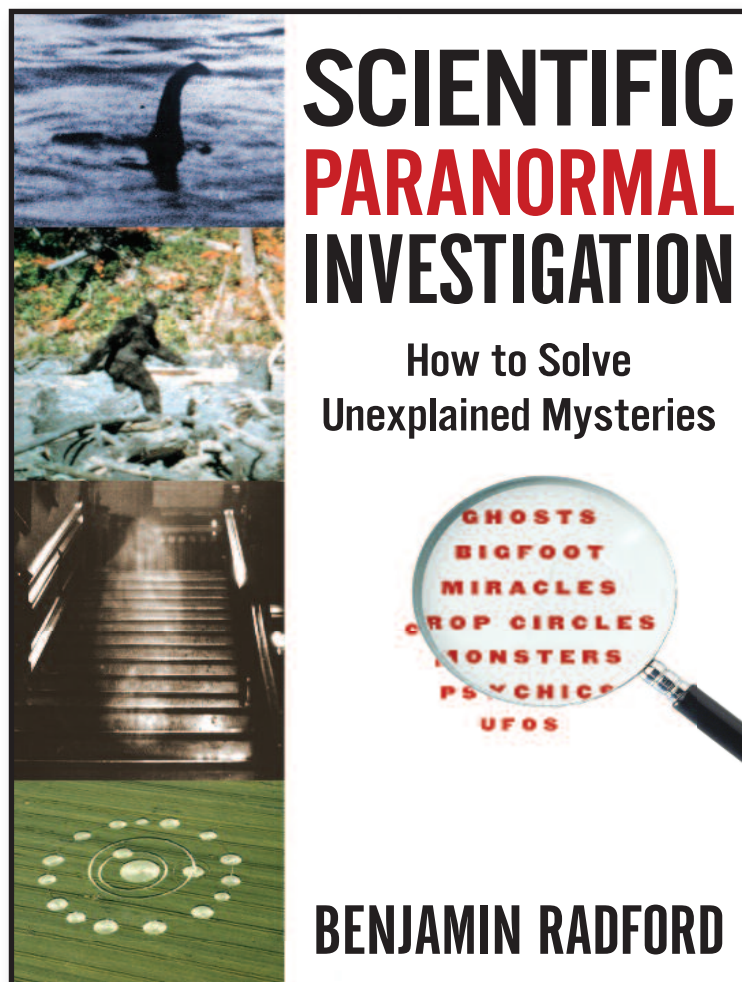


Top 5 Ghost Hunting Mistakes

Science and Pseudoscience in Ghost Hunting

by
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adapted from



You're interested in ghosts. Or maybe you investigate ghosts, and your group claims to be scientific; join the club. Just about every ghost hunting group calls themselves skeptical or scientific. A lot of ghost hunters think they are being scientific if they use EMF detectors and FLIR cameras. Others think they are being scientific if they don't use psychics, or if they conduct tests or experiments. If you want to know whether an investigator or group is scientific or not, examine their methods and results. Do they use the pseudoscientific methods described here? What is their track record of solved cases? Do their investigations end up with inconclusive and ambiguous results, or solved mysteries?

I've been a science-based paranormal investigator for over a decade. My investigations have been featured on CNN, in national magazines, and on a half-dozen cable TV shows. I give lectures on science literacy and critical thinking across the country. I edit a national science magazine and write columns for LiveScience.com and blogs for Discovery News. I've written four books from mainstream publishers (not self-published) and I have two more books coming out this year.

I point this out not to brag but to establish my credibility. Every Joe Shmoe who owns the first four seasons of *Ghost Hunters* on DVD and has an EMF detector from Radio Shack thinks he's a ghost hunter and knows how to investigate ghosts. I know both science and investigation, and 99% of what passes for "science" and "investigation" among ghost hunters and paranormal investigators is neither. This document explains why.

If you want to learn about the real science, the real deal, here it is. This article is adapted from Chapter 4 in my book **Scientific Paranormal Investigation: How to Solve Unexplained Mysteries**. I am making this material available for free to anyone who wants it, and it may be re-distributed in any form as long as proper credit is given.

Do I hope you'll buy, or at least check out, my book? Sure I do. I spent years researching and writing it, and it's a damn good book with great reviews. But even if you don't, I want to help educate the ghost investigation community about what real science is, and how to do good research.

Introduction

Ghost investigations can be tricky. Very ordinary events can be—and have been—mistaken for extraordinary ones, and the main challenge for any ghost investigator is separating out the facts from the jumble of myths, mistakes, and misunderstandings. Often it is very easy to accidentally create or misinterpret evidence: Is that flash of a light on a wall from flashlight reflection—or a ghost? Are the faint sounds recorded in an empty house spirit voices—or a neighbor's radio? It's not always clear, and investigators must be careful to weed out the red herrings and focus on the real information.

The most famous ghost hunters in the world, Jason Hawes and Grant Wilson (co-founders of the Atlantic Paranormal Society—T.A.P.S.—and stars of the TV show *Ghost Hunters*), agree with me that science is the best way to approach investigations. They have always claimed to use good scientific methods and investigative procedures, for example writing in their 2007 book *Ghost Hunting*, “T.A.P.S. uses scientific methods to determine whether or not someone’s home might be haunted,” and “We approach ghost hunting from a scientific point of view.”

