of mistakes and sloppiness that is a normal part of the scientific process.[19] The investigation of a particular set of research notes of Thereza Imanishi-Kari (a collaborator of Nobel laureate David Baltimore) by an independent committee established by Congress to investigate potential fraud, revealed a surprising number of mistakes. But as a historian of science Kevles knows that, in reality, science is messier than most outsiders realize. On top of this, research in molecular biology is far more complex than, say, particle physics. Molecular biological experiments are complicated by the fact that individual cells and viruses are far more variable than, say, hydrogen atoms. The question then becomes: can a distinction be made between intentional and unintentional distortion of the data and interpretations? This was, in fact, a central point of discussion in the famous Holocaust denial trial of early 2000, where Deborah Lipstadt's attorneys and expert witnesses attempted to show that the errors and omissions in David Irving's numerous books on the Nazis and World War II were not just the product of normal scholarship sloppiness, but the intentional distortion of the historical record by Irving. What they showed (and the judge agreed in ruling in favor of Lipstadt) was that Irving's mistakes were almost always in the direction of exonerating Hitler and the Nazis.

2. *Does this source often make similar claims?* Extremists, deniers, and pseu-

doscientists have a habit of going well beyond the facts, so when one individual makes numerous such claims it is a sign that they are more than just revisionists or iconoclasts. Again, this is a matter of quantitative scaling, since some great thinkers often go beyond the data in their creative speculations. Cornell scientist Thomas Gold is notorious for his radical ideas, but he has been right often enough that other scientists listen to what he has to say, and those same scientists are also testing these ideas for their validity. Gold's book, *The Deep Hot Biosphere*, for example, proposes the heretical idea that oil is not a fossil fuel at all, but the by-product of a massive subterranean colony of bacteria living in rocks.[20] Hardly any earth scientists I have spoken with take this thesis seriously, yet they do not consider Gold a crank. Why? Because he plays by the rules of the game of science. What we are looking for here is a pattern of fringe thinking that consistently ignores or distorts data not for creative purposes, but for ideological agendas.

3. *Have the claims been verified by another source?* Typically, nonscientists and pseudoscientists will make statements that are unverified, or verified by a source within their own belief circle. We must ask who is checking the claims, and even who is checking the checkers. The biggest problem with the cold fusion debacle, for example, was not that Stanley Pons and Martin Fleischman were wrong; it was that they announced their spectacular discovery before it was verified by other laboratories (at a press conference no less), and, worse, when cold fusion was not verified anywhere they continued to cling to their belief in the phenomenon despite the lack of evidence. Pons and Fleischman abandoned the rules of science, and in the process their science became their faith. Science writer Gary Taubes called this "bad science."[21] Physicist Robert Park calls it "voodoo science."[22] By whatever name, outside verification is crucial to good science.

4. *How does this fit with what we know about the world and how it works?* An extraordinary claim must be placed into a larger context to see how and where it fits. When deniers construct elaborate conspiracy theories about how the Jews have concocted the Holocaust story in order to extract reparations from Germany and support for Israel out of America, they are naive or deceptive about how modern political systems work. German reparations were calculated based on survivors, not victims; and America supports Israel primarily for selfish economic and political reasons, not out of altruism, guilt, or sympathy.[23] When pseudoarchaeologists claim that the Pyramids and the Sphinx were built over 10,000 years ago by an advanced race of humans (because the Egyptians could not have moved those heavy stone blocks and because the Sphinx shows signs

of water weathering that could not have happened after the end of the last ice age), they are not presenting any context for that earlier civilization.[24] Where are the rest of the artifacts of those people? Where are their works of art, their weapons, their clothing, their tools, their trash? This is simply not how history or archaeology works.[25]

5. *Has anyone, including and especially the claimant, gone out of the way to disprove the claim, or has only confirmatory evidence been sought?* This is the confirmation bias, or the tendency to seek confirmatory evidence and reject or ignore disconfirmatory evidence.[26] The confirmation bias is powerful and pervasive, and is almost impossible for any of us to avoid. It is why the methods of science that emphasize checking and rechecking, verification and replication, and especially attempts to falsify a claim, are so critical. David Irving's books are classic examples of an ideology in search of facts. When it comes to the Holocaust he rarely attempts to falsify or disprove his interpretations (although he does do so with great alacrity with most other aspects of the war). Disconfirmatory evidence for the Holocaust story are eagerly embraced (e.g., Nazi survivors who deny it, trivial anomalies in the physical evidence), whereas the disconfirming evidence that abounds for most of his claims are adroitly evaded. In like manner, there is so much evidence against cold fusion that all but a handful of die-hard physicists, chemists, and hopelessly optimistic futurists long ago gave up conducting further research, yet the purveyors of "infinite energy" (there is even a magazine of this title) cling to the slimmest of experimental results and blithely sweep the disconfirming evidence under the rug of conspiracy theories where, for example, oil and electrical conglomerates are said to be preventing the positive evidence from reaching the American public.[27]

