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CLIMATE CHANGE AND SOME OTHER IMPLICATIONS OF VIBRATORY EXISTENCE

Dr Glenn McLaren

Abstract: Modern Process Philosophy began when Alfred North Whitehead realized that existence is primarily vibratory, not points but processes. Vibrations are best understood as sound waves, or through using auditory metaphors rather than visual ones. Our Universe is more like music than matter, but how does this help us better understand it? In this paper I use the example of the large ocean current oscillators that help drive our climate systems to reveal the more effective nature of auditory approaches. Through an auditory approach, we can better understand the ways these oscillations constrain and interact with other levels of oscillations as well as how they might be destroyed by other levels. This can then lead to us extending our ethics to the conservation of these oscillations.

Keywords: Climate change, Process Philosophy, vibration, vibratory existence, oscillation, flatland, mean.

Around the fourth century B.C., Androsthenes, Alexander the Great's scribe, while marching to India, observed that the leaves of tamarind trees always opened during the day and closed at night.[1] According to Steven Strogatz, this is one of the earliest recorded recognitions of what we now refer to as oscillating, or vibrating systems. In the 1920's, in his book, *Science and the Modern World*, Alfred North Whitehead proposed that existence is vibratory.[2] Whether it is superstrings, quantum wave packets, living organisms, human social systems or suns and galaxies, all in the Universe vibrates, just at different frequencies and amplitudes. Primarily, existence is more like music than matter. In this paper I will explore some of the implications of this statement. Whitehead's realization that primary existence was vibratory led to him becoming one of history's foremost Process Philosophers, influencing the development of an alternative metaphysical tradition. Arran Gare has followed and moved beyond

1. This is in Steven Strogatz, *Sync: How Order Emerges from Chaos in the Universe, Nature and Daily Life*, (New York, Hyperion, 2003) p.104.

2. Alfred North Whitehead, *Science and the Modern World,* (New York, The Free Press, 1925). In Chapter VIII Whitehead makes his argument based on developments in Quantum Physics that primary entities in the Universe are energy vibrations, not essentially inert matter as Classical science had assumed.

Whitehead and has also suggested that Process Metaphysics be thought of in terms of auditory analogies rather than visual ones. In this paper I will seek to provide support for Whitehead's and Gare's position.[3]

Climate change is perhaps the defining issue of our time. As Jared Diamond argues in his book, *Collapse*, how we respond to such life-threatening phenomena largely determines our ability to survive them.[4] In this paper, as well as arguing that existence is vibratory, I will argue that understanding this vibratory nature is a necessary pre-condition for effectively responding to the life threatening challenges posed by climate change. What I am suggesting is that if we do not learn to respect and preserve the vibratory nature of natural phenomena, and instead seek through our own abstract creations to excessively dampen vibrations to serve our own immediate needs, we are doomed. I will argue this by first examining the nature of vibratory existence and then revealing some of its implications, including anthropogenic climate change. I will then suggest ways in which we can respond to and better anticipate life-threatening problems.

THE NATURE OF VIBRATORY EXISTENCE

There are a few words that I need to define before proceeding. The first are the words *vibrate* and *oscillate* as well as *frequency* and *amplitude*. The words *vibrate* and *oscillate* have come to be used synonymously despite both having differing origins. Vibrate can be traced to the Latin word *vibratus*, which means to 'move quickly to and fro', or shake, which itself has roots in words referring to the wagging of a dog's tail, swinging or wiping.[5] *Oscillate* has roots in the Latin word *oscillum*, which means small mouth. According to The American Heritage Dictionary, Virgil, in a passage from the *Georgics*, applies the word to '…a small mask of Bacchus hung from trees to move back and forth in the breeze.'[6] The fact that this word went on to be applied to anything having the character of a swinging motion, such as pendulums and weather systems, reveals the dynamic and metaphoric nature of language. Our modern conception of vibrations and oscillations is largely associated with the successes of mathematical physics. The project in physics to measure moving bodies in both nature and mechanisms has led to differential equations and state spaces. In such spaces moving phenomena are displayed as lines consisting of plotted points that trace either regular or irregular paths consisting of peaks and troughs. The resulting pattern resembles a wave, another metaphor that has its roots in the back and forth movement of a hand in greetings or farewells, which was later, applied to the undulations of the ocean.[7]

3. Gare argues this position drawing upon Henri Bergson's arguments in, Arran Gare, N*ihilism Inc:,Environmental Destruction and the Metaphysics of Sustainability*, (Como, Eco-Logical Press, 1996), p. 313.

