Unified Cycle Theory: Integration Toward a Cause

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Previous work supplied the data and statistical support for the *Unified Cycle Theory*, which showed the connection between various recurring earthly as well as cosmic phenomena. A theoretically infinite sequence of cycles (EUWS) occurs throughout the universe, connected by a single factor of three. The period of each larger cycle, whether it be a geological epoch or climatic fluctuation, is three times the next smallest cycle. Statistical analysis showed that the identified cycles are neither subjective nor random. The universal range of these cycles begs a universal cause. With naturally occurring oscillations tied to the EUWS cycles serving as key evidence, we present a new *Theory of Infinitely Oscillating Density and Magnetism*. We hypothesize that these fluctuations conform to Borchardt's *Ten Assumptions of Science*. In terms of univironmental determinism, all microcosms within the universe constantly oscillate in both density and magnetism. These microcosms are bathed in a sea of supermicrocosms capable of transmitting different motions dependent on the EUWS fluctuations. The *Theory of Infinitely Oscillating Density and Magnetism* integrates concepts from both standard and alternative theories. This integrated theory helps to explain numerous mysteries that have long puzzled physicists, astronomers, geologists, climatologists, economists, and sociologists.

1. Introduction

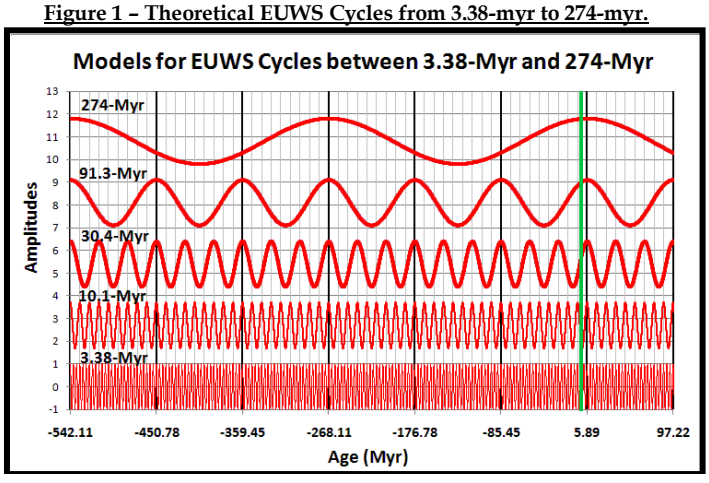
The *Unified Cycle Theory* [1,8] introduced the harmonic and mysterious EUWS (Extra-Universal Wave Series) cycles during February 2009. Subsequent statistical testing validated 21 of the 23 EUWS cycles with wavelengths spanning from 9.57 days to 822-myr [2]. After validation of the cycles, attention shifted to the cause. In this paper, we use evidence from the EUWS oscillations to infer some of their properties. Then, we merge this information with existing patterns, motions, and geometries to contribute to *Infinite Universe Theory* [30].

Over the past century, numerous universal models have emerged. In 1917, Albert Einstein viewed the universe as eternal and unchanging, and introduced a positive cosmological constant to make his view consistent with relativity [3]. In 1929, after Edwin Hubble's discovery of the redshift of light spectra from distant galaxies, expanding universe theories became popular [4]. Then, in 2002, Paul Steinhardt and Neil Turok wrote a paper entitled *A Cyclic Model of the Universe*. The cosmologists hypothesized that the universe undergoes endless cosmic epochs that begin with a slow accelerated expansion followed by contraction that produces the energy needed for the next cycle [5]. However, they failed to introduce a source for the contraction other than the usual assumption of gravitation acting as an attractive force.

While each of these theories, and their multiple variations, may have elements of truth, we view these popular theories as seriously flawed. At a minimum, any model must conform to Borchardt's *Ten Assumptions of Science* [6,7]. However, most models hypothesize a finite universe consisting of elementary particles. Both of these ideas violate Borchardt's assumption of infinity.

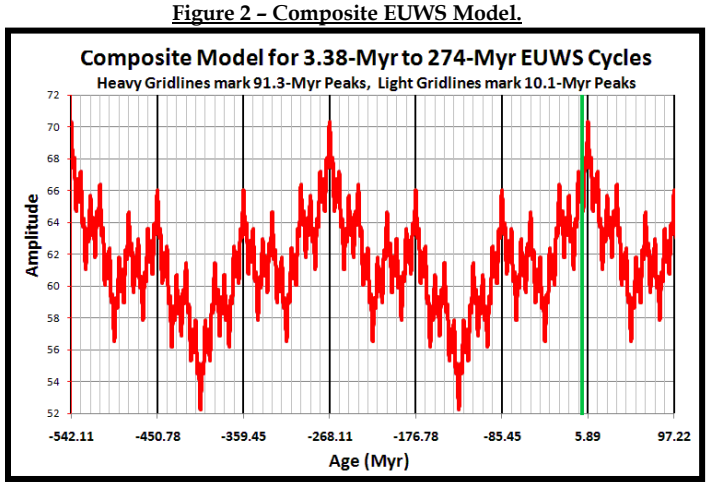
This paper breaks from current viewpoints by offering a unique model. This new model describes oscillations within the universe that occur at the hypothesized infinite EUWS wavelengths – distinctly different from the sole universal wavelength proposed by Steinhardt & Turok. The EUWS oscillations affect both the density and magnetism of all microcosms at all times and at all scales, as described by its title, the *Theory of Infinitely Oscillating Density and Magnetism*.

