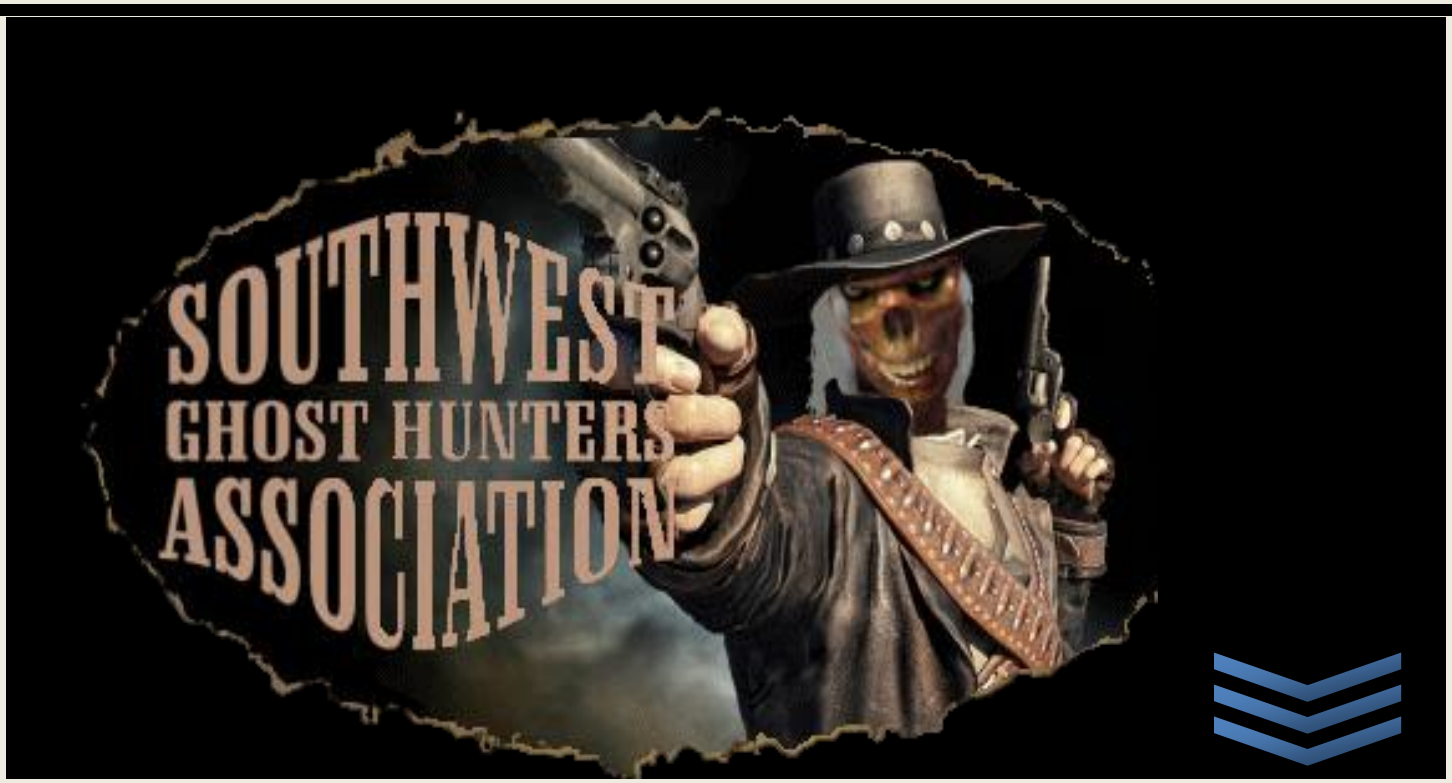


Scientific Investigation of the Paranormal

Abstract: This article discusses what scientific investigation of the paranormal is and how it is often misunderstood by paranormal enthusiasts. This lack of understanding often arises due to the layman's interpretations of what science is and how it works.

Contents

The nature of the problem

The Internet, films (like Ghostbusters) and television programs (like Most Haunted, Ghost Hunters, The Othersiders and Ghost Adventures), along with the increasing availability of high-tech equipment are thought to be partly responsible for the boom in ghost hunting. Despite its lack of acceptance in academic circles, the popularity of ghost-hunting reality TV shows have influenced a number of individuals to take up the pursuit. The increased media has also influenced how the public perceives ghost hunters and their methods.

While most ghost hunters claim to be “scientific” and give lip service to skepticism, they tend to ignore two basic facts.

1. Ghosts have not been proven to exist

2. There is no known way to detect ghosts. If there was we could obviously address issue #1.

This begs to ask a really simple but logical question. If you are looking for something that’s existence is uncertain, have no way of detecting it, no concept on what or how to properly measure it, then how are you going to find it?

Often the less scientific the methods and equipment are, the more likely a ghost hunter is to find "evidence" for ghosts. The concept is based on belief systems, not on sound empirical data or proper measurements. This means that the standard methodology used by many modern day ghost hunters is fundamentally flawed. You simply cannot go to a reputed haunted location and search for “paranormal activity”. There is no honest way of doing that. Doing so demonstrates a clear bias and unscientific train of thought. The ghost hunter will fail, each and every time. There's not even agreement on what ghosts are, or might be. There are dozens of guesses, unproven theories, and wild conjecture which have been readily accepted as fact and incorporated into the ghost hunting methodology.