4. Jared Diamond, *Collapse: How Societies Choose to Fail or Succeed*, (New York, Penguin, 2005) p. 11.

5. Dictionary.com. *Online Etymology Dictionary*. Douglas Harper, Historian. http://dictionary.reference.com/browse/vibrate (accessed: October 04, 2008).

6. Dictionary.com. The American Heritage® Dictionary of the English Language, Fourth Edition. Houghton Mifflin Company, 2004. http://dictionary.reference.com/browse/oscillate (accessed: October 04, 2008).

7. Dictionary.com. Online Etymology Dictionary. Douglas Harper, Historian. http://dictionary.reference.

Is it meaningful to distinguish between these words? Where does a vibration finish and an oscillation or wave start? My position is that the Universe is constituted by multiple vibratory space-time levels; vibrations within vibrations. Whether we call them vibrations, oscillations or waves probably makes little difference. Whitehead uses the word *vibration*, but then, as has been argued by those such as Gare and Ivor Leclerc, Whitehead's process metaphysics tended to focus more on the constituents of composite entities, what he called the actual occasions, rather than the irreducible and unique nature of composite entities themselves.[8] Does this mean that for Whitehead vibrations constitute oscillations, or that a distinction can be made in relation to scale? I don't think so. Making such distinctions would only complicate my argument, so I will use the words interchangeably.

Frequency and amplitude, however, can be distinguished. Vibrations, oscillations and waves are abstractly represented in state space as having particular frequencies and amplitudes. It is their relative frequencies and amplitudes which distinguish vibrations from each other. In physics, '…a frequency is defined as the number of crests of a wave that move past a given point in a given unit of time…The frequency of a wave can be calculated by dividing the speed of the wave by the wavelength. Thus, in the electromagnetic spectrum, the wavelengths decrease as the frequencies increase, and vice versa.'[9] Amplitude is defined in physics as: 'One half the full extent of a vibration, oscillation, or wave. The amplitude of an ocean wave is the maximum height of the wave crest above the level of calm water, or the maximum depth of the wave trough below the level of calm water. The amplitude of a pendulum swinging through an angle of 90° is 45°.'[10] As with *vibrate* and *oscillate*, both words have their roots in less abstract historical situations. In a Universe consisting of multiple vibratory levels of space-time, I will argue that one way of distinguishing such levels, is to identify their particular frequencies and amplitudes. In fact, the relationship between frequency and amplitude abstractly represents the relationship between time and space.

Many Eastern philosophies have a well developed understanding of the vibratory nature of existence dating back to the emergence of the *I Ching* around 2,900BCE. In this ancient text that was to strongly influence Chinese, Japanese and Indian philosophy up to the present day, as well as influencing more dynamic approaches in Western philosophy, change is seen as fundamental conditioned by the interactions of the emergent forces of *Yin* and *Yang*. Richard Wilhelm interprets the oscillating nature of the relationship between *Yin* and *Yang* and the whole from which it emerges in the following:

> However, no matter what names are applied to these forces, it is certain that the

com/browse/wave (accessed: October 14, 2008).

8. This relates to Gare's and Leclerc's criticisms of Whitehead's atomism. Arran Gare, *Nihilism Inc.*, op. cit. and Ivor Leclerc, *The Nature of Physical Existence*, (London, Allen and Unwin, 1972).

9. Dictionary.com. The American Heritage® New Dictionary of Cultural Literacy, Third Edition. Houghton Mifflin Company, 2005. http://dictionary.reference.com/browse/frequency (accessed: October 13, 2008).