Yet Jason Hawes spends a grand total of *four paragraphs* (out of 273 pages) to a chapter titled “The Scientific Approach.” Hawes doesn’t say much about science or the scientific methods, and in fact it’s the shortest chapter in the book. Hawes writes that “Scientific knowledge comes from systemic and objective observations, which help us make deductions we can trust. It also means we have to test those deductions through controlled experiments that can be repeated by others under those same conditions.... We’re determined to come as close to scientific accuracy as we possibly can. That’s the only way we’re going to produce reliable evidence and advance the study of the paranormal.”

Jason Hawes is correct, as far as he goes. He is right that only scientific investigation will shed light on ghostly phenomenon. But he is wrong in his belief that he and his T.A.P.S. crew are doing good scientific investigation. After watching episodes of *Ghost Hunters* and other similar programs it quickly becomes clear to anyone with a background in science that the methods used are both illogical and unscientific.

Ghost Hunting

Most ghost investigations follow a similar pattern. First, the group hears about the claim, and goes to the location to interview one or more people who reported some unusual event. Next, armed with reports and speculation about what might be going on, the team spends hours bringing out and setting up high-tech gear (cameras, audio recorders, EMF detectors, infrared cameras, etc.) around the reputedly haunted location. Then the group does a stakeout that lasts anywhere from a few hours to overnight. During this time they walk around taking photos, temperature readings, recording audio and video footage, and so on. The lights are turned off, and sometimes psychic mediums, dowsing rods, pendulums, and the like are used to try and communicate with a spirit. Other times a test (or “control”) object (such as a teddy bear, ball bearings, a toy, a candle, etc.) will be placed in a conspicuous place, and the ghost asked to affect or move the object.

Usually as the investigators, either individually or as a team, walk around the darkened place they may hear noises or bump into things. Often any “strange” sounds or smells or lights or other experiences will be considered potential ghost activity. Sometimes the ghost hunters will find an explanation for this (and the original claimed) phenomenon, other times they won’t. Nothing terribly dramatic will happen, and at the end of the specific time, the investigators have some phenomenon (recorded sounds, video, etc.) to be analyzed at a later time; the stakeout ends and everyone gets some sleep.

Later the investigators go over every bit of audio and video they recorded, combing through for anything that anyone thinks might be strange or unusual. Depending on how much recording they

did, they may have dozens or hundreds of hours, and usually they are able to find a few faint “unexplained” noises (that might be EVPs, or ghost voices) or lights or odd electromagnetic field readings. If the team uses psychics, they will give their impressions. Usually at this point the team has found at least a few pieces of evidence that they can associate with a human presence. For example, a psychic may say she sensed an older male presence in one room or area; or a faint sound recorded at some location might be thought to resemble a child’s voice; or one of the investigators might suggest that a shadow on a wall looks like a tall, thin woman.

Often the investigators research (or further research) the history of the house, poring over early records and newspaper archives, perhaps interviewing previous owners, looking for anything having to do with the house, its previous occupants, or even the nearby land and houses. Once they have a rough history of the place, they will look for matches: Is there anything in the location’s history that can support or confirm the “evidence” they gathered during their investigation?

Often the answer is yes: If it turns out that an elderly woman lived in the house at any point since it was built (and especially if she died there—or even *might* have died there), that “confirms” the psychic’s impressions. If a young girl lived there at some point (especially many years ago, and therefore might have since died), then the sound that could be a girl’s voice is probably her. And so on. In this way, the investigators believe they are being successful when they find a correlation. They congratulate themselves on a good ghost investigation, explain their findings to the location’s owner, and then either call the local news media or write up a report for their Web site listing the phenomena they couldn’t explain.

While this is standard operating procedure for many ghost hunting groups and paranormal investigators, there are many errors, logical fallacies, and investigation mistakes in this scenario. Most of these mistakes fall into two categories: They either create false evidence (red herrings, or what in science are known as false-positives, or Type II errors); or the practice is illogical and violates basic scientific methods.

Studies have repeatedly found that the general public has a very poor understanding of science. Most ghost investigators are intelligent, sincere people who have simply never been exposed to the real scientific side of ghost hunting, and instead take their cues and methods from “experts” and what they see on TV shows. Here are the top five ghost hunting mistakes.

1. Assuming that no specialized knowledge or expertise is needed to effectively investigate ghosts.

One of the most common assumptions among ghost investigators is that in the paranormal field “there are no experts.” If there are no experts, then of course anyone can effectively investigate ghosts. Almost all ghost hunters are amateur, part-time hobbyists from all walks of life, and thousands of them investigate ghosts (apparently with some success). On the hit show *Ghost Hunters*, two ordinary guys who work as plumbers during the daytime are touted as experts on ghost investigations, though none of the team has any background or training in science, investigation, forensics, or any other

field that might help solve mysteries.