So here comes the second question. How would you properly investigate haunted locations and events if you can’t use the methods and instruments typically employed by ghost hunters?

There are three things that can be investigated scientifically.

1. The claims of the witnesses

Did the witness mistake an explainable phenomenon as a paranormal one? Is there a natural explanation for what they encountered?

2. The reported phenomena itself

Are the reported phenomena explainable? They could be naturally occurring events that happen rarely or under the right conditions.

3. The validity of the "back story"

All hauntings have a back story, a type of catalyst, which explains why the haunting is occurring. Researching the back story often reveals that the event didn't occur or has been distorted. This is how urban legends are created.

A high school science teacher once explained the difference between good science and bad science in this fashion:

Bad Science is where the scientist creates a hypothesis and then tries to prove his hypothesis is correct. What makes this wrong is that if he neglects to identify any alternative explanations or factors that will affect the outcome of his experiments, the independent variable may not be identified causing the prediction of his hypothesis to fail.

Good science is where the scientist examines a question and identifies all of the alternative explanations and variables before making his hypothesis and predictions.

So, to investigate paranormal claims, we have to rule out alternative explanations and identify any variables. The investigator is going to use the scientific method to explore these possibilities.

The Scientific Method

The scientific method is a body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. To be termed scientific, a method of inquiry must be based on empirical and measurable evidence subject to specific principles of reasoning.

OBSERVATION

Good science investigations begin with a question. This question often asks "what if", "how" or "what effect something will have". The question should be one that can lead to an experiment, which will yield either quantitative or qualitative data. A question that is well written often identifies the independent variable in the experiment. Make sure that your question can be tested and measured.

HYPOTHESIS

A hypothesis is a conjecture, based on the knowledge obtained while formulating the question, which may explain the observed behavior of a part of our universe.

PREDICTION

This step involves determining the logical consequences of the hypothesis. One or more predictions are then selected for further testing. The less likely that the prediction would be correct simply by coincidence, the stronger evidence it would be if the prediction were fulfilled; evidence is also stronger if the answer to the prediction is not already known. Ideally, the prediction must also distinguish the hypothesis from likely alternatives; if two hypotheses make the same prediction, observing the prediction to be correct is not evidence for either one over the other.

PROCEDURE

In determining the procedure that will be used in the investigation the factors that will affect the outcome of the experiment, called variables, must be identified and controlled. There are three types of variables that must be considered:

- **Independent variable (manipulated variable)** - the factor that will be intentionally changed during the experimental procedure in order to find out what effect it has on something else. An example of an independent variable is using different lengths of string to construct a pendulum in order to observe the effect the length of the string has on the swing of the pendulum.

- **Dependent variable (responding variable)** - the factor that is observed and measured to see if it is affected by the change made in the independent variable. An example of a dependent variable is the number of swings the pendulum makes when the length of its string is changed.

- **Variables that are controlled** - the factors in the experiment that must be kept exactly the same to make sure that they are not having any effect on the dependent variable. Variables that would need to be controlled in the pendulum experiment would be the mass of the pendulum, the type of string, and the release height of the pendulum.

TESTING

This is an investigation of whether the real world behaves as predicted by the hypothesis. Scientists (and other people) test hypotheses by conducting experiments. The purpose of an experiment is to determine whether observations of the real world agree with or conflict with

the predictions derived from a hypothesis. If they agree, confidence in the hypothesis increases; otherwise, it decreases.

ANALYSIS

Analyze your data and results. Compare them with your hypothesis. Is the hypothesis correct?

REPLICATION

If an experiment cannot be repeated to produce the same results, this implies that the original results were in error. As a result, it is common for a single experiment to be performed multiple times, especially when there are uncontrolled variables or other indications of experimental error.

The use of the Scientific Method in a Ghost Investigation

As stated earlier, to investigate paranormal claims we have to rule out alternative explanations and identify any variables. Here I am going to use an example from a location that I have investigated to demonstrate how the steps work in a ghost investigation.

Background, Reported phenomena

As locals tell it, one night during the Depression a young mother ran frantically along the road searching for her missing child, slipping in icy ruts as she stumbled through the cold winter darkness. She never found her little one; the child had wandered away from the house and was presumed to have frozen to death. The mother's spirit still searches for her child, holding her lantern high to light her way in the dark night.

Yet another version of the story has the "son" much older and working for the railroad. The mother and son had a signaling system of sorts using a lantern. When he arrived back he would flash his lantern three times towards the house to let his mother know that he was on his way home.

Ghost hunters frequent Anson in search of the “Lights of Anson”, a phenomenon that appears at the Mt. Hope Cemetery and is featured in the book Ghosts in the Graveyard by Olyve Hallmark Abbot and in Texas Monthly. It was also featured on the television show “Unsolved Mysteries”.