6. *In the absence of clearly defined proof, does the preponderance of evidence converge to the claimant's conclusion, or a different one?* Deniers do not look for evidence that converges to a conclusion; they look for evidence that fits their ideology. In examining the various eyewitness accounts of the gassing of prisoners at Auschwitz, for example, a consistent core of a story develops among them, to the point where we now have a fairly good understanding of what happened. Deniers, on the other hand, take the minor discrepancies in the eyewitness stories and treat these as anomalies that disconfirm the theory. To the contrary, and it seems counterintuitive at first, these variations in minutia *confirm* the theory by virtue of the fact that no one remembers the details of the past perfectly and, of course, specific events are similar only in generalities, not in specifics, which will vary depending on conditions. UFOlogists suffer the same fallacy in their continued focus on a handful of unexplained (or poorly ex-

plained) atmospheric anomalies and visual misperceptions by uninformed eyewitnesses, while conveniently ignoring the fact that the vast majority (I estimate 90 to 95 percent) of UFO sightings are fully explicable with prosaic answers.[28]

7. *Is the claimant employing the accepted rules of reason and tools of research, or have these been abandoned in favor of others that lead to the desired conclusion?* Most deniers do not even *know* the accepted rules of scholarship, let alone employ them fairly. But those who do know, or should know—like Mark Weber, Robert Faurisson, and David Irving—seemingly abandon them in the service of their ideologies. Here I am not just talking about citing sources in articles published in scholarly looking publications like the *Journal of Historical Review*, or thick books with dozens of pages of references in the bibliography. I am talking about the *honest* employment of these tools where, in the quiet solitude of examining a particular document or translating a certain word or phrase, one has done one's best to consider the historical content and context. Creationists—whom I prefer to call evolution deniers—are especially subject to this problem, along with a lack of convergent thinking. Creationists (mainly the young-earth creationists) do not study the history of life. In fact, they have no interest in the history of life whatsoever since they already know the history as it is laid down in the book of Genesis. No one fossil, no one piece of biological or paleontological evidence has "evolution" written on it; instead there is a convergence of evidence from tens of thousands of evidentiary bits that adds up to a story of the evolution of life. Creationists must not only ignore this convergence, they have to abandon the rules of science, which isn't difficult for them since most of them, in fact, are not practicing scientists. The only reason creationists read scientific journals at all is to either find flaws in the theory of evolution or to find ways to fit scientific ideas into their religious doctrines.[29]

8. *Has the claimant provided a different explanation for the observed phenomena, or is it strictly a process of denying the existing explanation?* Deniers usually have no new theory of history to offer, but concentrate instead on knocking down the accepted doctrines of the field. This is a classic debate strategy—criticize your opponent and never affirm what you believe in order to avoid criticism. But this stratagem is unacceptable in science and scientific history. Revisionism may involve legitimate critiques of the existing paradigm, or offer a replacement with a new paradigm, but denial rarely amounts to more than simply attacks on the status quo. Creationists' only "theory" to replace evolution is "God did it."[30] Proponents of the Pyramids as being built by pre-Egyptians offer no evidence of just who these people are, and instead just pick at anomalies in the work of Egyptian archaeologists. Critics of the Big Bang ignore the convergence of

evidence of this cosmological model, focus on the few flaws in the accepted model, and have yet to offer a viable cosmological alternative that carries a preponderance of evidence in favor of it.

9. *If the claimant has proffered a new explanation, does it account for as many phenomena as the old explanation?* Occasionally new theories of history are offered (e.g., extreme Afrocentrists and radical Feminists), but rarely do these theories account for as much of the past as the one they hope to replace. It is in these details of the past that disconfirming evidence can be found in the form of unexplained events. If the Holocaust did not occur, then what happened to the millions of Jews unaccounted for after the war? If the Holocaust did not happen, then how do deniers explain all those references to the "ausrotten" (extermination) of the Jews? They do not explain them. They ignore them, rationalize them, or deny them. Similarly, the HIV-AIDS skeptics argue that lifestyle (drug use or promiscuity, coupled to a correlation with a naturally-weakened immune system), not HIV, causes AIDS. Yet, to make this argument they must ignore the convergence of evidence in support of HIV as the causal vector in AIDS, and simultaneously ignore such blatant evidence as the significant correlation between the rise in AIDS among hemophiliacs just after HIV was inadvertently introduced into the blood supply. On top of this, their alternative theory does not explain nearly as much of the data as the HIV theory.[31]

