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# PLANET UNDER PRESSURE

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## **Planet Under Pressure**

The space between Earth's surface and the ionosphere forms a giant resonator - the Schumann Resonance Cavity. Global lightning activity creates standing waves within this resonator at a fundamental frequency of 7.83 Hz. What is the effect of industrialized noise pollution in this resonator? Does it damage the Earth?

### **Planet Under Pressure**

*Theoretical Implications of Noise Pollution within  
the Schumann Resonance Cavity*

A Paper Presentation for the 2014 HUIC STEM Conference  
by Lee C. Payton, © 2014

It is like finding a gold nugget in the sand when one is researching one topic in preparation for a discussion with students, and subsequently learns about something new and afore unknown. Such is the case with the Schumann Resonance Cavity (SRC). Several semesters ago, while researching something as simple as "sound vibrations in sand" on a YouTube search<sup>1</sup>, a professor in one of the videos mentioned the SRC, and I have been researching this global phenomenon ever since.

The SRC is quite fascinating on many levels, including observations this author has made about trends in society over the past several decades; inexplicable weather patterns and global geo----physical changes; the ever increasing and rampant population of the human species; and the requisite world----wide technologies and their inherent un---- natural noise pollution that keeps the human species alive in today"s modernized world.

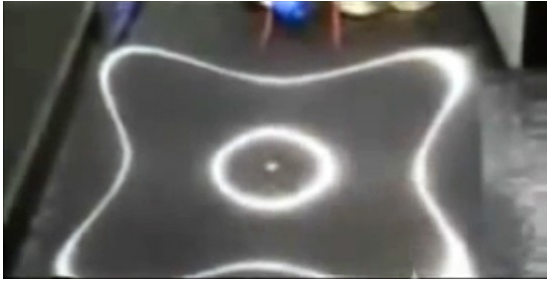
This paper asks more questions than it will answer, and poses more of a hypothetical probe into theoretical implications. This paper is based on research, as much has been published, both scientific and of a New----Age nature, about Schumann Resonances. Being an audiophile, musician, and cinema sound professor, it is not incumbent for me to answer the questions this paper poses, merely to ask them\*. One goal of this paper is to re----introduce hypotheses that are least of all new and radical, but are relevant enough to explore through a modern, digitized, high----definition mindset.

*\*Author's Note: This paper marks the beginning of formal presentations of my research into the Schumann Resonance Cavity. Long----range plans to more fully explore the theoretical implications presented herein include publication in book form, and a feature----length documentary Planet Under Pressure: Theoretical Implications of Noise Pollution within the Schumann Resonance Cavity*  
*A Paper Presentation for the 2014 HUIC STEM Conference*  
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## SOUND VIBRATIONS IN SAND<sup>1</sup>

<http://www.youtube.com/watch?v=AS67HA4YMCs>

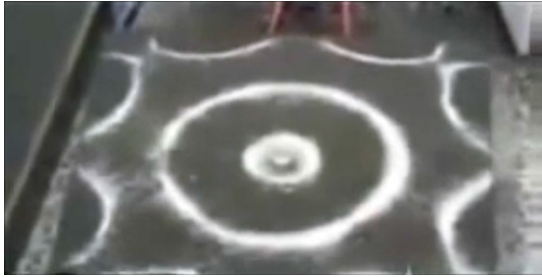
Over many years of studying sound in its myriad forms and propagations, I have seen numerous variations on the phenomenon illustrated by the screen---shots on the following pages. The set---up is as follows: a flat, resonant base (in the case of this video, a piece of metal) is connected to a tone generator that can oscillate between specific frequencies of the sound spectrum, making the metal vibrate in response to those frequencies. Sand is poured on the flat resonator, and begins to form specific geometric, and often symmetrical shapes in response to specific frequencies of sound. As the frequency of sound resonating the metal gets higher, the sand particles reform themselves into ever more increasing and complex, geometrical and specific patterns.



01--- High---Mid Frequency introduced



02 --- As the Frequency increases, the sand moves...



03 --- ...to form another symmetrical shape



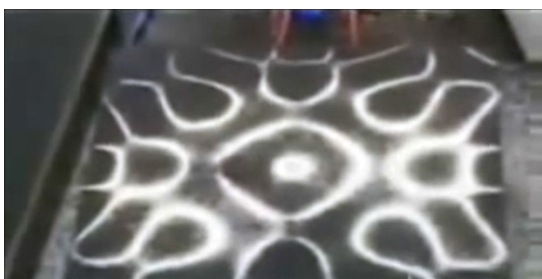
04 --- The Frequency continues to rise...