OBSERVATION

The cemetery is reached by driving east from Anson on Highway 180. We got to the dirt road turnoff and proceeded down to the cross roads, turned around, killed the headlights and engines of our car, and looked around for ANYTHING that could be construed as a "supernatural" light.

We didn't see anything, so we flashed our headlights three times and waited. After a few seconds, a light began to feebly glow down the road. It appeared to be orange, looking very similar to an arc-sodium street lamp or such viewed at a distance. After a bit of time, the color gradually changed to a bluish hue-similar to the xenon headlamps in some cars.

After a bit more time had passed, the light-which appeared to be anywhere from 200 yards to a half-mile away-slowly faded out. We wondered if we could bring it back if we flashed our lights at it again, and sure enough, when we did, it gradually reappeared. So we begin by seeing if the elements of the local myths could be somewhat accurate.

We started by confirming the existence of railroad tracks, which do exist, but they are located approximately half a mile to the south of the crossroads. It was from this vantage point that we noticed the layout of the surrounding terrain. The area where the crossroad is located is actually in a depression.

One of the biggest questions that arose occurred during our investigation of the area. One investigator was down on the road by the cemetery while the rest of the investigations team was at the crossroads observing the light. The investigator at the cemetery was not able to see the light itself.

Later it was determined that the light only appeared on the left hand side of the road, as viewed from the crossroads but seemed to be completely invisible to someone standing down by the cemetery. The light also disappears as one tries to approach it from the crossroads.

We also noticed that the light also appeared on its own, without having to "flash" it with the car lights. Something seemed to be out of place.

We focused on trying to determine exactly where the light was located down on the cemetery (north) end of the dirt road. We accomplished this by sending an investigator with a flashlight up to the north end of the road while another investigator stayed at the crossroads.

Through radio communication the "crossroads investigator" was able to direct the "Cemetery Investigator" so that his flashlight was positioned directly over the ghost light. When the cemetery investigator looked to the north, he could clearly see the light next to the foliage on the other side of HWY 180. It is definitely a light in the distance, although it is quite bright. By now, the "cemetery investigator" is standing down in the left ditch, far off of the dirt road itself. The foliage on the other side of HWY 180, conceals the light when someone is looking north from or near the road on the cemetery end.

HYPOTHESIS

The ghost light is explainable as the headlights of a car travelling southbound on US-277

PREDICTION

The ghost light phenomena are caused by car headlights. The lights can be tracked and replicated to prove that the lights are an explainable phenomenon.

PROCEDURE

The independent variable was identified as the car headlights. We could manipulate this variable by using a plug in high intensity spotlight. The spotlight could be turned on and off to flash the location of the car on the highway. The dependent variable was identified as the viewing position at the crossroads.

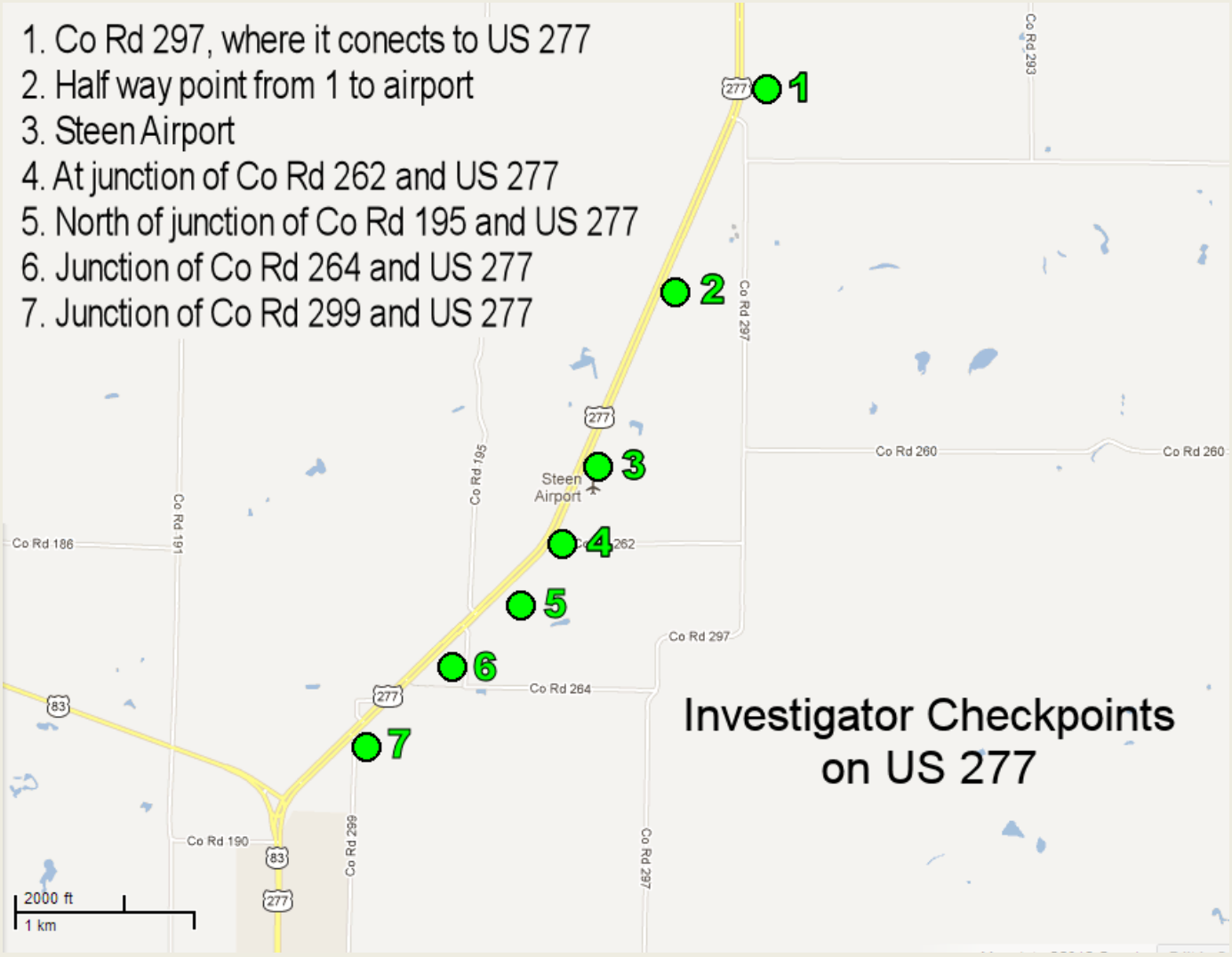
Using the flashing spotlight, we would track the movement of a car on south bound US-277 to see if it resembled the “ghost light” seen earlier.