10. *Do the claimants' personal beliefs and biases drive the conclusions, or vice versa?* All of us are biased. All scientists and historians hold social, political, and ideological beliefs that could potentially slant their interpretations of the data. The question then becomes: how do those biases and beliefs affect the research? It is true that even the most well-intentioned scientists and historians may find themselves searching for facts to fit their preconceptions. But at some point, usually during the peer-review system (either informally, when one finds colleagues to read a manuscript before publication submission, or formally when the manuscript is read and critiqued by colleagues, or publicly after publication), such biases and beliefs are rooted out, or the paper or book is rejected for publication. This is why one should not work in a vacuum. Intellect stumbles and falters without critical feedback. If you don't catch your biases in your research, someone else will.

With this Boundary Detection Kit we can expand the fuzzy logic heuristic into three sets that I will call *normal science, borderlands science*, and *nonscience*—a trinary system instead of the restrictive two-set binary system. Here are some examples from my experience of asking these questions in the process of study-

ing in considerable detail a number of claims that fuzzily fall into one of these three categories, along with my own subjectively assigned fuzzy fractions (.9 highest, .1 lowest, in relation to their level of scientific validity).

Normal science. On the science side of the boundary:

—Heliocentrism, .9
—Evolution, .9
—Quantum mechanics, .9
—Big Bang cosmology, .9
—Plate tectonics, .9
—Neurophysiology of brain functions, .8
—Punctuated equilibrium, .7
—Sociobiology/evolutionary psychology, .5
—Chaos and Complexity theory, .4
—Intelligence and intelligence testing, .3

Nonscience. On the nonscience, pseudoscience, or nonsense side of the boundary:

—Creationism, .1
—Holocaust revisionism, .1
—Remote viewing, .1
—Astrology, .1
—Bible Code, .1
—alien abductions, .1
—Big Foot, .1
—UFOs, .1
—Freudian psychoanalytic theory, .1
—Recovered memories, .1

Borderlands science. In the borderlands between normal science and nonscience:

—Superstring theory, .7
—Inflationary cosmology, .6
—Theories of consciousness, .5
—Grand theories of economics (objectivism, socialism, etc.), .5
—SETI, .5
—Hypnosis, .5
—Chiropractic, .4

—Acupuncture, .3
—Cryonics, .2
—Omega Point Theory, .1

Since these categories and fractional evaluations are fuzzy it is possible for them to be moved and reevaluated with changing evidence. Indeed, all of the normal science claims were at one time in either the nonscience or borderlands science categories. How they moved from nonscience to borderlands science, or from the borderlands to normal science (or how some normal science claims slipped back into the borderlands or even into nonscience), is one of the most important aspects of the study of the history and philosophy of science.

SETI, or the Search for Extraterrestrial Intelligence, for example, is not pseudoscience because it is not claiming to have found anything (or anyone) yet, it is conducted by professional scientists who publish their findings in peer-reviewed journals, it polices its own claims and does not hesitate to debunk the occasional signals found in the data, and it fits well within our understanding of the history and structure of the cosmos and the evolution of life. But SETI is not normal science either because its central theme has yet to surface as reality. Thus far no aliens have phoned in and, as much as I support the search, this still seems to me to belong in the borderlands. UFOlogy, by contrast, is nonscience (and sometimes pseudoscience) pure and simple. Proponents do not play by the rules of science, do not publish in peer-reviewed journals, ignore the 90–95 percent of sightings that are fully explicable, focus on anomalies, are not self-policing, and depend heavily on conspiratorial theorizing about government cover-ups, hidden spacecraft, and aliens holed up in Nevada caves.

Likewise, superstring theory and inflationary cosmology are at the top of borderlands science, soon to be either bumped up into full-scale normal science or abandoned altogether, depending on the evidence that is now starting to come in for these previously untested ideas. What makes them borderlands science instead of pseudoscience or nonscience is that the practitioners in the field are professional scientists who publish in peer-reviewed journals and are trying to discover ways to test their theories. By contrast, creationists who devise cosmologies that they think will best fit the book of Genesis are typically not professional scientists, do not publish in peer-reviewed journals, and have no interest in testing their theories, except against what they believe to be the divine words of God.

