The Ghost in the Machine

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Abstract

In this paper we outline an as yet undocumented natural cause for some cases of ostensible haunting. Using the first author's own experience as an example, we show how a 19hz standing air wave may under certain conditions create sensory phenomena suggestive of a ghost. The mechanics and physiology of this 'ghost in the machine' effect is outlined. Spontaneous case researchers are encouraged to rule out this potential natural explanation for paranormal experience in future cases of the haunting or poltergeistic type.

Introduction

When investigating a haunted building it is good practice to attempt to exclude as many possible normal causes for the 'haunting' as possible. The ways in which normal earthly events might conspire to convey an impression that a house is haunted (or even beset by poltergeist behaviour, see Eastham, 1988) are numerous. Thus, all of the following may well be the more mundane cause of an ostensible haunt; water hammer in pipes and radiators (noises), electrical faults (fires, phone calls, video problems), structural faults (draughts, cold spots, damp spots, noises), seismic activity (object movement/destruction, noises), electromagnetic anomalies (hallucinations), and exotic organic phenomena (rats scratching, beetles ticking). The exclusion of these counter-explanations, when potentially relevant, must be the first priority of the spontaneous cases investigator. To this end, we feel the "virtual paranormal experience " reported and explained in this paper might be of interest to the spontaneous case research community.

Though many of the above counter-explanations for ghost-like phenomena may be quite easy to discount in any one case, at least some normal causes of seemingly paranormal phenomena may in fact be quite subtle, and not at all easy to discern for the untrained observer, as we hope to show in this paper.

The Case of the Ghost in the Machine

The first author's background is as an engineering designer and at the time of the incident he was working for a company that manufactured medical equipment. Three people worked in a laboratory made from two garages back to back and about 10ft wide by 30ft in length. One end was closed off by doors normally kept closed and the other end had a

window, the other side of which was a cleaning bay. As an example of creativity with corrugated iron, this structure was home for anyone with a passion for playing with jets of water and foam.

The company's business was in the design of anaesthetic or intensive-care, life support equipment so there was always some piece of equipment wheezing away in a corner. When V.T. heard suggestions that the lab was haunted this was the first thing he thought could be behind it and paid little attention. One morning however none of the equipment was turned on and V.T. arrived just as the cleaner was leaving obviously distressed that she had seen something. As a hard nosed engineer V.T. put it down to the wild cats, wild other furry things, moving pressure hoses (as the pressure fluctuates, flexible hoses sometimes move) or some sort of lighting effect.

As time went on V.T. noticed one or two other odd events. There was a feeling of depression, occasionally a cold shiver, and on one occasion a colleague sitting at the desk turned to say something to V.T. thinking he was by his side. The colleague was surprised when V.T. was found to be at the other end of the room. There was a growing level of discomfort but the workers were all busy and paid it little attention. That is until V.T. was working on his own one night after everyone else had left. As he sat at the desk writing he began to feel increasingly uncomfortable. He was sweating but cold and the feeling of depression was noticeable. The cats were moving around and the groans and creaks from what was now a deserted factory were "spooky", but there was also something else. It was as though something was in the room with V.T. There was no way into the lab without walking past the desk where V.T. was working. He looked around and even checked the gas bottles to be sure there was not a leak into the room. There were oxygen and carbon dioxide bottles and occasionally the staff would work with anaesthetic agents, all of which could cause all sorts of problems if handled inappropriately. All of these checked out fine so V.T. went to get a cup of coffee and returned to the desk. As he was writing he became aware that he was being watched, and a figure slowly emerged to his left. It was indistinct and on the periphery of his vision but it moved as V.T. would expect a person to. The apparition was grey and made no sound. The hair was standing up on V.T.'s neck and there was a distinct chill in the room. As V.T. recalls, "It would not be unreasonable to suggest I was terrified". V.T. was unable to see any detail and finally built up the courage to turn and face the thing. As he turned the apparition faded and disappeared. There was absolutely no evidence to support what he had seen so he decided he must be me cracking up and went home.

The following day V.T. was entering a fencing competition and needed to cut a thread onto the tang of a spare foil blade so that he could attach the handle. He had all the tools necessary but it was so much easier to use the engineer's bench vice in the lab to hold the blade that he went in early to cut the thread. It was only a five minute job so he put the blade in the vice and went in search of a drop of oil to help things along. As he returned, the free end of the blade was frantically vibrating up and down. Combining this with his experience from the previous night he once again felt an immediate twinge of fright. However, vibrating pieces of metal were more familiar to him than apparitions so he decided to experiment. If the foil blade was being vibrated it was receiving energy which

must have been varying in intensity at a rate equal to the resonant frequency of the blade. Energy of the type just described is usually referred to as sound. There was a lot of background noise but there could also be low frequency sound or infrasound which V.T. could not hear. As it happens sound behaves fairly predictably in long thin tubes such as organ pipes and ex-garages joined end to end so V.T. started his experiment. He placed the foil blade in a drill vice and slid it along the floor. Interestingly the vibration got bigger until the blade was level with the desk (half way down the room) after the desk it reduced in amplitude, stopping altogether at the far end of the lab.

V.T. and his colleagues were sharing their lab with a low frequency standing wave! The energy in the wave peaked in the centre of the room indicating that there was half a complete cycle. It is important to understand that what we call sound is caused by variation in the pressure of the air around us. It is represented graphically as a wave. If someone were to shout at you the sound wave will travel from them to you transmitted by the air between you both, i.e. it is a travelling wave. However the wave sharing our lab was of just the right frequency to be completely reflected back by the walls at each end, so it was not going anywhere, hence it was a standing wave. In effect the wave was folded back on itself reinforcing the peak energy in the centre of the room. Once V.T. knew this he calculated the frequency of the standing sound wave as follows;

We should not be impressed by the apparent accuracy of the frequency because V.T.'s measurements were 'quick and dirty'. For example, the speed of sound can also vary depending on temperature and pressure so, overall, plus or minus 10% on the above figure would be a reasonable estimate.