Why it's a mistake: Paranormal investigation requires no certificate; anyone can do it with no training, knowledge, or expertise whatsoever (though of course there are people who will try to sell you a “ghost hunter” certification). Whether they are effective or not—actually solve any mysteries—is another matter entirely.

Despite their name, ghost investigators do not investigate ghosts; rather, they investigate various phenomena that might (or might not) be related to a ghost. Effectively investigating claims and solving mysteries, on the other hand, does require some experience and expertise—specifically in logic, critical thinking, psychology, science, forensics, and other areas. And there certainly *are* experts on that subject, people who have researched and investigated phenomena claimed to be evidence for ghosts. I'm one of them, and I can name a handful of others.

This shouldn't surprise anyone. Ordinary people hire specialists all the time to explain or handle things that seem too arcane or mysterious for us layfolk. People don't assume that a person without training can be a good mechanic, doctor, or athlete, yet when it comes to the supposedly “unexplained” mysteries—ghosts, crop circles, psychic powers, and so on—people often assume that no expertise or specialized knowledge is needed to successfully investigate the phenomenon. One thing that distinguishes an expert from an amateur is that experts get better. They improve their tools and refine their techniques as they gain knowledge and apply their experience to future investigations. Many ghost hunters, on the other hand, repeat the same mistakes over and over, investigation after investigation, year after year.

2. Considering subjective feelings and emotions as evidence of ghostly encounters.

Members of ghost hunting groups (and TV shows such as *Ghost Hunters*) often report descriptions of personal feelings and experiences like, “I felt a heavy, sad presence and wanted to cry,” or “I felt like something didn't want me there,” and so on. They also describe in detail how, for example, they had goose bumps upon entering a room, or grew panicked at some unseen presence, assuming they were reacting to a hidden ghost.

Why it's a mistake: Subjective experiences are essentially stories and anecdotes. There's nothing wrong with personal experiences, but by themselves they are not proof or evidence of anything. Most people who report such experiences are sincere in their belief that a ghost caused their panic, but that belief does not necessarily make it true.

The problem, of course, is that there is not necessarily any connection between any real danger or a ghostly presence and how a person feels. Many people suffer from irrational phobias and panic attacks, terrified of any number of things such as insects, airplane travel, and crossing bridges. Their

fears and panic are very real—they truly are sweating and terrified. But it's all psychological; it has nothing to do with the outside world. In the same way, the power of suggestion can be very strong, and a suggestible ghost hunter can easily convince herself—and others—that something weird is going on. There is of course no objective, scientific way to test these sorts of claims, no test for fear, uneasiness, panic, a sense of dread, a “spooky” feeling, or other subjective sensations. Even if a person is sweating, or his skin feels clammy, there could be any number of things that caused it. Most ghost hunters recognize that their personal feelings can't be considered good evidence, yet they often report these experiences along with the rest of their evidence. Investigators should make an effort to learn about psychology (especially perceptual processes) and human behavior so that their investigations aren't sidetracked by these distractions.

3. Using unproven tools and equipment.

There are two basic types of equipment and tools that ghost hunters use: metaphysical ones (psychics, dowsing rods, pendulums, séances, etc.) and scientific ones (electromagnetic field detectors, thermometers, FLIR cameras, etc).

Why it's a mistake: In their work, real scientists and investigators only use equipment that has been proven to work and is designed for the purpose for which it is used. Police detectives don't use dowsing rods to identify suspects, and doctors don't use EMF detectors to test for genetic diseases. It's not that EMF detectors aren't useful—they very much are, in certain fields—but they have nothing to do with what the doctor is investigating. The same holds true for these unproven tools.

Some investigators claim that they don't use the equipment to detect ghosts; instead they use it to rule out natural explanations for a ghostly phenomenon. The problem is that the naturalistic “explanations” they claim to be ruling out often have nothing to do with the original ghost claims. For example, let's say that a person believes his house is haunted because he hears faint voices at night, an odd glowing form appeared in a photograph of the house, and small items have inexplicably fallen off a kitchen shelf. Ion counters, FLIR cameras, and EMF detectors are of no benefit in addressing these claims. They cannot reveal the true identity of a glow in a photograph, nor will they explain the origin of the voice-like sounds, nor what caused an item to mysteriously fall off a shelf. The ghost investigators are not “ruling out” any natural explanations with this equipment, because the gear has nothing to do with the claims. Establishing the location of an electromagnetic field is of no value; it doesn't “explain” anything.

Metaphysical Tools

Psychic abilities have never been proven to exist. Some people—especially those who claim to be psychic or “intuitive”—may disagree, but the fact remains that such powers have never been scientifically validated. This is not the place for a lengthy discussion on the reality of psychic powers; the scientific evidence can be found elsewhere. But, for the sake of argument, let us suppose that psychic power exists, and that some psychics have some unknown, unprovable ability to provide unique in-

formation about a haunted location or spirit. This would still be of little or no value to a scientific paranormal investigator. To see why, let's examine some claims.