TESTING

While the observations from clearly indicated that the ghost light was most probably the headlights of a car travelling southbound on US-277, we needed to track the light to definitely prove this.

To accomplish this we stationed seven investigators along US 277 at various intervals. Each investigator had a two-way radio and a high intensity spot light. After dusk each investigator used the high intensity spot light to visually identify their location. These positions were noted from the crossroads.

Once at the checkpoints were recorded a car using a spotlight with a red filter over the lens would travel south along US-277. As the car passed a checkpoint, the spotlight would rapidly be turned on and off. The investigator at the checkpoint would also notify the observers at the crossroads that the test vehicle just passed them. This would enable us the track the vehicle (and the "ghost light") as it moved south down US-277.

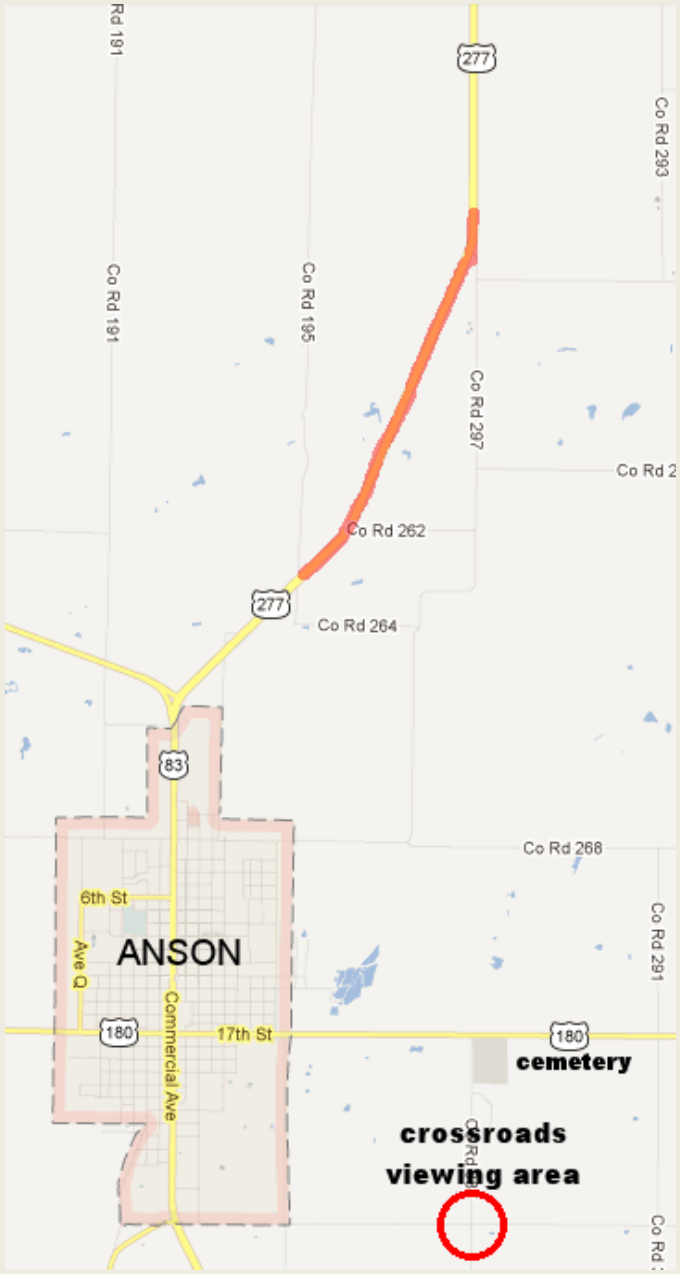


We also invited several people who believed that the light was a ghost light so we could replicate the test for them.