There are now two questions. The first is where is the energy coming from? The second is what does an 19 Hz standing wave do to people? The first was answered very quickly when V.T. discussed the problem with the works' foreman who told him that they had installed a new fan in the extraction system for the cleaning room at the end of the lab. We switched off the fan and the standing wave went away. The second question required a bit more research. A book by Tempest (1976) was consulted and a couple of interesting case studies were found.

"Noise consultants were asked to examine one of a group of bays in a factory where workers reported feeling uneasy. The bay had an oppressive feel not present in the adjacent areas although the noise level appeared the same. Management workers and consultants were all aware of the unusual atmosphere and on investigation it was found that low frequency sound was present at a slightly higher level than in other bays. However the actual frequency of the offending noise was not obvious. The cause of the noise was a fan in the air conditioning system. Workers in a university radiochemistry building experienced the same oppressive feeling together with dizziness when the fan in a fume cupboard was switched on. Conventional sound proofing had reduced the audible sound to the point where there was hardly any difference in the noise with the fan on as off. The situation effected some people so much that they refused to work in the lab. It was concluded that the low frequency component of the sound was responsible." (p81-82.)

On page 107 the book lists symptoms caused by frequencies in the range 15-20 Hz. V.T. had no idea of the amount of energy (spl) the infrasound had because we had nothing to measure it with. These effects are quoted by Tempest at a spl range of 125- 137.5 dB which would be very damaging to hearing if the frequency were in the audible range. It is a considerable amount of power but is not thought of as unreasonable by those V.T. has talked to considering that the energy was originated by a one metre diameter extractor fan driven by something like a 1 kW electric motor. In any case, the symptoms listed by Temple (1976) for low frequency sound waves are; Severe middle ear pain (not experienced), persistent eye watering, and respiratory difficulties, sensations of fear including excessive perspiration and shivering.

Table IV on page 212 of this book shows frequencies causing disturbance to the eyes and vision to be within the band 12 to 27 Hz. A more recent book by Kroemer (1994) describes the effects of low frequency vibration as follows;

"Vibration of the body mostly affects the principal input ports, the eyes, and principal output means, hands and mouth."(p. 287).

"Exposure to vibration often results in short-lived changes in various physiological parameters such as heart rate...At the onset of vibration exposure, increased muscle tension and initial hyperventilation have been observed." (p. 280).

Tables 5-12 of Kroemer (1994) on p. 288, indicate that the resonant frequencies of body parts are; Head (2-20 Hz causing general discomfort), Eyeballs (1-100Hz mostly above 8 Hz and strongly 20-70Hz effect difficulty in seeing). However, different sources give different resonant frequencies for the eye itself. The resonant frequency is the natural frequency of an object, the one at which it needs the minimum input of energy to vibrate. As you can see from above, any frequency above 8 Hz will have an effect and some sources quote 40Hz. Most interestingly, a NASA technical report mentions a resonant frequency for the eye as 18 Hz (NASA Technical Report 19770013810). If this were the case then the eyeball would be vibrating which would cause a serious "smearing"of vision. It would not seem unreasonable to see dark shadowy forms caused by something as innocent as the corner of V.T.’s spectacles. V.T. would not normally be aware of this but its size would be much greater if the image was spread over a larger part of his retina.

Another NASA report (NASA Technical Report 19870046176) mentions hyperventilation as a symptom of whole body vibration. Hyperventilation is characterised by quick shallow breathing and reduces the amount of carbon dioxide retained in the lungs. Note that Tempest (1976) also mentions respiratory difficulties caused by frequencies in our range. Hyperventilation can have profound physiological effects. For example, Flenley (1990) describes the symptoms of hyperventilation as "breathlessness usually at rest, often accompanied by light-headedness, muscle cramps, fear of sudden death and a feeling of difficulty in breathing in". Fried (1987) describes a panic attack as "a synergistic interaction between hyperventilation and anxiety." and suggests that as the carbon dioxide is expired physiological changes cause the body to respond by feeling

fear. This feeling of fear activates the sympathetic nervous system which increases the respiration rate making the hyperventilation worse. The panic attack will therefore feed itself and increase in intensity. This would seem consistent with V.T.'s experience of fear and panic when the "ghost" appeared. V.T. knows from the experiment with the foil blade that the peak energy, known as an anti-node, was in line with the centre of the desk. As V.T. sat up and turned to look at the object he moved from this zone of peak energy to a zone of slightly lesser energy and *the ghost disappeared*!

Exorcising the standing wave ghost

Once the problem was recognised a modification was made to the mounting of the extractor fan and our ghost left with the standing wave. Low frequency sound is not easy to detect without the proper equipment. It was shear luck that the foil blade happened to be the right length and material to react and reveal the presence of the standing wave (although 19Hz might just be heard on its own, it is in fact unlikely to exist alone so other sounds would drown it out). V.T. has since heard of a similar experience to this which happened in a corridor in a building that had a wind tunnel in the basement. The wind tunnel was on at the time of the sighting but V.T. was unable to do any measurements. Long tubes such as corridors are ideal places for standing waves especially if they are closed at both ends. The resonant frequency of one person's body parts would also be different from another so standing wave resonances may affect one individual but not another. Our advice for researchers in the future is to be very wary of ghosts reported to haunt long, windy corridors!

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