05 --- ...and the Sand shape resonates more complex



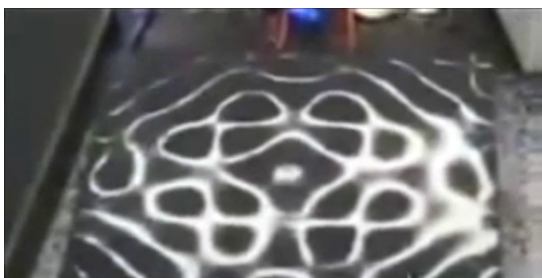
06 --- ...patterns in response to the sound vibrations



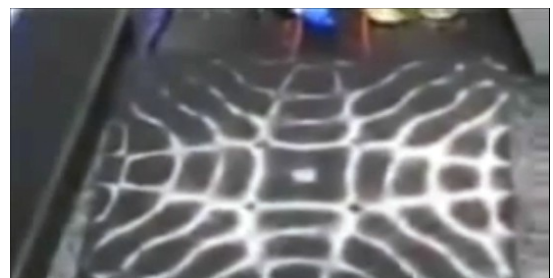
07 --- Much Higher Frequency than slide 01



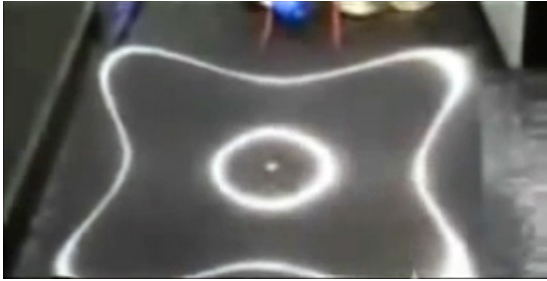
08 --- Still Higher



09 --- The tone attached to this metal increases...



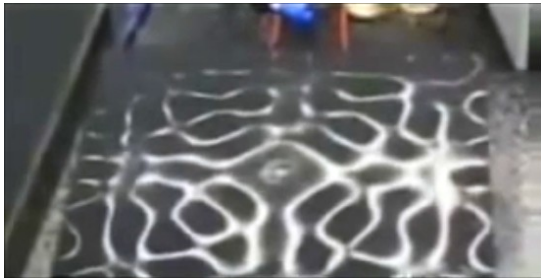
10 --- ...in frequency throughout the video



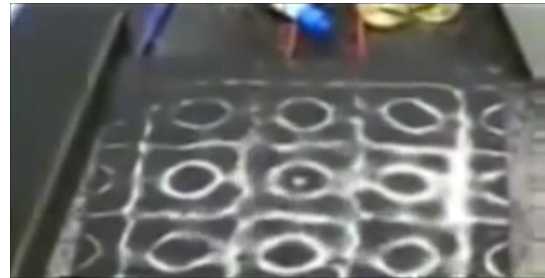
11 --- Tone in the Very High Frequency range



12 --- High Frequency = TREBLE range on an EQ



13 --- HF Tone with First Sign of Asymmetry



14 --- Waves form initial vibrations called...



15 ...Fundamentals<sup>1a</sup> --- starting sound movement &



16 ...creating harmonic resonant waves in response



17 --- Tone at the Upper Limits of Human Hearing

These stills illustrate a progression of sound frequencies heard in the video, and are included here for fair use & educational purposes only.

The complete video can be viewed at <http://www.youtube.com/watch?v=AS67HA4YMCs>

From slide 01 --- 17 the frequency range went from tones in the upper mid----range to tones at the peak of human hearing, the accepted range of which is 20Hz --- 20kHz<sup>2</sup>. Sand is a naturally occurring material made of fine rock and mineral particles, composed primarily of silica, or silicon dioxide (SiO<sub>2</sub>) in the form of quartz<sup>3</sup>. Quartz is considered to be the second most abundant mineral in the Earth's continental crust<sup>4</sup>. The essential elemental atomic building blocks of all Life on Earth are the elements hydrogen, oxygen, nitrogen and carbon<sup>5</sup>. As atoms join together through chemical or ionic bonding, they form molecules, compounds<sup>5</sup>, and in the case of "living" things, organelles and cells<sup>6</sup>.