Figure 1 – Theoretical EUWS Cycles from 3.38-myr to 274-myr.



The *Unified Cycle Theory* is best summarized by figure 1, which depicts theoretical oscillations of five EUWS cycles – covering the time from 542-myr before present to 97-myr in the future. The green vertical line in figure 1 represents the present. According to the theory, in 5.89 million years from now, a major contraction will begin. Currently, the 30.4-myr, 91.3-myr, and 274-myr cycles indicate expansion; however, at 5.89 Ma, those 3 cycles will join the 822-myr, 2.47-gyr, 7.40-gyr, and 22.2-gyr cycles in a hypothesized contraction. For the local microcosm, involving much of the observable universe, the resulting contraction at 5.89 Ma will be unusually pronounced. Figure 2 shows a composite model of the five EUWS cycles from figure 1. Once again, the green line represents the present.

Figure 2 – Composite EUWS Model.



This paper proceeds to show how statistically significant volcanic cycles provide strong evidence that universal density fluctuates continually. During expansion phases (decreasing density) volcanic activity increases, while in contracting phases (increased density) volcanic activity decreases. This implies that Earth's surface responds to changes in its environment (the macrocosm). Additional supportive evidence for EUWS-related cycles includes oscillations in star formation, starspots, climate, and even human behavior. Star formation cycles and starspot cycles are especially important because they indicate that the EUWS frequencies operate on a cosmic scale.

To appreciate the analytical approach used in this paper, a few definitions and assumptions must be mentioned.

2. Definitions

Univironment – The composition and properties of a particular microcosm and its macrocosm, at a particular moment.

Determinism – The belief that all effects have mechanical causes.

EUWS Cycles – Extra-Universal Wave Series (EUWS) cycles. These cycles occur as a harmonic sequence with wavelengths occurring in precise multiples of three.

Ether – (1) The medium responsible for the transmission of light and other electro-magnetic waves. (2) Alternatively, by using the assumption of infinity as a basis, we could define ether as all components of matter smaller than a chosen reference point. For example, with galaxies as reference points, ether consists of stars, atoms, and the infinite types of sub-atomic forms of matter. With atoms as reference points, ether is restricted to the infinite types of sub-atomic forms of matter.

Plasma -- A highly ionized gas containing an approximately equal number of positive ions and electrons. As such, plasma acts as one of the infinite types of sub-atomic ethers.

Microcosm -- A portion of the universe. All things are microcosms. Microcosm replaces the need to use the concept of a system or object.

Submicrocosm – One of the divided portions of the particular microcosm under consideration.

Macrocosm – The portion of the universe that resides outside of a particular microcosm. The entire universe equals a particular microcosm plus its macrocosm.

Supermicrocosm -- One of the divided portions of the particular macrocosm under consideration.

Universe – All that exists, an infinitely large volume containing both ever-smaller and ever-larger microcosms, with neither a smallest bit of matter nor a largest collection of matter.

3. Assumptions

The *Theory of Infinitely Oscillating Density and Magnetism* requires several assumptions that differ from standard theories. All aspects of the theory strictly conform to the Ten Assumptions of Science [6,7]. For the present work, we put special emphasis on four of the ten assumptions:

Assumption 4: Inseparability - Just as there can be no motion without matter, so there can be no matter without motion.

Assumption 5: Conservation - Matter and the motion of matter neither can be created nor destroyed.

Assumption 8: Infinity - The universe is infinite, both in the microscopic and the macroscopic directions.

Assumption 10: Interconnection – All things are interconnected, that is, between any two objects exist other objects that transmit matter and motion.

Assumptions 4 and 5 may seem quite obvious, although they are powerful antidotes to the more outrageous claims involving "action at a distance" and "curved space-time" that are sometimes considered to be universal causes of gravitation. For us, a

cause is described by Newton's Second Law of Motion, F=ma, whereby one microcosm influences the motion of another upon contact. Assumptions 8 and 10 are critical to our philosophical analysis of the EUWS cycles.