Theories of consciousness are borderlands science, whereas psychoanalytic theories are pseudoscience, because the former are being tested and are

grounded in sound facts of neurophysiology, whereas the latter have been tested, have failed the tests again and again, and are grounded in discredited nineteenth-century theories of the mind. Similarly, recovered memory theory is bunk because we now understand that memory is not like a videotape that one can rewind and play back, and that the very process of "recovering" a memory itself contaminates it. But hypnosis, by contrast, is tapping into something else in the brain, and there may very well be sound scientific evidence in support of some of its claims, so to that end we will wrap up this treatise on blurry lines and fuzzy boundaries by exploring in detail this borderlands science.

EXPLORING THE BORDERLANDS

Academic philosophy of science often finds itself bogged down in the thickets of symbolic logic, hypothetical scenarios, and theoretical speculations that lack correspondence to the real world. This is why I provided brief examples for each of the ten questions in the Boundary Detection Kit, and offered specific cases of normal science, borderlands science, and nonscience. To take one of these examples in detail, I recount an investigation we conducted for *Exploring the Unknown*, as further consideration of the boundary problem in science.

On Saturday, May 13, 2000, I was hypnotized by James Mapes, hypnotherapist and motivational speaker, for an episode segment on hypnosis. The theoretical question at hand is this: is hypnosis an altered state of consciousness, or is it nothing more than fantasy role-playing on the part of the subject in tacit agreement with the hypnotist? This is borderlands science because, on the one hand, we have some remarkable experimental results that suggest an altered state of consciousness is real, yet, on the other hand, despite over a century of research on the subject, scientists have been unable to agree on what is really going on in the hypnotic trance. Hypnosis skeptics argue that there is nothing the hypnotized subject does in a hypnotic trance that an unhypnotized subject could not do through either outright faking or (more likely) through an intense state of role-playing and fantasy enactment directed by the hypnotist.[32] In other words, an actor could duplicate anything an allegedly hypnotized subject could do such that an outside observer would be unable to distinguish between the two. The stage magician Kreskin, in fact, has a standing offer of $100,000 to anyone who could pass this test. No one has collected thus far.

Hypnosis believers, by contrast, point to research of Stanford University experimental psychologist Ernst Hilgard, and his discovery of the so-called "hidden observer." Hilgard's experimental protocol was to dip subjects' arms into a

bucket of ice-cold water—water so cold that within minutes subjects reported high levels of pain. When hypnotized, the subjects were told that the water would cause no discomfort, and, in this state, they indeed reported low levels of pain. But when these same subjects were later asked to evaluate the level of pain they experienced when in the earlier hypnotized state, they reported the same levels of pain as the first groups of nonhypnotized subjects. In other words, during the hypnotic state in which one part of their brain reported a low level of pain, another part recorded the higher level of pain. That part of the brain Hilgard called the "hidden observer." This hidden observer is dissociated from the other part of the brain that is in the hypnotic altered state, and thus this is known as a dissociation theory of hypnosis, which Hilgard describes as a "multiplicity of functional systems that are hierarchically organized but can become dissociated from one another."[33]

Critics argued that Hilgard instructed his subjects to create a "hidden observer," itself a concept highly metaphorical, like the premodern notion of the homunculus—the little man inside the sperm cell that simply unfolds into a full-grown man. Is the hidden observer nothing more than a nonexistent homunculus? Here is what Hilgard told his subjects:

> When I place my hand on your shoulder (after you are hypnotized) I shall be able to talk to a hidden part of you that knows things are going on in your body, things that are unknown to the part of you to which I am now talking. The part to which I am now talking will not know what you are telling me or even that you are talking. . . . You will remember that there is a part of you that knows many things that are going on that may be hidden from either your normal consciousness or the hypnotized part of you.[34]

Did Hilgard simply invent the "hidden observer," then plant that idea into subjects' minds, who then obliged him accordingly? Maybe, but it seems unlikely—impossible more like it—for a subject to consciously create a dissociated state of mind. But even if this were possible, does that not make the case for the "hidden observer" as something real? Shortly before we filmed our piece on hypnosis, I attended the Western Psychological Association conference in Portland, Oregon, at which one of the world's leading neuroscientists spoke, Dr. Richard Thompson from the University of Southern California. Thompson arguably knows as much as or more about the brain than anyone in the world, so I presented this problem to him. His lecture, by chance, was on breakthroughs in brain studies as a result of brain imaging techniques (where different

parts of the brain "light up" when active). To my delight Thompson showed how Hilgard's "hidden observer" experiments were replicated using neuroimaging techniques, in which it was demonstrated that the part of the brain active in nonhypnotized subjects experiencing pain is the same part of the brain active in hypnotized subjects who report feeling no pain, but in fact, later report the same levels of pain. "*There* is the hidden observer," Thompson dramatically proclaimed. At last, a neurological correlation for Hilgard's metaphorical concept. The hidden observer would appear to be real and the dissociation theory of hypnosis is further supported by experimental evidence.