10. Dictionary.com. The American Heritage® Science Dictionary. Houghton Mifflin Company. http://dictionary.reference.com/browse/amplitude (accessed: October 13, 2008).

> world of being arises out of their change and interplay. Thus change is conceived of partly as the continuous transformation of the one force into the other and partly as a cycle of complexes of phenomena, in themselves connected, such as day and night, summer and winter. Change is not meaningless -- if it were, there could be no knowledge of it—but subject to the universal law, tao.[11]

In the West, change has not been so easily assumed or accepted and has in fact been denied by some. Concepts of vibratory existence can be said to have emerged in Western thought from debates over whether space and time were continuous or discrete. According to Cornford, prior to the emergence of Ancient Greek Philosophy and Mathematics, space was generally seen to be bounded and time seen to be continuous and irreversible. Ancient Greek mathematics and philosophy, however, through its increased capacity for abstract thought, challenged these naïve views.[12] An important figure in these developments and in the history of vibratory existence due to his obsession with music and numbers was Pythagoras, although, as McClain argues, the relationships between music and mathematics can perhaps be traced back at least to the Ancient Sumerians some two thousand years earlier.[13] The Pythagoreans conceived of the Solar System as consisting of ten spheres revolving around a central fire. The distances between the spheres had the same ratios that produced harmonious sounds from a plucked string. Each sphere produced a sound like the sound of an object accelerating through the air. Closer and slower moving spheres produced lower tones while faster, more distant spheres, faster probably due to centrifugal force, produced higher pitched tones.[14] As well as plucking strings, the Pythagoreans counted by arranging objects like stones. In between the stones were seemingly empty spaces leading them to conclude that what separated objects, such as planets, within the spheres, was a void.

It is this concept of the void, or empty space that has attracted much controversy due to its highly abstract nature. As Cornford argues, it is the invention of geometers and atomists which eventually led to the counter-intuitive concept of infinite space:

> As geometry developed, mathematicians were unconsciously led to postulate the infinite space required for the construction of their geometrical figures—that space in which parallel straight lines can be produced 'indefinitely' without meeting or reverting to their starting point. In the sixth and fifth centuries no distinction was yet drawn between the space demanded by the theorems of geometry and the space which frames the physical world. We know from Aristotle that the earlier Pythagoreans did not even distinguish the solid figures of geometry from the bodies we daily see and handle. Hence the considerations which led mathematicians to recognize infinite space in their science simultaneously led some physicists to

11. Richard Wilhelm, *The I Ching or Book of Changes*, Cary F. Baynes, Trans., Introduction at www.iging.com/intro/introduc.htm#Top, (accessed 18/7/09).

12. E.M. Cornford, 'The Invention of Space', in *The Concepts of Space and Time: Their Structure and Development*, Milic Capek Ed., (Dordrecht, D. Reidel Publishing, 1976) pp. 3-16.

13. Ernest G. McClain, 'Musical Theory and Ancient Cosmology', in *The World and I*, February 1994 (p.p. 371-391), at http://www.new-universe.com/pythagoras/mcclain.html, (accessed 22/7/09).

14. Paul Calter, *Pythagoras and the Music of the Spheres*, Dartmouth College, 1998, at http://www.dartmouth.edu/~matc/math5.geometry/unit3/unit3.html. Viewed 18/10/08.

> recognize an unlimited void in nature. These were the atomists, whose system was the final outcome of a tradition inspired by Pythagorean mathematics.[15]

Parmenides and Aristotle held different views. Parmenides opposed the whole concept of nothingness. While believing in a celestial sphere, he held that this sphere was completely filled in and the perception of space was an illusion. Aristotle's view was that the celestial sphere contained everything there was without being contained in anything.[16] Relative to even our understanding today, both views can be interpreted as having some truth to them. Such ancient theories of finite and infinite space, therefore, came to influence later relativist and absolutist theories.