Oscillations in microcosmic density and magnetism correspond to theoretical EUWS cycles, described by the general equation previously discussed at length [8]:

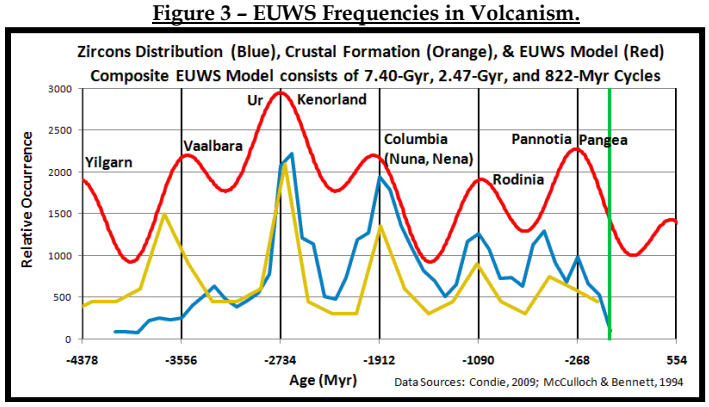
$$y_i = d_n * \text{sine}((2\pi(t_i + t_{scale})/\lambda_n) + \theta_n))$$

Standard definitions of many sub-atomic elements are not consistent with the Ten Assumptions of Science. These contradictions impede an accurate and fully developed description of the *Theory of Infinitely Oscillating Density and Magnetism*. The scope of this paper excludes redefining standard theory concepts to agree with the Ten Assumptions of Science. Those redefinitions are the focus of a future project.

4. Evidence

Among all of the effects produced on Earth, the EUWS cycles correlate closest with pulses in volcanic activity. In fact, the theoretical peak of the 22.2-gyr cycle at 2.73 Ga closely corresponds to the greatest outbreak of volcanism in Earth's history – at 2.70 Ga [9,10]. Studies of the periods of intense crustal formation by McCulloch & Bennett [9] and those of relative zircon occurrence by Condie [10] show nearly identical estimates of Earth's volcanic history. Figure 3 shows these estimates, along with their strong correlation with the EUWS model and the times of supercontinent formations. In addition to their linkage with the 2.73 Ga theoretical peak, both volcanic time-series exhibit a strong 822-myr pulse.

Figure 3 – EUWS Frequencies in Volcanism.



Turning to more recent times, on an individual basis, some recent major eruptions corresponded closely to theoretical peaks of the 376-kyr cycle. For example, the 376-kyr cycle predicted spikes in volcanic activity at 0.50 Ma (Lava Creek Tuff eruption at 0.64 Ma [34]), 0.88 Ma (Bishop Tuff eruption at 0.76 Ma [28]), 1.26 Ma (Mesa Falls Tuff eruption at 1.28 Ma [34]), and 2.01 Ma (Huckleberry Ridge Tuff eruption at 2.06 Ma [34]). However, rather than individual occurrences, the best way to measure volcanism is from a global basis. Hence, in this paper, we use indicators such as volcanic dust accumulated in the Antarctic and Greenland ice-cores as well as distribution of zircons collected globally. Unfortunately, a gap exists in good volcanic proxies in the range between 30-myr and 42-kyr.

Figure 4 – EUWS Frequencies in Volcanism.

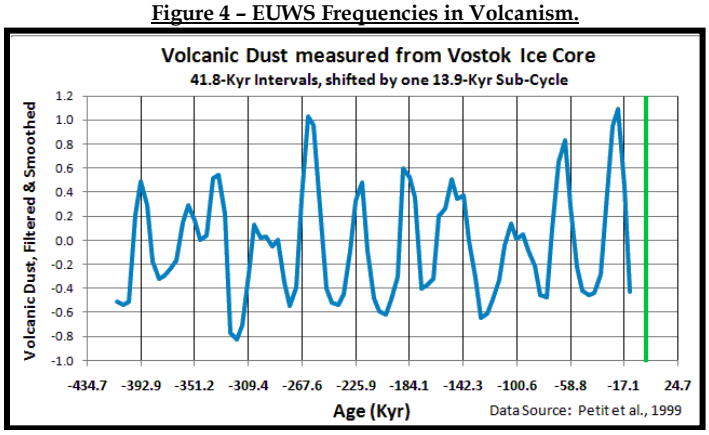
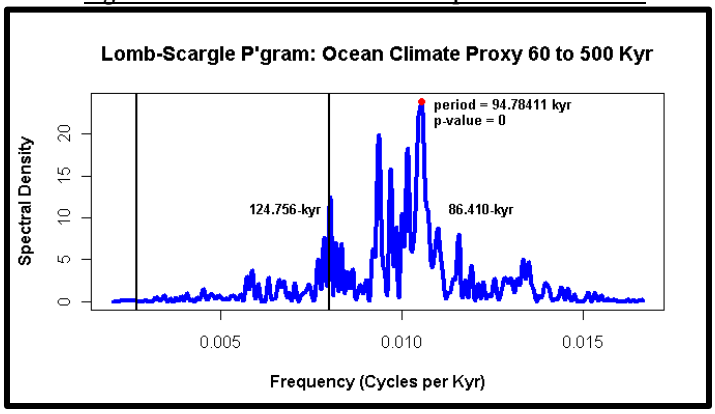


Figure 4 presents an analysis of the Vostok ice-core [11] by Jean-Robert Petit. The study revealed cycles in volcanic dust accumulation that closely matched theoretical peaks of the 41.8-kyr cycle. Data from Petit also confirmed a 13.9-kyr volcanic cycle.