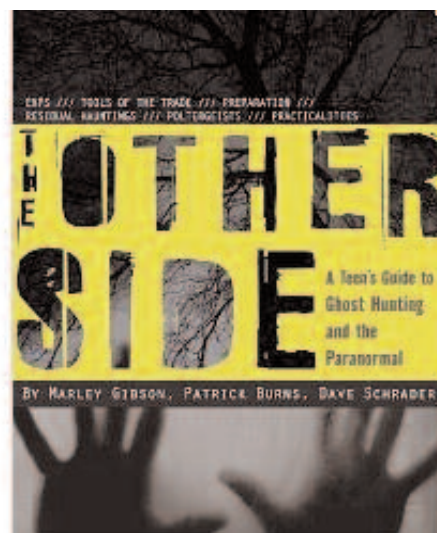
In the book *The Other Side: A Teen's Guide to Ghost Hunting and the Paranormal*, authors Marley Gibson, Patrick Burns, and Dave Schrader write, "Certain studies suggest that even the best psychics are accurate only 30 percent of the time... Remember again that a lot of psychics will be wrong more often than they are exact" (p. 49, 51). I don't know where the authors—who, by the way, all believe in psychic ability—got the 30% figure (instead of random chance), but let's assume they are correct. If the accuracy rate of psychic power is 30%, this is a horrible success rate!

No scientific test is accurate 100% of the time, but any investigative tool or technique that was wrong 70% of the time would never be used by a responsible scientist or investigator. Can you imagine going to a doctor for a cancer screening and being given a test that was wrong almost three-quarters of the time? Any result from the test would be worthless; you'd have to take the same test many times to overcome such a low accuracy rate. If you were smart, you'd use a tool that had been proven to be valid and reliable most of the time. And remember: that rate is for the *best* psychics. If the ghost-hunting psychic isn't one of the best, the accuracy rate would presumably be lower—twenty percent? Ten percent? Zero percent? Who knows?

Imagine if, during the course of an investigation, a ghost hunter used a psychic who gave 30 different pieces of information about the haunting or spirit. Assuming your psychic is one of the best, she will be wrong about 21 pieces of information, and correct about 9 of them. Making matters worse, there's no way to know which 9 clues she is correct about. To find out, each piece of information would have to be investigated, and three out of four will be wrong. It's an incredible waste of time and resources—and *that's assuming psychic powers exist!* No scientific investigator in his right mind would use a psychic.

Steve Gonsalves, of the *Ghost Hunters* TV show, wrote in the February 2007 issue of the *TAPS Paramagazine* that "the legitimacy and findings of remote viewing [psychics] are obviously questionable, but... if you believe in mind power and ESP, then I say, 'Why not?' It certainly won't hurt..." Gonsalves's answer reveals a very shaky grasp of both science and investigation. Real investigation requires knowing that the tools and methods you use to gather information are valid, and that the information from those sources is accurate and useful. To an investigator who wastes hours trying to verify wild leads provided by psychics who can't validate their powers scientifically, it certainly *can* hurt!

The exact same problem occurs with the use of dowsing rods, pendulums, Ouija boards, and other metaphysical and New Age items: they may be fun to play with, but they have never been scientifically proven to work. There's no evidence that dowsing rods can detect water, much less ghosts. Any readings that these devices provide are far more likely to be red herrings than valid evidence.



Scientific Tools

Many ghost hunters consider themselves scientific if they use high-tech scientific equipment such as Geiger counters, Electromagnetic Field (EMF) detectors, ion detectors, infrared cameras, sensitive microphones, and so on. Yet the equipment is only as scientific as the person using it; you may own the world's most sophisticated thermometer, but if you are using it as a barometer, your measurements are worthless. Using a calculator doesn't make you a mathematician, and using a scientific instrument doesn't make you a scientist.

The use of these devices rest upon nothing more than assumptions and pure speculation. For any of these pieces of equipment to be useful there must be some proven connection to ghosts. For example, if ghosts were known to emit electromagnetic fields, then a device that measures such fields would be useful. If ghosts were known to cause temperature drops, then a sensitive thermometer would be useful. If ghosts were known to emit ions, then a device that measures such ions would be useful. And so on.

The problem is that there is no body of research that shows that any of the things these devices are measuring have anything to do with ghosts. Many things are known to emit electromagnetic fields and cause temperature drops; ghosts are not among them. There has not been a single study that shows that these things can detect a ghostly presence. Until someone can reliably demonstrate that ghosts have certain measurable characteristics, devices that measure those characteristics are irrelevant.

Every single reading, whether a fluctuation in a field or a drop in temperature or anything else, can always be attributed to something other than a ghost: even if an investigator gets an "anomalous" reading, there's simply no way to prove it was caused by a ghost. The evidence gathered by these devices will be inconclusive at best—and always has been.

There is no reason for any scientific investigator to possess or use these devices, since there is no evidence that they detect ghosts. Using a tool or device without being certain it works to find what you're searching for is illogical and unscientific. What's the point in using a tool that—even if it works as you think it does—can't prove anything one way or the other?