ANALYSIS and REPLICATION

North of checkpoint 1 the light appears as a steady light. The car headlights are viewed almost directly on center. The lights are brighter, often containing the lights of more than one vehicle. Believers do not interpret this as the ghost light yet.

At check point 1 the vehicle turns slightly to the Southwest. The vehicle lights now dim and start to flicker as they are not being viewed dead on. Believers are now calling this the ghost light.



The "ghost light" moves slowly but steadily towards the west from the viewing area at the crossroads. We are easily able to verify that it is actually our test vehicle through radio communications as it passes the checkpoints.

The movement of the light is slow through checkpoints 2 to 4. After passing checkpoint 4, the speed to the light (from the crossroads) increases dramatically.

By checkpoint 5 the lights have dimmed are now barely visible. They have completely vanished by the time the test vehicle reaches checkpoint 7.

This test was repeated four more times with identical results.

The primary fading effect occurs when the car turns to the southwest. The headlights move from a dead on viewing angle to an offset angle. This also creates the flicker effect of the light. Also, if you travel south on HWY 277 from Stamford to Anson, you will notice that several sections of the road go uphill. This also provides the illusion of the light" fading in".

When Ghost Hunters Fail

SGHA was not the only ghost hunting group that has investigated the Anson Light. Several other teams in Texas, all claiming that they are scientific, have visited the cemetery and crossroads. Their reports contain "evidence" such as audio recordings (EVP) and photographs showing "orbs" and other photographic "abnormalities". The reports also contain the "personnel experiences" of the investigators which are used as a form of validation that the area is indeed haunted. Why did they fail to identify the actual phenomenon?

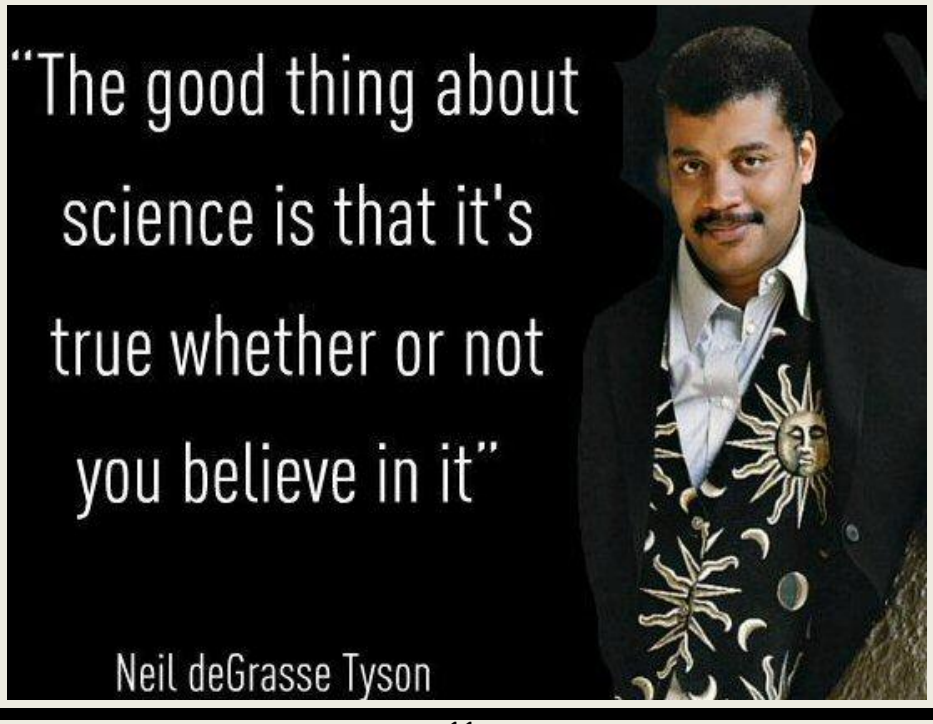
They failed because nothing about their investigations was even remotely scientific. Where is the hypothesis, the predictions, the testing and the replication? Their evidence falls short of proving the burden of proof because they failed to identify any other explanations or variables other than their own belief systems. This causes problems when the validity of their "evidence" is challenged by a skeptical person who understands how science works. Basically the skeptics are identifying the other possible alternatives and variables that the ghost hunters have neglected. Since the ghost hunters have made a paranormal claim (offering evidence) the burden of proof for that evidence is upon the ghost hunters themselves. This means that they have to be able to disprove the alternative explanations offered up by the skeptic. Lacking any sort of scientific controls and relying upon a pseudoscientific methodology, they cannot do this. The skeptic is labeled as "a closed minded disbeliever" and is ignored (along with the truth).

Believers vs. Skeptics

An actual quote from a paranormal unity site:

"I think having a skepic would be the worse person to have looking at any evidence just because no matter what you show them their gonna think of some reason it's not paranormal even if it is."