In addition to volcanism, for periods greater than 500-kyr, climate cycles also correspond to EUWS frequencies. In 2001, paleoceanographer James Zachos reconstructed Earth's ocean climate history for the past 67-myr [12]. This climate history confirmed many EUWS cycles and Milankovitch cycles. However, it must be noted that Milankovitch cycles and EUWS cycles originate from completely different sources. No link exists between the two, although they both influence global climate. The Milankovitch cycles result from gravitational effects related to Earth's position relative to the Sun and planets, particularly Jupiter and Saturn. These gravitational effects cause Earth's orbit and axial-tilt to vary, creating ice-age cycles. The EUWS cycles appear to originate from a cosmic source, causing cycles in volcanism, which also influence climate change. The periodogram in figure 5 shows Milankovitch's 94.8-kyr eccentricity cycle and the 125-kyr EUWS cycle. [12]

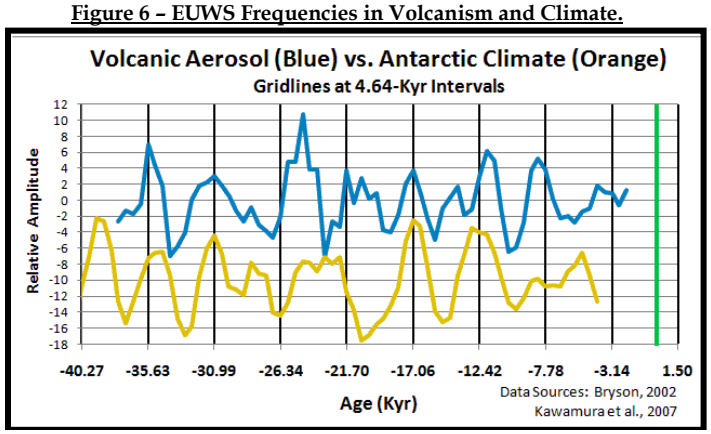
Figure 5 – EUWS & Milankovitch Frequencies in Climate.



For periods less than 20-kyr, Milankovitch cycles become irrelevant, and climate cycles again correspond to the EUWS frequencies and their associated volcanic cycles.

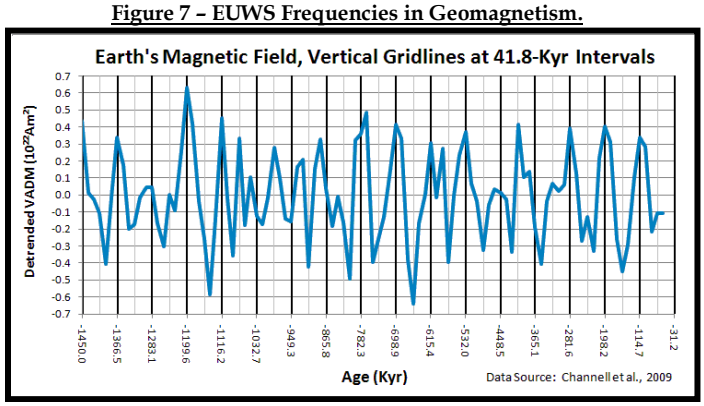
Figure 6 shows a volcanic proxy from Bryson [13,14] and an Antarctic climate proxy by Kawamura [15,16]. Both reveal statistically significant cycles that almost exactly match the 4.64-kyr EUWS cycle. In this case, volcanism generally led climatic change, as would be expected for a cause and effect relationship.

Figure 6 – EUWS Frequencies in Volcanism and Climate.



In contrast to other geological observations, fluctuations in geomagnetism are detected at exactly twice the EUWS frequencies for the 41.8-kyr and 13.9-kyr cycles [17]. This suggests that the magnitude of EUWS signals affects volcanism, while the polarity of the signals modulates geomagnetism. Figure 7 shows geomagnetic oscillations [17], with every other gridline at 83.5-kyr intervals (double the 41.8-kyr EUWS period).

Figure 7 – EUWS Frequencies in Geomagnetism.

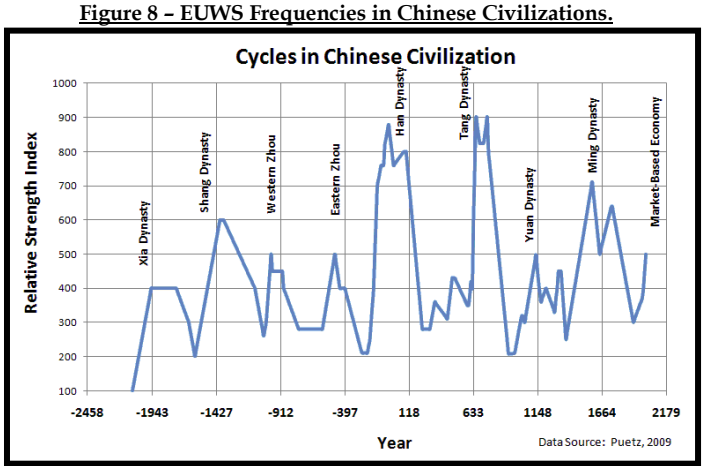


A magnetic component is important because it may explain why EUWS cycles are linked to human behavior cycles. Recent research by Young and others in the Department of Brain and Cognitive Sciences at MIT showed that magnetism affects decision making [18]. In their experiments, the researchers tested the hypothesis that the right temporoparietal junction (RTPJ) of the brain must function properly to make judgments of right and wrong. The RTPJ area involves mental state reasoning. Young *et al*. describe the experiments: "In two experiments, we used transcranial magnetic stimulation (TMS) to disrupt neural activity in the RTPJ transiently before moral judgment (experiment 1, off-line stimulation) and during moral judgment (experiment 2, on-line stimulation). In both experiments, TMS to the RTPJ led participants to rely less on the actor's mental states. A particularly striking effect occurred for attempted harms (e.g., actors who intended but failed to do harm)" [18].