Many ghost hunters, including the T.A.P.S. team, use EMF detectors to search for electromagnetic fields because they believe that intense magnetic fields can create hallucinations, which in turn might create the illusion of ghosts. The basis for this theory comes primarily from research done by a Canadian cognitive neuroscientist, Michael Persinger. He found that hallucinations (such as out-of-body experiences) could be triggered by stimulating specific areas of the brain with fixed wavelength patterns of high-level electromagnetic fields. He suggested that EMFs might therefore be responsible for everything from UFO sightings to religious apparitions to ghosts.

It's an interesting idea. Unfortunately for the ghost hunters, it's just a theory—not a proven effect. There's little or no evidence to support the idea that EMFs create ghosts. Ghosts are not being seen in Persinger's experimental laboratory in Ontario; they are being seen in abandoned hospitals and suburban basements. There is simply no evidence that electromagnetic fields generated by common household appliances can generate EMFs of the frequency and power that induce hallucinations in a clinical setting.

Indeed, Yale neuroscientist Steven Novella says that the theory of EMFs as an origin for ghosts is “speculative at this point.” The electromagnetic stimulation used by Persinger “has to be focused, and at a certain frequency in order to have this effect. It seems unlikely that environmental electromagnetic fields would be fine-tuned just enough to cause this effect... It’s an interesting idea, I just don’t think it’s terribly plausible. At present, while we can certainly duplicate it in a lab, I’m not aware of any evidence to suggest it actually happens out there in the world” (Novella, Steven. 2010. Getting into the Spirit of Things. MonsterTalk podcast, March 2).

In their rush to accept this “scientific” explanation for ghost sightings, investigators extrapolated far beyond the evidence. Until it can be demonstrated that generalized, non-clinical EMFs can create the psychological perception of ghostly phenomena, there is no investigative value in detecting such fields.

Is it theoretically possible that, if ghosts exist, EMF detectors might find a sign of them? Of course it is; anything is possible, but there’s no evidence for that. There are hundreds or thousands of other devices or tools that could possibly do the same thing. Without knowing what specific characteristics define a ghost experience, it’s based on nothing more than guesses. There’s no logical reason to think that an EMF detector would be any more useful in detecting ghosts than a snow globe, a broken inkjet printer, or a fuel gauge from a 1983 Buick. I’ve been investigating ghosts for over a decade now, and I don’t use EMF detectors to find ghosts for the same reason I don’t use a toaster to clean my laundry.



This is not to say that cameras and other recording gear cannot be useful in an investigation. They can, but it all depends on the purpose, on what the investigator is using it for. A camera set to record the entrance to a door might be very useful in making sure that no one enters unnoticed to pull a hoax or prank. If there is a specific claimed phenomenon that is said to occur, the camera may be a useful tool to record the event if it happens. But simply setting a camera up to record for hours on end with no particular purpose is an easy way to collect bogus evidence.

Why do so many ghost hunters use these high-tech devices, even though there’s no evidence they detect ghosts? Part of it is because that’s what they see on TV, so they assume that must be the “scientific” way to look for ghosts. And partly it’s because there are dozens of “ghost equipment” outfitters who make a lot of money selling this gear to amateur ghost hunters. They can make hundreds or thousands of dollars by selling this equipment to people who don’t know any better.

4. Using improper and unscientific investigation methods.

In addition to misusing scientific equipment, ghost hunters often misuse (or ignore) good sci-

entific research methods.

Why it's a mistake: Examining all the errors in ghost investigations would take an entire book; instead I will highlight the three most common mistakes I have encountered, drawing from personal experience and TV shows like *Ghost Hunters*.

Investigating with the lights off

Nearly every ghost-themed TV show has several scenes in which the investigators walk around a darkened place, usually at night, looking for ghosts. Purposely conducting an investigation in the dark is the equivalent of tying an anvil to a marathon runner's foot. It intentionally hobbles the investigation and is completely counter-productive. It also violates common sense and logic; think about it for a second: if you are trying to identify an unknown object, is it better to look for it under bright lights, or in a darkened room? There are no other objects or entities in the world that anyone would think are better observed in darkness instead of light; why would ghosts be any different? Humans are visual creatures, and our eyes need light to see—the more light the better. Darkness, by definition, severely limits the amount of information available. Searching at night in the dark puts investigators at an immediate and obvious disadvantage in trying to identify and understand what's going on around them. If limiting the investigator's ability to detect things around them helps find ghosts, why not take it a step further and use blindfolds and earplugs on the ghost hunters?

Furthermore, this strategy fails on its own terms. While some report seeing ghosts as glowing figures, many people report them as shadows or dark entities. Searching a dark room for a shadowy figure is an exercise in futility. If it was an established fact that ghosts emit light, there would be some logic to looking for them in a dark room. Unless a ghost or entity has been specifically and repeatedly reported or photographed emitting light, there's no valid, logical reason that ghost investigators would work figuratively (and literally) in the dark. Some ghost hunters believe that darkness helps to draw out ghostly entities. Yet even a casual review of ghost reports shows that this is not true: most sightings do not occur in darkness. People have reported seeing ghosts in broad daylight, in the morning, and at all times of the day. It is true that people are more likely to report seeing a ghost in the evening, but it does not logically follow that ghosts must be more active after sunset.

