Sound of Form and Colour

What's the difference between a 'sound' and a 'noise'? Perhaps we attribute 'sounds' to certain *things* but are much more likely to ask "what's that noise"? if the source of what we can hear is a mystery. We might be likely, for instance, to remark on the pleasing, *sound* of a gentle wind in the trees but describe the traffic under our window as a source of *noise*. We might say then, that noise consists of sounds that are intrusive, unwanted, annoying, unpleasant or otherwise a nuisance.

Natural sounds can be loud of course; the roar of crashing waves or waterfalls, thunderclaps, howling winds, but it's within cities, where humans live closely with other humans, that high levels of environmental noise are a growing problem. The buildings that we live in, shop in, socialise in are filled with more electrical equipment than we have had at any time in the past, most of which

creates some sort of sound. Music, televisions, radios, computer game effects can be loud but quieter sounds, specifically those at low frequencies, are now also recognised as a growing environmental noise problem especially in poorly insulated buildings. These sounds are often to do with washing machines, central heating pumps, fridges, or fans; the sounds then of things being washed, of things being kept warm or cold, or of the attempts to bring fresh air from outside, inside, the sounds in fact of the things that keep us going. Recently just such a sound phenomenon could be heard at night in the normally quiet bedroom of our home, resonating around the recess where the bed is located. Perhaps the distant ventilation fan of an internal kitchen or bathroom we thought, but as it continued over the course of several nights, which turned into weeks, it became evident that something else was the cause.

Sound waves as they travel, disturb the air particles that they move through, causing them to vibrate. The frequency of a sound is the number of complete back and forth movements of an air particle per unit of time; 1 Hertz is equal to 1 vibration per second. Low frequency sounds typically sit within the range of around 10 to 200 Hz; 10 to 200 vibrations of the air per second. As a result of it's low frequency, the sound that we could hear was low, deep and pulsing. It's a trait of humans that they naturally attempt to associate heard sounds with objects or at least causes; I

remember reading somewhere that we never hear a noise of indeterminate origin which we do not nevertheless name; that sounds are always ‘clunks’, ‘taps’, ‘bangs’, ‘knocks’ ‘booms’, ‘rustles’, ‘pulses’. The sound that we could hear seemed to throb, it was easy to make the association with something rotating, and thus the mental picture ‘fan’ became a central focus of our investigations.

Low frequency sounds often sit at levels just on the threshold of human hearing and they can be carried over large distances, both of which can make them remarkably difficult to measure or trace. This sound was virtually inaudible during the day. In the quiet of night however, it assumed a much more dominant presence. We prowled the flat in the dark, pressing our ears to the walls, finding the noise present in other spaces that we had never before paid attention to at night.... *it’s here too; there as well; but not here; quieter over there.*

Of course, sound can travel through other mediums besides air and it was very difficult to tell whether what could be heard was *airborne* sound – noise being carried from somewhere else on the air *through* the walls or floors, or *transmitted* sound – noise that is being carried as a vibration into the structure of a building. This happens when the source of the sound is touching something; a wall, a floor, ducting or a beam and can also be difficult to identify.

This sound could be heard from the front of our flat, right through to the back, close to the most easterly walls which interconnect. However, the loudest part of this phenomenon was less in the wall itself, when I placed my ear against it, but more at specific points around the room of varying heights and positions around the space and in some places, it couldn't be heard at all.... *it's here too; there as well; but not here; quieter over there.* This seemed to lend the sound a physical 3 dimensional form floating in space within the room. I could crouch underneath it in silence, then slowly raise my head until, at about two feet above the floor, it became audible again. In some parts of the room just by turning ones head slightly from side to side the sound could be experienced as loud, diminished or cut completely. A spot of particular intrigue was just in front of a wall that would once have held a fireplace where nothing could be heard below a height of about four feet. I now know that these quiet spots are known as 'nodes' and the louder parts 'anti-nodes' and that they are the result of the way that sound waves of certain frequencies of vibration behave within the architectural shape of a space in which a sound is experienced. As these waves are reflected off walls and back into the path of the next oncoming set of waves a standing wave pattern is set up...as if parts of the medium, in this case, air, are not vibrating but standing still; and these points are experienced as silent.