For example, the MIT researchers showed that without magnetism to the RTPJ, subjects judged it wrong for a person to drive intoxicated – whether or not others suffered injury from the driver's actions. However, when TMS was applied to the RTPJ, subjects judged it morally permissible to drive intoxicated – as long as the driver avoided injuring others. Hence, without TMS, the subjects judged morality based on actions, but with TMS, the subjects judged morality based on outcomes.

With geomagnetism acting as a possible influence, figure 8 shows a 516-year cycle in Chinese civilizations [8]. Vertical gridlines coincide with theoretical peaks of the 516-year EUWS cycle.

Figure 8 – EUWS Frequencies in Chinese Civilizations.



Focusing on modern times, financial crises are aligned with the 19.1-year EUWS cycle. The vertical gridlines in figure 9 correspond to theoretical 19.1-year peaks, with major stock market declines, panics, and crashes corresponding to those peaks [19, 20, 21, 22, 23, 24, 25].

Figure 9 – EUWS Frequencies in Stock Prices.

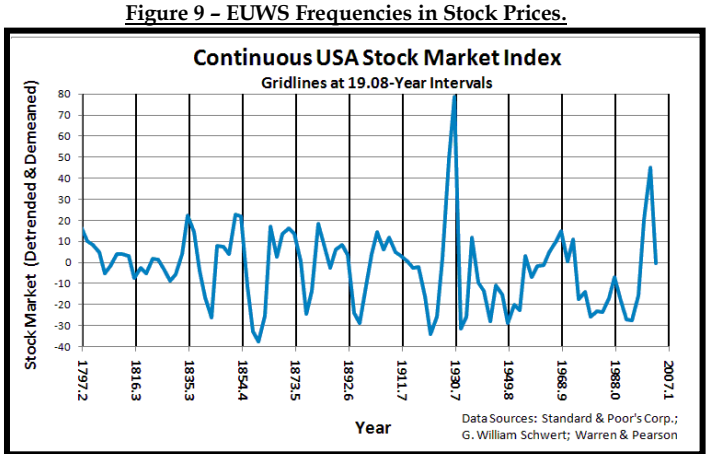
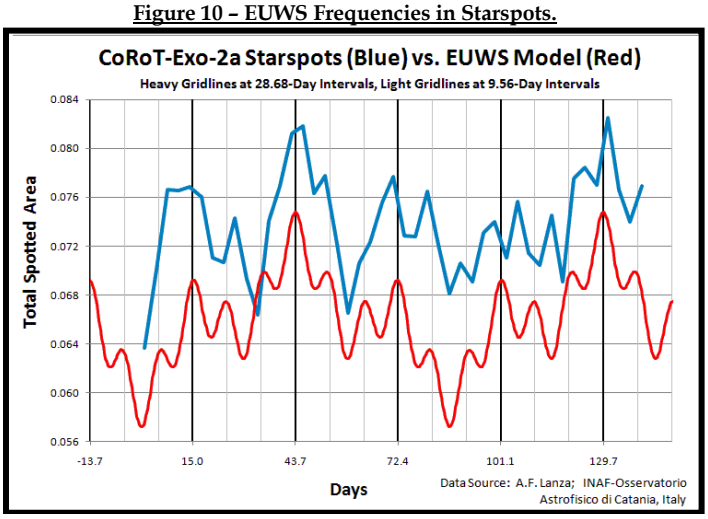


Figure 10 shows the close correlation between EUWS cycles and starspots in CoRot-Exo-2a [26]. This amazing correlation reveals two important aspects about the cycles: (a) the EUWS cycles are cosmic in scale, and (b) the EUWS cycles possess a

magnetic component, because sunspots and starspots are strongly associated with magnetic flux.

Figure 10 – EUWS Frequencies in Starspots.



5. Discussion

The volcanic episodes can be explained by cycles in macrocosmic density. As density increases, the condensed matter in the macrocosm pushes against Earth's surface with greater intensity. The compression reduces volcanic extrusion. Then, when the density within the macrocosm decreases, the collective push against Earth's surface relaxes, resulting in expansion of Earth's surface. This creates weak spots and cracks in the surface, thus intensifying volcanic activity.

Based on the episodic nature of volcanism, we propose merging two theories that explain crustal movements on Earth's surface. During EUWS expanding phases (reduced density), the Expanding Earth Theory best explains surface movements, with the Plate Tectonic Theory playing a minor role. During EUWS contractions (increased density), plate-tectonics play an increased role, with Earth's expansion playing a minor role.