There are several non-supernatural reasons why ghost reports would occur more often at night, especially in homes. For one thing, there's a sampling bias: most people are not at home during the daytime, and most of their waking hours while at home occur in the evening. Obviously, people are more likely to report potential ghostly activity at night in their homes instead of during the day at an office job or assembly plant. Furthermore, people are more likely to be in psychological states that can induce misperceptions (and even mild hallucinations) in the evening. The evening hours—which of course coincide with the darkness hours—are when people get off work to relax; sometimes they drink alcohol or use recreational drugs. Even those who don't succumb to another mental state that has been clinically proven to greatly increase misperceptions and hallucinations: ordinary fatigue.

This of course does not mean that everyone who is tired after a long day will necessarily see or hear things that aren't there, but fatigue is a real and significant factor that cannot be dismissed. Ghost hunters who are quick to attribute hallucinations to EMF fields often overlook fatigue as far more obvious (and proven) cause. Ironically, ghosts are almost never reported under the conditions that most ghost hunters search for them: late at night, in near-total darkness with flashlights and EMF detectors. The reason it's often done for television shows is obvious: it makes more dramatic footage. It's spookier and more visually interesting to film the ghost investigators with night-vision or infrared cameras.

Sampling errors

Elsewhere I explain why a ghost stakeout or overnight investigation is a bad idea, but there's another, less obvious basic scientific mistake. Usually ghost hunters will begin their stakeout by taking readings from their high-tech equipment. While a thorough investigation into *specific claims* or phenomena (such as why a door opens on its own, or the source of a strange noise) can be conducted in a matter of hours, a complete investigation into a haunted location can't be done in a few hours, or even during an overnight stay. The reason is very simple: a few hours or overnight is not enough time to gather enough information to establish a valid set of baseline (or control) measurements for what "normal" (i.e. presumably ghost-free) conditions are at the location.

To know what is extraordinary for the area, an investigator must first determine what is ordinary. Many ghost hunters understand this general principle, but greatly underestimate the importance of valid sampling. In environmental science, measurement sampling, for example checking for water or air contaminants, is a very complex process: choosing how to sample, where to sample, what to sample, how often, with what tools, etc. is critical to getting useful measurements. This is why for valid experiments, scientists must take dozens—sometimes hundreds—of independent measurements, and analyze the results to derive a statistical average (along with a range of normal variation), which can be used as a basis for research. The timeframes and number of samples that ghost hunters use are far too short to yield any scientifically meaningful baseline numbers.

There's also the logical problem of comparing readings (EMFs, temperatures, etc.) taken at different times. As any scientist or statistician can tell you, two data points are meaningless. All you can tell from two sets of readings is that either the number has changed or it hasn't. How can the investigator know that the baseline readings they got "before" the investigation started were not detecting ghosts? Think of it this way: Just because Measurement A was taken a few hours before Measurement B does not mean that Measurement A is the "normal" one (the control) and Measurement B represents an anomaly. Maybe Measurement A was the anomaly; or maybe Measurement B was the anomaly; or maybe both Measurements A and B were within the ordinary range of variation and if the investigators took Measurement C they would find *that* to be the anomaly. There's no way to tell which of these interpretations is correct without many more samples (data points).

It gives you no information about which number (or set of numbers), is the "normal" condition and which is the "anomalous" one. It gives no information on correlation or causation (such as noting that a higher temperature reading was taken in a room that had just been occupied by a dozen warm-

bodied investigators). It gives no information about anything, yet it is a standard procedure among many ghost hunter groups, who have convinced themselves and others they are doing good science.

A scientific ghost investigator would have to make at least a dozen separate visits to the location (at different times of the day and under different conditions) to carefully measure and record whatever variables (temperature, humidity, light, vibrations, sounds, electromagnetic fields, etc.) they will be measuring during their stakeout. The more times an investigator samples the location, the more complete and more accurate the information will be.

It's easy to understand why ghost hunters don't follow scientifically valid sampling methods. First, it requires learning about basic scientific and sampling methodologies. This doesn't require a college education; there are plenty of books that can help investigators learn about this. But ghost hunters need to "know what it is they don't know" and be willing to study and use correct procedures.

Second, there is the time commitment and "fun factor." From my experience, most ghost hunters aren't really interested in the science; they want the fun. Taking measurements and creating a data set in preparation for an investigation is neither interesting nor spooky; it is boring, tedious, mathematical drudgery. Why bother spending weeks with equipment and silly old numbers and textbooks when you can be walking around an abandoned hospital with flashlights, spooking your friends and jumping at shadows?

