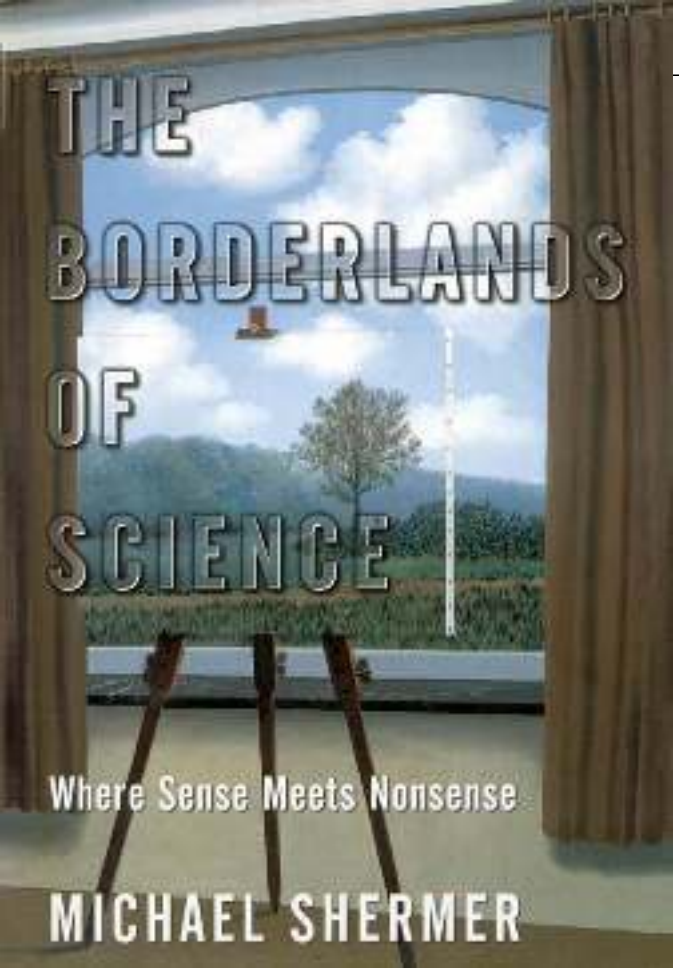
THE
BORDERLANDS
OF
SCIENCE
Where Sense Meets Nonsense
MICHAEL SHERMER

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, Superstition, and Other Confusions of Our Time (Foreword by Stephen Jay Gould; W. H. Freeman, 1997)
Endzeitaussicht: Prophezeien, 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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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 reasoning 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 markers 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 trance. 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 prominent 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."[3] 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, Jern 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.[4]

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.[5]
>
> 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.[6]
>
> 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, so 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.[7]

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.[19] 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 contents 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

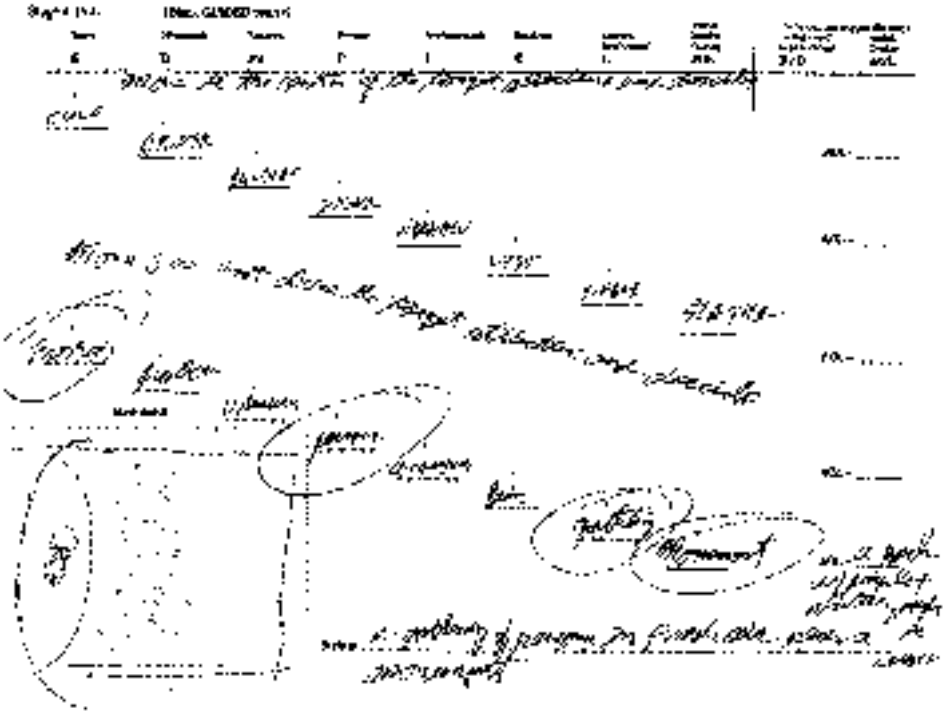
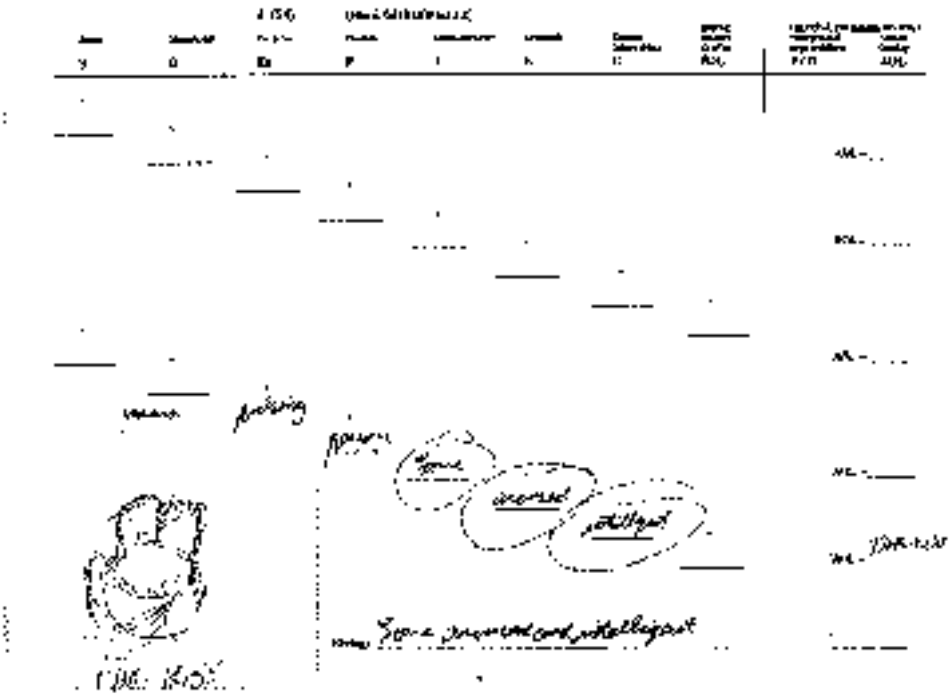


Figure 1. The Author's Remote Viewing Experimental Results

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 Sobrichsky," and his nonexistent son-in-law "Allis Bafs Hirian."[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 geogmnities 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 clearly 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.[6] 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