Okay, not only do they not know the definition of the word skeptic but they can't spell it either. But seriously, what is the goal of this group? What are they really trying to accomplish? If you take everything away it all boils down to the validation of a belief system. Different people may have different beliefs but it really doesn't matter.



Belief will not create fact. Truth is independent of belief. No matter how hard I may try, believing something will not make it true. For example, I may believe with all my heart that I want it to snow tomorrow, but this will not guarantee snow. Or, I may believe that my run-down old car is really a new Mercedes convertible, but my belief won't change the facts.

Belief is only as good as the object in which we put our trust. Someone may come to me and say, "Hey, let's go for a ride in my new plane!" I may believe that it is safe. But if his plane hardly runs at all and he doesn't even have a pilot's license, then my faith, no matter how strong, is not well founded. My faith won't make my friend a great pilot once we are in the sky!

However, if another friend comes along and makes the same offer, but he is a certified pilot and has a new plane, then my trust has a much more solid base. It is the fact which makes it true, regardless if I believe it or not. Science deals with facts.

THIS is the big disconnect between believers of the paranormal and their skeptics.

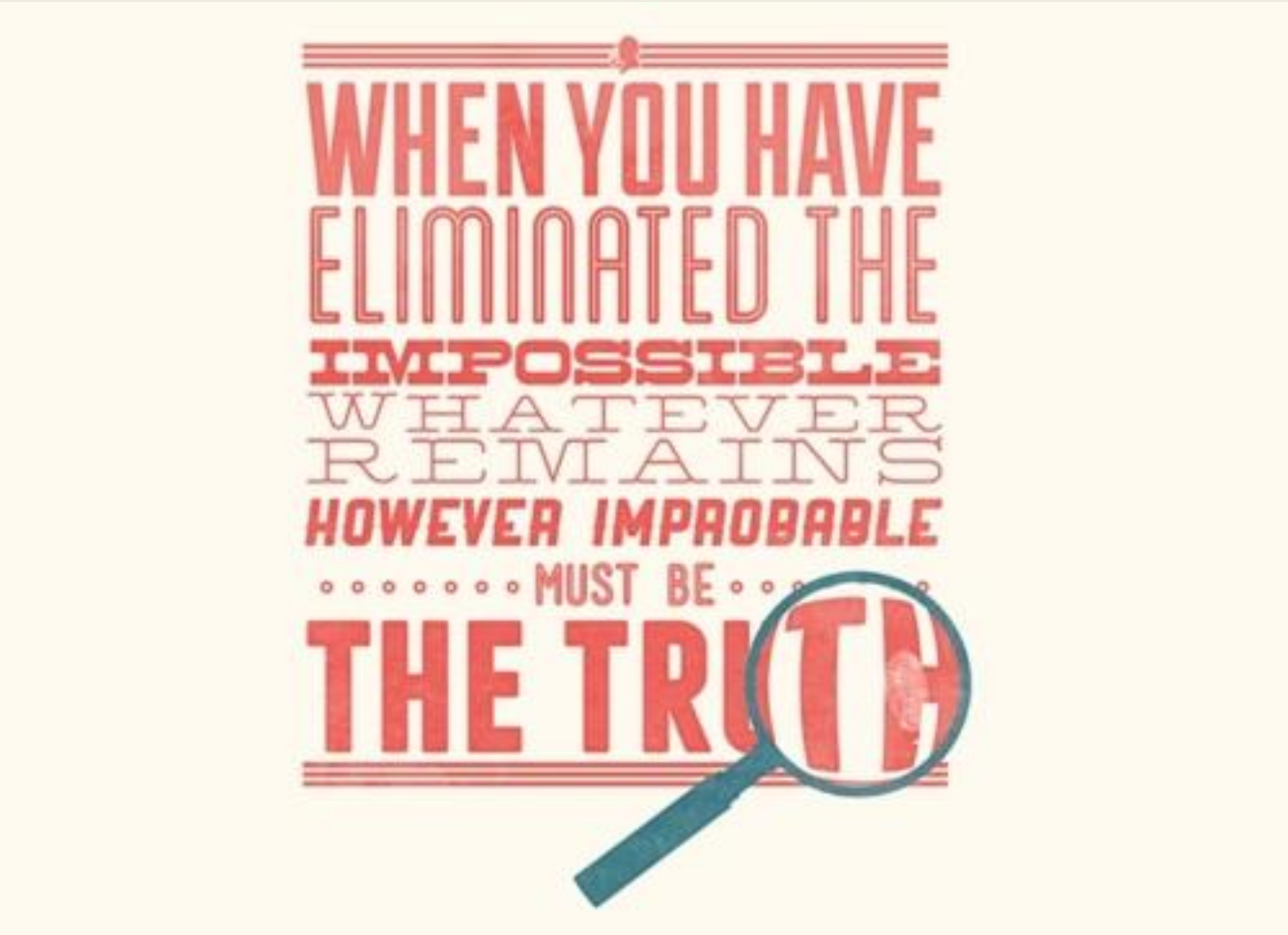
Ghost hunters who are believers fail to acknowledge that their investigative methods are based on beliefs. Ghosts exist, they are electromagnetic in nature (or emit / alter EM), ghosts create cold spots, they can be photographed, EVP is communication with the dead, etc. The goal that they hope to achieve by doing these things is to provide some sort of evidence that a particular place is haunted and/or that ghosts exist.