Major climatic cycles result from volcanic ash and gas clouds that spread globally following major eruptions. These climatic cycles correspond to EUWS frequencies, and they exhibit patterns identical to the climate changes that followed the Pinatubo eruption in 1991. Specifically, in 1991, global temperature initially rose in the two months after the eruption, followed by a steady decline for the next 18 months [35]. These particular cycles appear to be relatively independent of the Milankovitch cycles responsible for glacial advance and retreat.

Based on the repetition of numerous patterns, including volcanic and climatic cycles, we hypothesize that four elements of the universe operate infinitely:

1. From the smallest known collections of matter to the largest (from atoms, planets, stars, star-clusters, galaxies, galaxy clusters, to super-clusters), matter accumulates in tight clumps in a hypothesized infinite sequence of sizes.
2. EUWS cycles appear in harmonics of 3 in a hypothesized infinite sequence. The infinite sequence, of course, can never be proved or disproved, although there is no logical reason to suggest that they suddenly stop at a particular frequency.
3. Most cosmic microcosms accumulate in the shape of a sphere. We hypothesize that this spherical geometry infinitely extends to other microcosms too small and too large to be detected. The spherical shape indicates that the univironmental interaction between microcosm and macrocosm is relatively uniform.
4. Excluding molecular-type bonds, all major collections of matter spin around an axis. We hypothesize this vortex motion infinitely extends to other microcosms too small [31] and too large to be fully detected [32].

We hypothesize that the various microcosms, each with its distinctive size, geometry, and spin, contributes significantly to motions observed in the universe.

Also, we hypothesize that the EUWS cycles reflect oscillations in the density of matter associated with electromagnetic pulses. These pulses in density and electromagnetism also contribute to infinite variation in universal motion.

Based on the assumption of infinity, we hypothesize that the consistency in the clumping, geometry, spinning, and pulsing (EUWS cycles) of matter reveals a universal structure described by divergence and convergence within an infinite universe [29,30].

Our new *Theory of Infinitely Oscillating Density and Magnetism* allows sub-atomic ethers to easily fit within its framework. In our view, theorists use different terms with slightly different descriptions to portray matter and motions related to cosmic ether. Today's mainstream cosmogonists use the term dark-matter to refer to a portion of sub-atomic ether, while alternative theorists prefer the word ether.

Hannes Alfven won the 1970 Nobel Prize in Physics for his work on magneto-hydrodynamics [27]. In 1990, Alfven argued that a form of sub-atomic ether (plasma) pervaded the universe: "In order to understand the phenomena in a certain plasma region, it is necessary to map not only the magnetic but also the electric field and the electric currents. Space is filled with a network of currents which transfer energy and momentum over large or very large distances. The currents often pinch to filamentary or surface currents. The latter are likely to give space, as also interstellar and intergalactic space, a cellular structure." [27]

However, plasma only represents one of an infinite number of ether subsets. We prefer a general description. More than 100 years ago, during a speech at the Royal Institution Library of Science, Sir Oliver Lodge attributed the following description of ether to Professor J.J. Thomson: "The whole mass of any body is just the mass of ether surrounding the body which is carried along by the Faraday tubes associated with the atoms of the body. In fact, all mass is mass of the ether; all momentum, mo-

mentum of the ether; and all kinetic energy, kinetic energy of the ether. This view, it should be said, requires the density of the ether to be immensely greater than that of any known substance." [33]

By modifying Thomson's description to comply with the infinity of microcosms postulated in the *Scientific Worldview*, we achieve an excellent way of describing the mass, motion, electromagnetism, and density of ether. In this sea of microcosmic matter, we hypothesize that the EUWS cycles reflect the oscillating interactions between the various phases of matter.

In addition to explaining ether, the EUWS oscillations may help clarify gravitation. More specifically, gravity may contain two components – density and electromagnetism. This explanation is somewhat speculative, and a good hypothesis about how they combine to produce a gravitational effect has not been fully developed. This possible explanation requires better definitions of sub-atomic microcosms. Redefinition is required because the current standard model of sub-atomic microcosms fails to conform to the Ten Assumptions of Science. In particular, strictly based on the Ten Assumptions of Science, all microcosms must contain mass consisting of submicrocosms in motion *ad infinitum*. In short, elementary particles do not exist.

6. Conclusion

In this paper, we demonstrated how the EUWS cycles help to explain much of the variation in volcanism, climate, geomagnetism, cosmic magnetism, and human behavior. Based on these patterns, we conclude the following….

1) EUWS cycles produce fluctuations in density and magnetism on a cosmic scale. These observations became the basis for the *Theory of Infinitely Oscillating Density and Magnetism*.

2) To better explain the patterns, the theory includes factors related to mass, spherical geometry, and spin as part of the inherent structure of motions observed throughout the universe. These factors were included in accordance with the Ten Assumptions of Science.

3) The theory offers reasonable explanations for mysteries that have long puzzled physicists, astronomers, geologists, climatologists, economists, and sociologists – in particular, oscillations related to the EUWS cycles.