What we could hear turned out to be a mix of both airborne and transmitted sound and had its origins in a fridge, quite a large one, located in the shop beneath our flat. Unexpectedly, and for no apparent reason, the fridge had begun to operate at a frequency that was carried up into our walls by some means that we have never really got to the bottom of. It could have been that a part of the fridge was just touching a piece of panelling, which was screwed in to the wall, which was attached to the ceiling, which was attached to our floor and in turn to our walls, where it exited that medium and crossed into the air of our room to bring about what met our ears.

It's strange how different an experience of the same sound can be depending on whether or not it's source can be seen or identified. An unidentified sound can cause anxiety as the mind repeatedly returns to the task of trying to attach a mental picture to it. If the sound is thought to be the gentle wind in the trees mentioned earlier, the effect may be one of pleasure but if it later proves that the cause is in fact the roar of traffic on a distant road, then responses to it will change. For a while, we felt relieved when the identity of our fridge tormentor was revealed. But there is also a difference in the way sounds are received between day and night too and this is not just to do with their masking by the background noise of day time. A fuller experience of a sound is to be gained by excluding visual stimuli. There is a philosopher who talks of closing

his eyes in the concert hall while he is listening to the music and on opening them again finds that the visible space seems cramped compared to his experience moments previously. Our resonant companion seemed to induce just the opposite sensation; as other sounds fell away to leave just us and it in the darkness, the sound at times seemed almost overwhelming, like a great weight pressing in our heads and on our chests. Lying there in the dark, it was like being submerged, stifled and yet this effect seemed to shrink back dramatically at the instant of switching on the bedside lamp. We realised that all of our attempts to identify the noise in the early stages of its occurrence had taken place in the dark *because we could hear it better that way*.

Our noise nuisance turned out to have a specific cause, but there are groups of people worldwide who complain that low frequency noise from mostly unidentified sources is having a detrimental effect on their lives through sleep disruption and related stress. Where such sounds cannot be properly measured or traced they are often attributed to what is known under the collective term as the 'hum' a worldwide sound phenomenon of unknown origin experienced by relatively small numbers of people over the last 40 years, although it's thought that there may be more incidences that go unreported. Sometimes sufferers of low frequency noise disturbance, whether traceable or not, report that

physical sensations such as pressure in the head, ears or chest also accompany the experience of the sound.

If you think about it, this is hardly surprising considering how physical the act of hearing actually is. Everything in our world vibrates; we live in these vibrations of high and low air pressure, some of which are audible to us as sound waves. Our eardrums pick up these pressure changes and vibrate at the same frequency as the sensed sound. This energy is transferred to the tiny bones, or ossicles, of the middle ear; the hammer, the anvil, and the stirrup, that act like little levers to amplify the vibrations of the sound wave. The transmitted vibrations then enter the fluid of the inner ear as a compression wave, moving around the cochlea; snail-shaped and lined with thousands of hair-like nerve cells. When their frequency equals that of the natural frequency of a particular nerve cell, the waves are converted by these cells into an electrical impulse, that is received by the brain as sound. Hearing then, is literally a physical engagement with environment. We dragged our mattress across the room to the floor, to sleep underneath the range of the intrusion.

You might imagine, without examining the matter too much, that the sound of the rhythmic swell of the ocean, the rolling in and out of waves, would have calming effect on most listeners. However, I have learned that some people are more easily comforted by the sounds of fans or fridges, or indeed washing

machines; so we are all very different and our sensitivities and responses to sound tend to differ greatly too. As a result of our nightly experience with the fridge, I have discovered noise cancelling software, you've probably heard of white noise; it works by generating a continuous sound that is comprised of a little bit of all the frequencies that a human ear can detect. When listened to through headphones it effectively masks out the alterations to the pressure of the air that we experience as unwanted sound. But there is also brown noise which is particularly good for tuning out unwanted low frequency noise.....such as that made by fridges. This sound is also reported to be good for easing migraines, calming stress, aiding sleep and soothing babies.

I have started paying attention to the low level sounds of peoples houses, noticing the subtle differences that make any given sound comfortable or uncomfortable to listen to. If you haven't noticed the presence of low frequency noise in your home during the night, it's probably best not to go listening for it; once you're tuned into it, it can be hard to tune out.