On the other hand, a scientific skeptic is one who questions beliefs on the basis of scientific understanding. Most scientists, being scientific skeptics, test the reliability of certain kinds of claims by subjecting them to a systematic investigation using some form of the scientific method. As a result, a number of claims are considered "pseudoscience" if they are found to improperly apply or ignore the fundamental aspects of the scientific method. Scientific skepticism may discard beliefs pertaining to things outside perceivable observation and thus outside the realm of systematic, empirical falsifiability/testability.

Ironically, the goal of a scientific investigation is very similar to that of the believing ghost hunters. The premise is actually quite simple. If the phenomenon occurring at a reputed haunted location is really paranormal in nature, the investigator should not be able to explain it, much less replicate it!

If you are unable to identify the phenomenon, test after test fails, hypothesis after hypothesis turns out to be untrue and you document these, then a rather odd thing happens. Suddenly you are no longer debunking the site; you are actually building a very strong case that something unusual is occurring there. As long as you do not make a claim (this place is

haunted because I can't figure it out) you stay well within the guidelines set forth by the Scientific Method.



You can't prove that ghosts or the paranormal exists (still impossible at this point) but you can prove that the other possibilities and variables are not the cause (thus making them impossible explanations).

This is all about logic. Start with eliminating the most probable causes. Then eliminate those that are impossible and you are well on your way to a solution.

That's the first stage of solving any mystery. You have to eliminate all the things that it couldn't possibly be, or you will have too many distractions.

Once we remove all the distractions, we can focus on what remains. Sometimes what is left is easy to believe, other times it can seem highly improbable. However, with the impossible eliminated, what remains are the only possible solutions, and one of them must be the truth.

For a ghost hunter, this is as far as you can go, but things are not always so black and white. Sometimes, it can be hard to solve a challenging case even under the best of circumstances. Sometimes it is not solvable due to extraneous or confounding variables. A confounding

variable refers to a variable which the investigator cannot control or eliminate so that it does not damage the internal validity of an experiment. Extraneous Variables are undesirable variables that influence the relationship between the variables that an experimenter is examining.

The challenges of investigating the paranormal

What makes investigating the paranormal difficult is the identification and resolution of extraneous and confounding variables. It is an intellectual pursuit that requires critical thinking. This section was included in this paper to demonstrate why those skills are so important. There is significantly more to it than just wandering around in a dark building looking for ghosts.

1. Problems with witnesses of paranormal activity

The greatest challenge of investigating the paranormal actually comes from the witnesses themselves. By definition, a haunting is defined by multiple witnesses perceiving unusual phenomenon at a specific location. Since this is the criteria used, the accuracy of the witnesses' testimony is very important. However, determining the reliability of the witnesses is often difficult due to a variety of factors and alternative explanations.

Misperceptions

Misperception probably accounts for more paranormal reports than any other single cause. Misperception is misinterpreting something seen, heard, felt or otherwise sensed. Identifying the misperceptions of the witness is one of the primary techniques for solving a haunting.

Hallucinations

Hallucination is more difficult to detect than misperceptions. With no 'sensory stimulus' to look for, detecting hallucination requires examining what was happening to the witness when they experienced the apparent paranormal phenomenon. If they were on the verge of sleep at the time, you might suspect a near sleep experience. If they felt paralyzed then it might be sleep paralysis. Other causes of hallucination include sensory deprivation, medical issues such as partial seizures and delirium.

Hypnagogic hallucinations are visual and auditory perceptions that occur during sleep onset, while hypnopompic hallucinations occur on awakening. They are usually visual and may be bizarre and dreamlike, but with some preservation of consciousness. They can also be caused by very simple things like low blood sugar and caffeine overdose.

Bias

Bias is an inclination of temperament or outlook to present or hold a partial perspective and a refusal to even consider the possible merits of alternative points of view. Biased means one-sided, lacking a neutral viewpoint, not having an open mind.

Bias is a major issue when it comes to witnesses who have reported paranormal events. This is due to the witness's belief in ghosts and the paranormal. Typically speaking, the greater degree of bias a witness has the greater possibility that the paranormal phenomena are explainable phenomena that was misperceived by the witness.

Bias also creates issues when alternative explanations are presented to the witness. Sometimes, when you investigate a case, an obvious explainable solution will be found that fits the description given by the witness very well. However, when you put this idea to the witness they will suddenly 'remember' other points about their observation that they never mentioned before and tend to confirm the paranormal interpretation that the witness already places on what they saw. This is known as confirmation bias.