4) Density oscillations provide the elusive cause for proponents of the Expanding Earth Theory [36,37]. At the same time, the density oscillations suggest that plate-tectonics play a role in continental movements as well. By slightly modifying the concept of an expanding Earth to one that oscillates, the cyclical nature of volcanism can then be easily explained with expansions and contractions in Earth's crustal shell.

5) Many cycles in global climate result as a secondary effect from volcanic episodes. In addition to volcanic-induced change, the Milankovitch cycles also contribute to climate change. However, the Milankovitch cycles are completely unrelated to the EUWS cycles.

6) EUWS cycles produce cosmic oscillations in magnetism. These magnetic cycles appear to influence sunspot cycles, starspot cycles, geomagnetism, and human behavior. These oscillations are consistent with the existence of cosmic plasma -- as originally proposed by Alfven.

7) EUWS related oscillations in density may also partially explain star formation cycles, and they may explain other issues related to gravity, plasma, and ether.

Still other issues remain unresolved. An explanation must be found for the regularity of EUWS oscillations, for their linkage by a factor of 3, and for their presumed cosmic origin. We hope that others will join our efforts and rise to the challenge of finding solutions to these new and interesting issues.

7. Acknowledgements

{Add acknowledgements after reviews.}

References

[1] Puetz, S.J., "*The Unified Cycle Theory: How Cycles Dominate the Structure of the Universe and Influence Life on Earth*." (2009) Outskirts Press, Denver, Colorado; ISBN: 978-1-4327-1216-7.

[2] Puetz, S.J., "*Unified Cycle Theory: Statistical Validation*." (2010) Proceedings of the Natural Philosophy Alliance. 2010. Long Beach, CA: Natural Philosophy Alliance.

[3] Einstein, A., "*Cosmological Considerations in the General Theory of Relativity*." (1917)

[4] Hubble, E., "*A Relation between Distance and Radial Velocity among Extra-Galactic Nebulae*." (1929) From the Proceedings of the National Academy of Sciences, Volume 15: March 15, 1929: Number 3.

[5] Steinhardt, P.J.; Turok, N., "*A Cyclic Model of the Universe.*" (2002) Science: 24 May 2002, Vol 296.

[6] Borchardt, G., "*The ten assumptions of science: Toward a new scientific worldview.*" (2004) iUniverse, Lincoln, NE. 125; Borchardt, G., "*Ten assumptions of science and the demise of 'cosmogony'.*" Proceedings of the Natural Philosophy Alliance, 2004. 1(1): p. 3-6.

[7] Borchardt, G., "*The Scientific Worldview: Beyond Newton and Einstein.*" (2007) iUniverse, Lincoln, Nebraska; ISBN-10: 0-595-39245-8; Borchardt, G., "*The scientific worldview and the demise of cosmogony.*" (2007) Proceedings of the Natural Philosophy Alliance, 2007. **4**(1): p. 16-19.

[8] Puetz, S.J., "*Unified Cycle Theory: Introduction & Data*." (2010) Proceedings of the NPA, Long Beach 2010 Annual Conference.

[9] McCulloch, M.T.; Bennett, V.C., "*Progressive Growth of the Earth's Continental Crust and Depleted Mantle – Geochemical Constraints*." (1994) Geochim. Cosmochim. Acta 58, 4717-4738.

[10] Condie, K.C., "*Excel spreadsheet containing 3 types of Zircon data*." (2009) Dept. of Earth & Environmental Science; New Mexico Tech, Socorro, NM 87801.

[11] Petit J.R. *et al.* "*Climate and Atmospheric History of the Past 420,000 years from the Vostok Ice Core, Antarctica*." (1999) Nature, 399, pp. 429-436. Data reference: Vostok Ice Core Data for 420,000 Years, IGBP PAGES/World Data Center for Paleoclimatology Data Contribution Series #2001-076. NOAA/ NGDC Paleoclimatology Program, Boulder CO, USA.

[12] Zachos, J.; Pagani, M.; Sloan, L.; Thomas, E.; Billups, K., "*Trends, Rhythms, and Aberrations in Global Climate 65 Ma to Present*." (2001) Science 292, 686; DOI: 10.1126/science.1059412. http://www.es.ucsc.edu/~silab/ZacPubData/2001CompilationData.txt.

[13] Bryson, R.A., "*Volcanic Eruptions and Aerosol Optical Depth Data*." (2002) IGBP PAGES/World Data Center for Paleoclimatology, Data Contribution Series # 2002-022. NOAA/NGDC Paleoclimatology Program, Boulder CO, USA.

[14] Bryson, R. "*Late Quaternary Volcanic Modulation of Milankovitch Climate Forcing*." (1998) Theor. & Applied Climatology 39, 115125.

[15] Kawamura, K. *et al.*, "*Northern Hemisphere Forcing of Climatic Cycles in Antarctica over the Past 360,000 Years*." (2007) Nature, Vol. 448, pp. 912-916. doi:10.1038/ nature06015.