If scientific theory postulates that all matter is comprised of different combinations of the same elemental building blocks of life, then essentially the human body, mind and spirit (soul) should react in its own resonate way to certain frequencies, as do grains of sand on a metal plate. It would stand to reason that these frequencies should be beyond the accepted range of human hearing, either above or below, if for no other reason than to not interfere with using our ears as a survival mechanism in primitive existence<sup>2a</sup>.

Another interesting phenomenon I have researched centers around the theory that the space between the atoms that make up the cells of our bodies is bigger than the atoms themselves<sup>7</sup>. Given the resonance factor from the above images, and the prevalence of space that permeates everything<sup>7</sup>, I ask students what they think it is that holds our bodies together? How does one account for the sub---atomic Quarks of recent discovery, and the amount of space between them relative to their size<sup>7</sup>? What do students think holds together the atoms and elements that make up all things if most of the mass of all things is the space between the protons, neutrons and electrons that comprise the atoms that make up those things<sup>7</sup>? Many students naturally respond by saying, "Sound waves." And in some cases students answer by saying simply, "Vibrations."

It may or may not be difficult to disprove this theory. More importantly, it prompts the Students to think about sound in new and different ways. These teaching methodologies also strive to help enlighten the general cinema student to the fact that they essentially know more about sound than they allow themselves to believe. As I stated earlier, without a significant amount of research and interviews with those more qualified than myself, I am not proposing to know the answer to these theoretical implications, nor to argue whether they are beyond debate, merely to explore them.

By asking Students to ponder these types of hypotheses, my main goal is to reach through a students' apparent intimidation to sound, and help them embrace the art of capturing and manipulating sound. These broader scope relevancies of sound to the natural world also seem to reinforce or substantiate their learning of the cinema sound language, if for no other reason than a broader appreciation of sound in general. These hypotheses are designed, elaborated upon and discussed so that students can better share and communicate their artistic vision and nuance with their collaborators.

During one of the many variations on the above video that I have researched, a professor was describing the "sound vibrations in sand" process and made reference to the "Schumann Resonance Cavity" as it related to global vibrations. Since I had not heard of this before, the concept stuck in my head. I have spent two years now studying the SRC as a global phenomenon that is an inherent part of this Earth and Her role in this Galaxy and in the Universe beyond. My primary interest in this research is in theoretical implications regarding how Man's "interference with" and "dominance over" our natural world with technology, politics, religion, war, big business and industry, and how the resultant noise pollution, may affect the Earth's resonance within the Schumann Cavity.

## SCHUMANN RESONANCE CAVITY<sup>8</sup>



*Still from animation of Schumann Resonance in Earth's atmosphere<sup>9</sup>*

The space between the surface of the Earth and the ionosphere is what is known as the Schumann Resonance Cavity<sup>8</sup>. The ionosphere is electrically conductive and propagates thunderstorms and lightning activity, which is considered an electrical discharge<sup>10</sup>. These electrical discharges create standing electromagnetic waves in the Earth's atmosphere<sup>10</sup>. Because there is a finite amount of space inside the Schumann Resonance Cavity, this space acts as a resonator for these standing waves<sup>11</sup>.

This is very much like the box of a guitar, the tunnel of a flute, or the inside of a bottle when you blow against it. The closed spaces inside resonators have their own resonant frequencies, which are essentially the frequency of sound waves that most efficiently travel inside the resonator at the speed of sound<sup>12</sup>. Electromagnetic waves inside the Earth's atmosphere travel at the speed of light, and these waves resonate at a frequency of 7.83 Hz<sup>12</sup>, which is considered to be in the ELF, or Extremely Low Frequency range.

The longest wavelength of any sound or wave propagation is called the *fundamental*<sup>11</sup>. The fundamental ELF frequency of 7.83 Hz inside the Schumann Resonance Cavity, can be best described by Dickenson<sup>10</sup> quoting Konig<sup>13</sup>:

""...Certain wavelengths circumnavigate the Earth with little attenuation due to the fact that standing waves are formed within the cavity, the circumference of which is "approximately equal to the wavelength which an electromagnetic wave with a frequency of about 7.8 Hz would have in free space" (Konig, 1979, pg. 34). It is the waves at this frequency and its harmonics... that form Schumann Resonances<sup>10</sup>.""