Confirmation bias is the tendency of people to favor information that confirms their beliefs or hypotheses. People display this bias when they gather or remember information selectively, or when they interpret it in a biased way. The effect is stronger for emotionally charged issues and for deeply entrenched beliefs. People also tend to interpret ambiguous evidence as supporting their existing position. Biased search, interpretation and memory have been invoked to explain attitude polarization (when a disagreement becomes more extreme even though the different parties are exposed to the same evidence), belief perseverance (when beliefs persist after the evidence for them is shown to be false), the irrational primacy effect (a greater reliance on information encountered early in a series) and illusory correlation (when people falsely perceive an association between two events or situations).

A series of experiments in the 1960s suggested that people are biased toward confirming their existing beliefs. Later work re-interpreted these results as a tendency to test ideas in a one-sided way, focusing on one possibility and ignoring alternatives. In certain situations, this tendency can bias people's conclusions. Explanations for the observed biases include wishful thinking and the limited human capacity to process information. Another explanation is that people show confirmation bias because they are weighing up the costs of being wrong, rather than investigating in a neutral, scientific way.

Confabulation

In psychology, confabulation (verb: confabulate) is a memory disturbance, defined as the production of fabricated, distorted or misinterpreted memories about oneself or the world,

without the conscious intention to deceive. Confabulation is distinguished from lying as there is no intent to deceive and the person is unaware the information is false. Although individuals can present blatantly false information, confabulation can also seem to be coherent, internally consistent, and relatively normal. Individuals who confabulate present incorrect memories ranging from "subtle alternations to bizarre fabrications", and are generally very confident about their recollections, despite contradictory evidence.

We only remember a fraction of what we experience. Some people are better at remembering than others. We may also only remember fragments of a particular event and those bits may not even be the most important. The problem occurs during the interview when the witness is pressed for too many details. This may encourage the witness to confabulate. These confabulated details will form part of the witness evidence in paranormal cases. This could cause problems when we are trying to explain the reported event. We may be trying to explain some details that never even happened!

Suggestion

Suggestion is the psychological process by which one person guides the thoughts, feelings, or behavior of another. Nineteenth century writers on psychology such as William James used the words "suggest" and "suggestion" in senses close to those they have in common speech—one idea was said to suggest another when it brought that other idea to mind. Early scientific studies of hypnosis by Clark Leonard Hull and others extended the meaning of these words in a special and technical sense (Hull, 1933). The original neuro-psychological theory of hypnotic suggestion was based upon the ideo-motor reflex response of William B. Carpenter and James Braid.

Deception is a unique part of the human experience. Telling untruths is common enough that every person has lied and been lied to many times throughout his or her life. A problem facing investigators is that people not only lie but do so unwittingly.

Suggestion may also play a vital role in peer pressure. The influence that a peer group, observers or an individual exerts on witnesses that encourages them to change their attitudes, values, or behaviors to conform the group norms. This may happen in a work environment where multiple witnesses have claimed to experience paranormal phenomenon or by the witness reading the paranormal accounts of others that influence their own perceptions. Suggestion also plays a role if the witness felt that the location was ‘spooky’ or was previously aware that there were stories that the location was “haunted”.

2. Myth Building

Myth building is the elaboration of elements in a story. These elements may have some degree of truth while others may be completely false. As the story passes from one person to another the elements become exaggerated, changed and sometimes outright forgotten. It is the essential building blocks used in the construction of myths and urban legends. The designation suggests nothing about the story's veracity, but merely that it is in circulation, exhibits variation over time, and carries some significance that motivates the community in preserving and propagating it.

When myth building becomes extreme, the original elements and facts that are vital to identifying important variables become obscured. This can actually make the case unsolvable. Once again, you may be trying to explain some details that never even happened.

3. Ego

Ego, both personal and organizational, can prevent investigators from adjusting to new information or seeking alternative avenues of exploration. But truth is more important than reputation. An investigator must have the flexibility to admit his or her original theory was incorrect, and avoid falling into the ego trap. Stubbornness, which often accompanies ego, is just as problematic.

4. Groupthink

Groupthink is the reluctance to think critically and challenge the dominant theory. (No one wants to tell the emperor he has no clothes.) It occurs in highly cohesive groups under pressure to make important decisions. The main symptoms of groupthink include the following:

- Power overestimation—belief in the group's moral purpose, taking themselves too seriously, inflating and/or using bogus credentials to appear more experienced and blindness to the ethical consequences of presenting poor or bogus evidence,
- Close-mindedness—group rationalizations and discrediting of constructive criticism
- Uniformity pressures—conformity demands and self-censorship
- Confirmation Bias -- Confirming evidence is given more weight, while contradicting evidence is given less weight, failure to seek evidence that would disprove the theory, not utilizing such evidence if found, refusing to consider alternative hypotheses, and not evaluating evidence properly.

Groupthink has several negative outcomes. Group members selectively gather information and fail to seek expert opinions. They also neglect to critically assess their ideas and examine few alternatives.

Summary

The purpose of a scientific investigation is not to debunk or disprove the paranormal. That would simply be doing the exact opposite of what the believers do and is an indication of bias. Science requires that observations be performed from a neutral position. It may appear to be rather dismissive due to the process of the elimination that is advocated by the scientific method but the confusion comes from a misunderstanding of how science operates.

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