With this theoretical debate in mind we gathered about forty people at a studio in Glendale, California for an afternoon of hypnosis. This was not the first time I had experienced hypnosis. In 1982, I had gone through a series of sessions with a trained hypnotherapist name Gina Kuras, a friend of mine from graduate school days in an experimental psychology program at California State University, Fullerton. Gina now made a living, in part, from hypnotherapy, and I was preparing for the first ever 3,000-mile, nonstop transcontinental bicycle Race Across America. Four of us were to compete around the clock, riding 24-hours a day for ten straight days, with sleep breaks and rest stops optional. Since ultra-marathon cycling is clearly more than just a physical sport, I figured I would need all the psychological help I could get. So, in addition to training over 500 miles a week, utilizing a specialized diet, and trying out any and all alternative new age therapies for health and fitness, I went through a series of hypnosis sessions with Gina to learn to control pain and stay focused.

I wasn't very good at it at first, but as all hypnotists know, some people are highly suggestible and make excellent subjects, while others are less suggestible and have a difficult time slipping into the altered state. For whatever reason, I fall into this latter category—far too self-analytical and aware of my surroundings to let myself slip into the psychological bonds with the hypnotist. But after several sessions I did get into it and was able to be hypnotized. My final session before the race, in fact, was filmed by ABC's *Wide World of Sports* for an "up close and personal" they were preparing on each of the riders as part of their coverage of the event. I was so "under" that I gave Gina a scare when I did not come out of the hypnotic trance upon her usual command of "3, 2, 1, awake." For a moment she feared she might have shut down my brain permanently, and on national television no less!

Twenty years later I was uncertain whether I would be able to get back into the state of hypnosis, or if my logical, scientific state of mind would cause me to be too aware of my external surroundings and internal states of mind to let

myself go. That was, in fact, the case. I came close to being hypnotized and tried vigilantly to let myself go, following Mapes's suggestions as far as I could take them, but I don't think I was hypnotized. By contrast, however, there were half a dozen of our forty subjects who were most definitely in an altered state. While I am quite skeptical of some of the tasks Mapes put them through, such as age regression (which does strike me as nothing more than fantasy role-playing), his most dramatic demonstration was to plant the suggestion that a certain single-digit number does not exist, such that when the subjects counted their fingers all of them skipped that number and ended with their pinkie as finger number eleven. The hypnotically-implanted suggestion caused a number to disappear for these subjects. Yet when brought out of the hypnotic altered state of consciousness, every one of them not only remembered the number, they recalled that they could not previously say the number and that it was, like the tip-of-the-tongue phenomenon, a most peculiar and frustrating experience. In other words, the hidden observer knew the number and was aware of the other part of the brain's inability to say it, but the dissociated brain module in the hypnotized state was unable to do so.

So intrigued was I by this that we dismissed all of the subjects but one, a young woman named Jocelyn who works as a legal secretary in a Los Angeles-based law firm. Jocelyn seemed especially suggestible and emotionally involved in the hypnotic session, so Mapes and I sat back down with her for a private hypnosis session, all taped for the show. Even though over an hour had passed by the time the crew relit the set for this segment, Mapes was able to command her back into a hypnotic state in seconds with a touch to the back of her neck and the command "sleep." I instructed Mapes to suggest to Jocelyn that she would be unable to say the number eight. He did so, and when I asked Jocelyn to count on her fingers to ten she obliged us as before (but with a different number) with the count "1, 2, 3, 4, 5, 6, 7, 9, 10, 11," followed by a puzzled look at her "eleventh" finger. I asked her how many fingers she has. "Ten," she answered confidently. I asked her to count again, this time starting on the other hand. Same result, followed by the same confused look. I then explained to Jocelyn about the "hidden observer" and that a part of her brain did, in fact, know the number eight. I repeated the number over and over. I explained that the number eight comes after seven and before nine. I told her that Mapes had simply planted that suggestion, and that she was now to override that suggestion at my command and count straight through to ten. So she did: "1, 2, 3, 4, 5, 6, 7, 9, 10, 11." I couldn't believe it. I had Mapes bring her back out of the hypnotic state and asked Jocelyn to count to ten, which she did flawlessly. Did