Ineffectively using recording devices

As we have seen, devices such as EMF detectors and ion counters have no use in ghost investigations. Ordinary cameras and audio recorders, however, can be helpful if used correctly. Unfortunately, many ghost hunters (including the *Ghost Hunters*) don't know how to use the equipment effectively. For example, in Episode 401 (airdate March 5, 2008), the TAPS crew investigated Philadelphia's Fort Mifflin. While there, lead investigator Grant Wilson acted startled on camera while looking through a crawlspace (in near-darkness, of course). He claimed he saw a human face staring back at him only a few feet away, but predictably the television crew trailing him didn't capture it on video. This type of incident has happened dozens of times over the six seasons of the *Ghost Hunters* television show: One or another ghost hunter claims to have seen or heard something just off-camera, and therefore without any proof. Was it real, a hoax, an illusion, or hallucination? Without some recorded evidence, it's just another personal story. The solution is obvious: head-mounted wireless digital cameras. They were finally used occasionally in a few recent episodes (though not consistently by all the crew), and it's odd that it took five years for the high-tech TAPS crew to realize they were a good idea.

Another example is the use of voice recorders. Most ghost hunters, including the TAPS team, use handheld voice recorders in an attempt to capture a ghost voice or EVP. Often the ghost hunter holds it while standing in the middle of a room while addressing the supposed spirit, or while walking around. Sometimes a voice-like sound or noise will be heard at the time; if so, the ghost hunter(s) will ask more questions, and if not the sound or EVP will be saved for later analysis.

Unfortunately, this is not an effective protocol. To identify the nature of the sound (human,

ghost, cat, furnace, etc.), an investigator must first determine its source, and that in turn involves locating the sound's origin. This can be very difficult for a ghost hunter to do, especially in a darkened room. If the sound came from an open window, that would suggest one explanation, while if the sound's origin could be located to the middle of an empty room, that might be more mysterious. Locating the source of a sound is nearly impossible using only one recording device.

The way to scientifically determine the source location of a sound is with more than one microphone—at least three, and the more the better. By placing sensitive microphones throughout the location (and certainly in the four corners of a room and outside), the signal strength of the sound can be measured at each microphone. Sound is created by longitudinal compression waves in the air, moving away from the source of the sound. Furthermore, soundwaves have several measurable characteristics, including frequency, amplitude, speed, and wavelength. Along with a basic knowledge of acoustics and math, these characteristics allow the investigator to triangulate within a few feet where the sound came from. Ideally this should be done in real time so that the ghost hunters can immediately investigate. Methods of triangulation have been used by engineers and sailors for hundreds of years—and are widely used in GPS equipment—but for some reason are not used by the T.A.P.S. crew.

5. Doing a stakeout or “lockdown.”

This is typically an overnight “investigation” into a haunted location, usually with a half dozen or more people wandering around the location, setting up cameras and other gear, etc. This is one of the most common and basic mistakes made by amateur ghost investigators. Nearly every ghost-themed “reality” television show features this, and it's a staple of most ghost-hunting groups, and a particular favorite of the cast of *Ghost Adventures* TV show. It's also a huge red flag, warning of bad science and amateur investigation.

Why it's a mistake:

As an investigative procedure in ghost hunting, the stakeout (or “lockdown,” as it's sometimes melodramatically called) has a 100% track record of failure; out of the hundreds of stakeouts conducted by ghost hunters, not a single one has yielded any significant proof of ghosts. (As I noted, they might have better success if they left the lights on.)

Every stakeout gets more or less the same results: a few ambiguous—yet supposedly mysterious—noises or lights or shadows, but never anything scientifically useful or definitive. Scientists and investigators abandon tools and techniques that don't work, help solve mysteries or explain phenomenon. Instead of recognizing that their evidence never gets any better using this technique, amateur ghost hunters keep doing it. There's a certain entertainment value in walking around a supposedly haunted location and scaring each other silly.

A stakeout is essentially a scientific experiment without the science. Scientific experiments are carefully controlled by the investigator or experimenter: he or she controls some variables or conditions, and measures the variation. To use a basic example, if a scientist wants to see if one potting

soil helps plants grow better than another potting soil, she can set up a simple experiment to test this. But she would need to establish careful controls over the experiment to make sure that the results she gets are valid. She would take two identical plants (ideally cuttings from the same parent plant to control for genetics) and expose them to identical sunlight, water, temperature, and so on—essentially controlling a dozen or more variables, so that she can be sure that any difference in growth between the two plants is a result of the dependent variable, the different potting soil. This careful control of the environments is absolutely critical to conducting a valid experiment. If one of the plants was given more sunlight or more water, then that could be the reason it grew better, regardless of which soil it was planted in. Without careful control over the variables and conditions, the experiment is invalid and any results from that experiment are worthless.

Some ghost hunters and paranormal investigators believe they are using good science and controls when they conduct tests, for example setting out “trigger” or “control” objects (teddy bears, balls set on tables or chairs, and so on) that ghosts are invited to move to demonstrate their presence. The problem is that there is no scientific control group to compare any result to. For example, let’s say that a child’s ball is placed in the center of a table in a reputedly haunted room and recorded on camera overnight. Even if the ball begins to move or roll for some reason, it is not a valid experiment. The investigator would need to have a control condition—one or more identical balls set up in comparable conditions and locations that are supposedly not haunted. It might be, for example, that slight vibrations from a passing train a few blocks away would be enough to move the ball, and that any ball placed on any comparable table anywhere in the neighborhood would act the same way. If the investigator only tests that one ball on that one specific table in the suspected haunted location, it’s impossible to know if any movement was caused by a circumstance unique to that place. Without a control group, there is nothing to compare any result to. It is classic pseudoscience. This is directly

relevant to ghost investigations, because in a stakeout the experimenter by definition cannot control all, or even the most, of the variables and conditions in the experiment he’s conducting.