[16] Kawamura, K.; Nakazawa, T.; Aoki, S.; Sugawara, S.; Fujii, Y.; Watanabe, O., "*Atmospheric CO_2 Variations over the Last Three Glacial-Interglacial Climatic Cycles Deduced from the Dome Fuji Deep Ice Core, Antarctica Using a Wet Extraction Technique*." (2003) Tellus B, 55, 126-137.

[17] Channell, J.E.T.; Xuan, C.; Hodell, D.A. [2009]. "*Stacking Paleointensity and Oxygen Isotope Data for the Last 1.5 Myr*." PISO-1500. Elsevier B.V.

[18] Young, L.; Albert Camprodon, J.; Hauser, M.; Pascual-Leone, A.; Saxe, R., "*Disruption of the Right Temporoparietal Junction with Transcranial Magnetic Stimulation Reduces the Role of Beliefs in Moral Judgments*." (2010) Proceedings of the National Academy of Sciences 200914826, 2010, doi: 10.1073/pnas.0914826107

[19] S&P, "*The S&P 500 Index*." (2009) The McGraw-Hill Companies, Standard & Poor's Corp. http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_500/

[20] Warren, G.F.; Pearson, F.A. "*Prices*." (1933) John Wiley & Sons, New York, NY.

[21] Macaulay, F.R. "*The Movements of Interest Rates, Bond Yields, and Stock Prices in the United States since 1856*." (1938) National Bureau of Economic Research, New York, NY.

[22] Schwert, G.W. "*Indexes of United States Stock Prices from 1802 to 1987*." (1991) Journal of Business, 64 (July 1991) 442. Summarized in The C.F.A. Digest, 21 (Winter 1991) 3-5.

[23] Schwert, G.W., "*Monthly US Stock Returns, 1802-1925*." (2009) University of Rochester, Rochester, NY 14627, and National Bureau of Economic Research. http://schwert.ssb.rochester.edu/mstock.htm

[24] Cowles, A. and Associates, "*Common Stock Indexes, 2nd Edition*." (1939) Cowles Commission Monograph, Bloomington, Indiana. Principia Press.

[25] Smith, W.B.; Cole, A.H., "*Fluctuations in American Business, 1790-1860*." (1935) Harvard University Press, Cambridge, Massachusetts.

[26] Lanza, A.F. *et al.*, "*Magnetic Activity in the Photosphere of CoRoT-Exo-2a: Active Longitudes and Short-Term Spot Cycle in a Young Sun-Like Star*." (2008) Astronomy & Astrophysics 493, 193–200 (2009) DOI: 10.1051/0004-6361:200810591. ESO 2008.

[27] Alfven, H., "*Cosmology in the Plasma Universe: An Introductory Exposition.*" (1990) IEEE Transactions on Plasma Science (ISSN 0093-3813), vol. 18, Feb. 1990, p. 5-10.

[28] Borchardt, G., P.J. Aruscavage, and H.T. Millard, Jr., "*Correlation of the Bishop ash, a Pleistocene marker bed, using instrumental neutron activation analysis.*" (1972) Journal of Sedimentary Petrology. **42**: p. 301-306.

[29] Borchardt, G., "*Resolution of SLT-order paradox.*" (2008) Proceedings of the Natural Philosophy Alliance (in press), **5**(1): http://www.worldsci.org/pdf/abstracts/abstracts_3.pdf

[30] Borchardt, G., "*Infinite universe theory.*" (2007) Proceedings of the Natural Philosophy Alliance, **4**(1): p. 20-23.

[31] Borchardt, G., "*The physical meaning of $E=mc^2$.*" (2009) Proceedings of the Natural Philosophy Alliance (in press), **6**(1): http://www.scientificphilosophy.com/Downloads/The%20Physical%20Meaning%20of%20E%20=%20mc2.pdf

[32] Kashlinsky, A., et al., "*A measurement of large-scale peculiar velocities of clusters of galaxies: Results and cosmological implications.*" (2008) The Astrophysical Journal, **686**: p. L49–L52.

[33] Rayleigh, L.; Lodge, O., "*The Ether of Space*" (1908) The Royal Institution Library of Science; London. Friday Evening Discourses in Physical Sciences. February 21, 1908.

[34] Christiansen, R. L.; Lowenstern, J. B.; Smith, R. B.; Heasler, H.; Morgan, L. A.; Nathenson, M.; Mastin, L. G.; Muffler, L. J. P.; Robinson, J. E., "*Preliminary Assessment of Volcanic and Hydrothermal Hazards in Yellowstone National Park and Vicinity*." (2007) U.S. Geological Survey, Open-file Report 2007-1071, p. 94

[35] NASA, Goddard Institute for Space Studies, "Global Land-Ocean Temperature Index in 0.01 degrees Celsius." (2010) HadISST1, http://data.giss.nasa.gov/gistemp/tabledata/GLB.Ts+dSST.txt

[36] Carey, S.W., "*The Expanding Earth*." (1976) New York: Elsevier/North-Holland. 488.

[37] Shen, W.-B., "*The Expanding Earth: Evidence From Temporary Gravity Fields and Space-Geodetic Data.*" (2008) [http://www.worldsci.org/php/index.php?tab0=Abstracts&tab1=Display&id=1116].