As Capek argues, time is a far more elusive phenomenon than space and is '… bound up with introspective experience.'[17] The musical and revolving nature of the Pythagorean celestial sphere, meant that Pythagoreans were unable to separate time and space. This separation was the achievement of the atomists. It was Parmenides who famously denied succession and becoming in opposition to those such as Heraclitus, but according to Capek, this position was too radical for the atomists:

> While they retained the Eleatic principle of the immutability of Being, they modified it in such a way as to make it compatible with experience. Change was not denied, but merely reduced to the displacement of the atoms, each of which was the Parmenidean plenum on a microscopic scale: uncreated, indestructible, immutable, impenetrable. What was the place of time in such system? Since only two basic principles were posited—matter and the void—time was not included among them; it was a mere appearance.[18]

The revolving motion of the Pythagorean sphere, however, did have a significant effect on the development of the concept of time:

> …it focused the attention of philosophers on the regular periodicity of the celestial motions by which time can be measured, and thus it deepened the distinction between the qualitative content of time and its metrical aspects;…the correlation of time with spatial motion was, as we have just seen, the source of the relational theory of time; …finally, the alleged inseparability of time from spatial displacements created the tendency to exaggerate the analogy between space and time and, eventually, to spatialize time altogether, and thus eliminate it entirely.[19]

Like Gare and Whitehead, Capek argues that these extreme views of time and space have persisted throughout the whole history of Western thought. While not being denied completely, change and time were consistently excluded from the realm of 'true reality'.

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15. Cornford, op. cit., p. 6.
16. Milic Capek, 'Introduction', in *The Concepts of Space and Time: Their Structure and Development*, Milic Capek Ed., (Dordrecht, D. Reidel Publishing, 1976), p. xix.
17. Ibid, p. xxvi.
18. Ibid, p. xxvii.
19. Ibid, p. xxvii.

PROCESS PHILOSOPHY AND SPACETIME

Process Philosophy emerged as a reaction to this exclusion. Of particular concern to Whitehead was the concept of simple location. The spatialization of time just discussed underpinned the mechanistic concepts of Descartes in the 17th Century. Not only did he radically reduce mind to subjective states of what he conceived to be an objective soul's consciousness, he was instrumental in '…uniting Euclidian geometry and symbolic algebra into a single system of coordinate geometry.'[20] After Descartes time and space became separate x and y coordinates on a grid in which the motion of matter could be plotted as discrete points. This has been referred to as the oxymoronic, instantaneous rate of change and continued the trend since Pythagoras to mathematize reality. This has led to the development of more and more sophisticated levels of abstraction with the development of calculus by Newton and Liebniz, the phase space of Hamilton and the binary logic of George Boole. Descartes' grid has evolved to become virtual multi-dimensional phase or state space within which the motions of complex systems can be plotted as a series of discrete events which represent 'real' time thanks to the iterative power of modern computers. As Hobart and Schiffman argue, Descartes was part of a tradition of those who have sought to tightly define and manage information in response to perceived chaos, no matter how far from reality this may take them.[21]

An example of this is the materialist concept of simple location. According to Whitehead:

> To say that a bit of matter has *simple location* means that, in expressing its spatio-temporal relations, it is adequate to state that it is where it is, in a definite finite region of space, and throughout a definite duration of time, apart from any essential reference of the relations of that bit of matter to other regions of space and to other durations of time.[22]

For Whitehead, this concept is an example of committing what he calls 'the fallacy of misplaced concreteness', the fallacy committed when abstract entities are conceived as being primary, ignoring or losing sight of the processes of becoming from which such abstractions emerge. According to Whitehead this fallacy is committed by classical scientific materialists who presuppose '…a definite present instant at which all matter is simultaneously real.'[23] Modern relativity theory, however, revealed to Whitehead that there is no unique present instant. The discovery by Michelson of a constant speed of light meant that the differing velocities of bodies in the Universe had to be seen to be relative to the speed of light, or as Whitehead puts it in relation to the velocities of the Earth and a comet:

> Accordingly, velocity has different meanings for the two bodies. Thus the modern scientific assumption is that if anything has the speed of light by reference to any

20. Michael E. Hobart and Zachary S. Schiffman, *Information Ages: Literacy, Numeracy and the Computer Revolution*, (Baltimore, The Johns Hopkins University Press, 1998), p. 127.