Given these scientific conclusions, one may say that the resonator formed by the space between the surface of the Earth and the ionosphere resonates with a fundamental frequency of 7.83 Hz, and harmonic frequencies representing the multiples thereof. Granted, 7.83 Hz is FAR below the base level of the range of human hearing (20 Hz), but this alone should not implicate having no affect on humans or other Life on Earth.

It was German physicist Winfried Otto Schumann who, in 1952 predicted mathematically that these standing electromagnetic waves exist in the Earth's atmosphere, inside the resonator cavity formed by the space between the earth and the ionosphere<sup>8, 10</sup> --- hence, the moniker Schumann Resonance Cavity. He also predicted the frequency of the waves in this cavity during a lesson with his students about the frequency found within the two concentric balls of a ball condenser<sup>10</sup>.

The frequency of these standing electromagnetic waves is measured in places with a high concentration of lightning activity. Globally, lightning strikes an average of ~50---100 bolts per second<sup>8, 10</sup>. The effect of this worldwide, creates the total "resonant spectrum," or dynamic range of sound, found within the Schumann Resonance Cavity<sup>10</sup>. It is extremely interesting to note that the fundamental resonant frequency within the Schumann cavity has been found to be very close to the frequency of the alpha rhythms of brainwaves<sup>10</sup>. This was substantiated when Konig compared the EEG readings of human brainwaves with recordings of naturally occurring electromagnetic fields in the environment<sup>10, 13</sup>.

Dr. Wolfgang Ludwig furthered Schumann's and Konig's research by seeking to measure the electromagnetic signals of a healthy environment, within the atmosphere, on the surface of the Earth and from inside the Earth<sup>14</sup>. Ludwig found that surface based measurements were best taken at sea, far away from man---made radio signals, frequencies and waves prevalent in cities and urban areas where noise pollution dominates the resonant spectrum of sound<sup>10</sup>. Subsequent to these tests, much research has been done to explore whether the presence of this 7.83 Hz resonant frequency actually has any affect on human health, wellbeing, and psyche. It was proven in a controlled test that the answer was in fact affirmative that this fundamental frequency has an affect on humans whether they are actually capable of hearing the tone or not<sup>10</sup>.

In conducting research for this paper and this concept, this Author has seen innumerable references in New---Age publications as to 7.83 Hz being some kind of "miracle frequency." Most of the advertisements claim, albeit unscientifically, that this frequency is what innately "tunes us into our natural world." I have even seen a 7.83 Hz tone generator "for home use" on sale on e---Bay for over \$400! In a capitalist society, one can hardly argue with another person's ability to "get rich quick" on any scheme the American consumer public will buy into (hoola---hoop, anyone?). However, much of the New---Age take on Schumann Resonances tends to dilute the scientific, physical, biological and pertinent ramifications of the Earth having its own Resonant Frequency.

Recap the four broad concepts enumerated above into consideration --- 1) That high frequencies cause particles of sand to form specific geometric shapes; 2) The basic building blocks of all Life on Earth starts with the same four elements hydrogen, oxygen, nitrogen and carbon; 3) The space between the particles that comprise an atom's structure is greater than the size of those particles (very similar to the space between the patterns in the grains of sand); and 4) The very low Schumann Resonance frequency contained within the Earth's atmosphere that is similar to alpha waves in the brain.