In a recent issue of *Haunted Times* magazine, ghost experts Christopher Mancuso and Brian J. Cano suggest searching for ghosts in urban areas such as abandoned hospitals, institutions, and factories. This, of course, is a textbook example of a completely uncontrolled location with an untenable signal-to-noise ratio. It’s difficult to understand why Mancuso and Cano would think that their “urban exploration” would be a productive setting for an investigation. A serious investigator wants *fewer* variables and distractions, not more. You might as well try to record EVPs during a rock concert. How, exactly, is an investigator



supposed to tell the typically subtle signs of a ghost in a place that is not only decaying (and likely infested with rodents, insects and other animals), but also surrounded by the typical lights, smells, and noises of an urban area? There are likely to be ordinary sounds and drafts all over the place that would duplicate or mask any supposed ghostly phenomena. (Not to mention the potential problems of running into vagrants, drug users, and police enforcing trespassing laws.) It's hard to think of a worse place for ghost investigation—or one that would be more likely to create false-positive evidence. An investigator's inability to reliably distinguish between ordinary and extraordinary phenomena renders these "investigations" a joke.

Making the problem worse, ghost hunters often have little or no training in proper investigation procedures and usually create as much "evidence" as they uncover. I have witnessed many cases where ghost hunting groups waste time investigating "evidence" that they themselves created because of sloppy technique and carelessness. It's very much like a dog chasing its own tail, and it would be funny if it wasn't such a serious problem. It's important to remember that nearly anything anyone thinks is odd for any reason can be offered as evidence of a ghost. There is an impossibly broad spectrum of phenomena that have been claimed as signs of ghosts, including lights, shadows, noises, silence, heat, cold, moving objects, smells, uneasiness, and so on. If the presence of a ghost could be narrowed down to a specific phenomenon—for example, if everyone agreed (or it had been proven) that ghosts give off red light, or a certain high-pitched sound—then the problem of not having a controlled location would be greatly reduced. An investigator wouldn't need to rule out every possible source of sound, smell, light, etc. but instead rule out merely any sources of red light or a high-pitched sound. But because just about any phenomenon can be attributed to ghosts, there is no way to rule out or control for the conditions. A ghost stakeout or lockdown is completely unscientific, and a waste of time.

There is one limited exception when a stakeout is warranted: if there is some claim or *specific reason* to believe that the ghostly phenomena will appear at a certain time, or under certain conditions. This can help establish or refute a cause-and-effect link. For example, if a mysterious sound or light is claimed to happen at a specific time (say, around midnight), or under certain conditions (such as a full moon or the anniversary of a death), then it is reasonable to be present and ready to investigate should the phenomenon present itself. However, simply sitting around waiting for some unspecified event to happen is non-scientific and almost guaranteed to create false positive evidence.

To be fair, some of these techniques may be useful in doing demonstrations for the public as to how not to scientifically investigate ghosts (for example using EMF detectors to explain to the public why they can cause false readings). Similarly, if ghost investigators are not claiming to be doing good science or real investigation but merely having spooky fun, there's no harm in these techniques. These are mistakes only if the goal is to understand the phenomena using science and logic.

There are many more common ghost hunting mistakes; I list another half-dozen in Chapter 4 of *Scientific Paranormal Investigation*. Ultimately, of course, whether ghost hunters and paranormal investigators choose to use the scientific methods and strategies I describe is up to them. I personally don't care either way; it's not my time, effort, and money that's being wasted. I get results and solve cases using these techniques. If ghost hunters don't care about doing scientifically valid investigations and are happy with the quality of evidence they are getting, they are welcome to ignore this information. But they can't complain that no one has offered a science-based paradigm for investigation. I believe that if ghosts exist, they are important and deserve to be taken seriously. If investigation is to be done, it should be done right: with science. Healthy peer review is an important part of good science. To that end, I invite informed, constructive criticism of the material presented here. If ghost hunters who use these techniques can explain the valid science behind their methods, I will be happy to address those comments and revise this material. I can be contacted via my Web site www.ScientificParanormalInvestigation.net.

About the author

Benjamin Radford has been a science-based paranormal investigator for the non-profit educational organization The Center for Inquiry since 1997. He is author of five books and hundreds of articles on critical thinking, popular science, and paranormal investigation. He is also a columnist for LiveScience.com, Discovery News.com, and has been seen on CNN, CBC, ABC News, The History Channel, The Discovery Channel, National Geographic Television, MTV, and *The New York Times*, among others. He has investigated and solved dozens of ghost cases, including New Mexico's Haunted KiMo Theater, the Santa Fe Courthouse Ghost, Jamaica's White Witch of Rose Hall, the Kansas City Gym Ghost, California's Wolfe Manor, and many others.

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