21. Ibid, Ch. 5.

22. Whitehead, *Science and the Modern World*, op. cit., p. 58.

23. Ibid, p. 118.

> one meaning of space and time, then it has the same speed according to any other meaning of space and time.[24]

For Whitehead, space and time are primarily unities that become differentiated through the enduring nature of patterns. Endurance of patterns is constituted by multiplicities of events of different durations: what he refers to as epochal wholes succeeding each other. As Stengers argues, however, for Whitehead it is not endurance that is primary but becoming: '…everything that exists must be conceived not first as enduring, but as becoming, as the actualization of a potentiality, as making a difference between what could have been, but will not, and what will be.'[25] The concept of simple location begins with space and time already differentiated and absolute, a position that cannot then account for change. Whitehead begins with a unity that becomes differentiated and oscillates through processes of succession revealing better the dynamic nature of the Universe and its constituents.

But it was not only relativity that challenged the concept of simple location. Atomists always had a problem, identified by Aristotle, with the contradiction that extended, indivisible atomic bodies could be composed of smaller such bodies. Liebniz addressed this problem by arguing that bodies are not simple but pluralities and attributes of such bodies, such as hardness and extension, should be analyzed as relations.[26] Field theories, such as relate to electro-magnetism and relativity, emerged from this and challenged the atomistic, discrete view of space by positing the notion of a space-time continuum. What then challenged this continuous view of space-time was quantum theory. Some interpretations of quantum theory, however, created the paradox once again of discontinuous fundamental entities underpinning the continuous existence of material entities. As Capek argues, however, this is a problem for those using geometrical visual metaphors but not for those using auditory ones, such as Whitehead.[27] For Whitehead, there is no paradox in the relationship between the micro and macro world:

> There is no difficulty in explaining the paradox, if we consent to apply to the apparently steady undifferentiated endurance of matter the same principles as those now accepted for sound and light. A steadily sounding note is explained as the outcome of vibrations in the air: a steady colour is explained as the outcome of vibrations in ether. If we explain the steady endurance of matter on the same principle, we shall conceive each primordial element as a vibratory ebb and flow of an underlying energy, or activity. Suppose we keep to the physical idea of energy: then each primordial element will be an organized system of vibratory streaming of energy. Accordingly there will be a definite period associated with each element; and within that period, the stream-system will sway from one

24. Ibid, p. 118.

25. Isabelle Stengers, 'Unity Through Divergence', in *Applied Process Thought 1:Initial Explorations in Theory and Research*, Mark Dibben and Thomas Kelly (Eds.), (Heusenstamm, Ontos Verlag, 2008), p. 129.

26. Glenn McLaren, *The Metaphysical Roots of Physical Inactivity and Obesity in Late-Capitalism*, Ph. D Thesis, Swinburne University, 2004, p. 100

27. Milic Capek, op. cit., p. LV.

> stationary maximum to another stationary maximum—or, taking a metaphor from the ocean tides, the system will sway from one high tide to another high tide. This system, forming the primordial element, is nothing at any instant. It requires its whole period in which to manifest itself. In an analogous way, a note of music is nothing at an instant, but it also requires its whole period in which to manifest itself.[28]

The idea that both sound and colour are the consequences of environmental vibrations is, of course an over-simplification on Whitehead's part that ignores the complex vibratory activities of perception, some of which he understood in his later works but which came to be better understood after Whitehead's time. The central and still highly relevant insight of Whitehead is, however, that if the primordial elements of our Universe are wave-like and require a whole period to manifest, then they are not points, but processes. This is the idea underpinning Process Philosophy today and particularly the process metaphysics of Arran Gare. I will now briefly summarize Gare's metaphysics, but if auditory metaphors and analogies better reveal the vibratory nature of reality then it is incumbent upon me to use them. There is a problem, however, in that living in a world of other senses renders me incapable of any pure auditory experience. Therefore, my metaphors will often be mixed ones.