## THEORETICAL IMPLICATIONS

1. Could it be the case that everything imaginable, from the cells in our bodies, to the Crab---Nebula in space, and every conceivable thing in between, is created via specific amalgamations of sound frequencies contained within time and space?
2. Does the movement of electromagnetic waves inside the Schumann Resonance Cavity mirror the energy between the protons, neutrons, electrons and Quarks that make up an atom?
3. There is a high probability of Schumann Resonances and electromagnetic activity within the atmospheres of neighboring planets, and at least one moon<sup>8</sup> (that of Saturn --- Titan). Does the design of this Galaxy, with its planets, moons, Sun as nucleus, and so much space between each, function as a macrocosmic mirror example of how the atoms of our bodies function in microcosmic relation?
4. If very high frequencies have such a dramatic effect on a "life----form" as simplistic as a grain of sand, shouldn't it stand to reason that extremely low frequencies should have a similar dramatic effect on more complex "life----forms" like humans?
5. If the alpha waves of our brain are shown by scientific measurement (EEG) to be very closely related to the size and frequency of the Schumann Resonances, does this mean that these Resonances are designed to keep us "connected" to the Earth that is our celestial home?
6. Given the undeniable and seemingly unstoppable proliferation of technology, industry, big business, nuclear testing, warfare, etc., and its by----product of noise pollution worldwide, how much "louder" is this world going to get?
7. Does the global impact of noise pollution contribute to a rise in the global sound density of the 7.83 Hz resonant fundamental of the Earth?
8. If so, what impact is there, short----term and long----term, when the Earth's innate resonate frequency is altered by man----made interference?
9. Since the Schumann Resonances are electromagnetic waves that are trapped within the Earth's atmosphere, and since it is lightning (basically electricity) that excites them, what impact does global use of radio, television, and wireless transmission technology (i.e. cell phones, etc.) have in competing with, altering, or potentially replacing the Schumann Resonances?
10. Can Life on Earth survive without a clear communication between our brains and the Schumann Resonances?
11. Is it possible for the Earth to survive as a Living Organism if the natural Schumann Resonant frequencies are replaced by the rampant proliferation of the frequencies of wireless technology and digital transmission?
12. If global noise pollution does alter or raise the Earth's 7.83 Hz resonant frequency, would this alone be enough to cause geo----physical anomalies like the hole in the ozone layer, earthquakes, tsunamis, global warming, and the like?
13. Is it possible to reverse these bio----trends with quieter technology and industry, an alternative to wireless transmission, and/or alternative energy sources, or any other all----natural process or initiative?

## SUMMATION

The questions on page seven would form the basis of interview questions pertaining to this subject, when further research moves this project toward a documentary film. It was during the assembly of research for this paper that I realized the amount of theories that abound concerning Schumann Resonances. It was also recently that I learned how exploited this phenomenon has become through the more New---Age interpretations. Practical applications of this research in a classroom environment strive to open Students" minds regarding their innate relationship with sound. These concepts seem to have a deeper resonance with those students who are more sound---oriented.

Many of the questions posed herein recur within much of the research I have done. So as not to be repetitive, or border on concept saturation, I have learned through this latest round of research, that my exploration of Schumann Resonances, if published in book form, should remain at a conversational level, and should have direct correlation to the other parts of the book. If represented by a feature---length documentary, given my cinematic accomplishments thus far, I know it would be a very lengthy, time---consuming, and expensive documentary to create, and would likely have to endure a high degree of prejudicial scrutiny over the content, hypotheses, data, and conclusions. As stated earlier, to arrive at a finite answer to all the questions posed herein, I would have to consult a myriad of science, math and physics professionals who are infinitely more qualified than I am to make a final surmise pertaining.

One thing I do know from personal experience --- I feel much more "in touch" with my Spirit, with the Earth, and with reality when I am surrounded by only natural sounds. When constantly bombarded with the din of man"s existence, it is a struggle to remain a "clear channel" of inspiration, and it is very difficult to feel at ease. I also know from personal experience that the whole Earth is very much a living organism unto herself. Just as the human body is a miracle---machine with the ability to self---heal, a built---in immune system, and a kinesthetically near---perfect orthopedic structure, so is the Earth a miracle---planet ecosystem whose gestalt is absolutely vital to Her healthy function.

Since the study of Schumann Resonances is such a relatively new concept (1952 to present), and post---dates the advent of the Industrial Age by roughly two centuries<sup>15</sup>, it is difficult to predict the answers to a lot of the questions posed herein. Thereto, with modern civilization so heavily reliant on the same technology that potentially undermines the functioning of the natural world, what will happen to the Earth if and/or when the "machine stops running?" Does the rampant, unchecked, and very unnatural over---consumption of this Planet"s natural resources provide any fail---safe fallback contingency should humans be forced to revert to primitive society? Have we become so reliant on industrialized Earth---changing technology that humans would no longer survive and thrive in a primitive existence? Perhaps most importantly, how much richer would our lives become when we re---establish our built---in resonance with the Earth, and how silent must we become in order to initiate this re---connection?

## CITATIONS & REFERENCES

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