Process metaphysics begins with cosmology, or theories of the nature, origin and fate of our Universe. We can only understand ourselves through an understanding of the context within which we emerged and participate. The Twentieth Century saw major transformations in our understanding of our Universe. Relativity, quantum, and later, complexity theories, challenged previous static, deterministic and Absolutist views by revealing our Universe to be complex, dynamic, and evolving. We also came to understand the ways in which our understanding is mediated via our perception. These developments have resulted in the emergence of the current popular theory of early Universe cosmology, Cosmological Inflation. According to 'The Oxford Companion to Cosmology', inflation theory:

> …postulates that the Universe underwent a period of accelerated expansion during its earliest stages, during which its size increased by a huge factor. Such an expansion explains a series of otherwise puzzling features about the large-scale Universe, known as the horizon problem, the flatness problem and relic particle abundances. Inflation's most important role in modern cosmology is that it provides a quantitative theory for the origin of density perturbations in the Universe, which ultimately induce structure formation, with the predictions of the simplest inflationary models showing excellent agreement with observations.[29]

What is particularly interesting for Process Philosophy about Inflation Theory is that it reveals a growing awareness of the limits to atomistic materialism in trying to understand the nature of our Universe. For example, the origins of Inflation Theory

28. A. N. Whitehead, op. cit., p. 35.

29. Andrew Liddle and Jon Loveday, *The Oxford Companion to Cosmology*, (Oxford, Oxford University Press, 2008), p. 74.

lie in the application by Steven Weinberg and later, Alan Guth, of the originally thermodynamic concept of phase transitions to explain symmetry breaking. Phase transitions create density perturbations which act as levels of constraint which limits potential creating the conditions for novel order and structure to distinguish itself. In complexity theory they are associated with concepts of non-linear emergence. Inflation theory also relies on the existence of scalar fields, or quintessence which is a more dynamic and relative concept than cosmological constants.[30] Also essential to the theory is the concept of quantum tunneling which can only be understood if quantum entities act as waves. Lastly, Inflation Theory provides the possibility of an open Universe in which phase transitions continue to occur as well as the possibilities of the continual creation of multiple universes. Modern cosmology, therefore, seems to be following Whitehead and evolving towards process metaphysics and vibratory existence. In what follows I will therefore draw loosely upon the theory of Cosmic Inflation, while conforming to the demand in Process Philosophy for truths to be both contingent and provisional.

A cosmology such as Inflation Theory is required because metaphysics requires us to understand and interpret continual developments in human knowledge. Also, Gare begins with cosmology in asking us to begin by imagining a lack of order in the Universe from which order emerges and evolves. Gare also recognizes that metaphysical schemes must be general. Efforts to define reality too sharply become too abstract, which became a problem for Whitehead, particularly in his major work, *Process and Reality*, as well as for atomistic approaches to physics. With auditory metaphors this is not a problem as sound has a more ephemeral nature with no simple location. Precise definitions are more like notated music than the sound of it. Gare's scheme is therefore based on four general categories within which eight sub-categories can be defined. As he explains it:

> The first categories to be defined (the categories of the ultimate—into which all primary beings can be analyzed) are activity, order and potentiality. These are required to define the other categories without being presupposed by them. As such they are the most difficult categories to define. The second categories (the categories of existence), process, structure and event, characterize what exists as primary beings in the world. The third categories (the categories of explanation), of causation, pertain to the explanation of all that has existed, does exist and could exist, while the fourth categories (the categories of ultimate potentiality), of spatio-temporal position (where space and time are shown to be inseparable from each other and ontologically derivative), are the most fundamental concepts defining potential relationships between actual or potential existents,[31]

As mentioned, to begin, Gare asks us to imagine an absence of order.[32] This is

30. Andreas Albrecht explains and gives support to the dynamic nature of initial conditions in Inflation Theory over traditional absolute notions in, Andreas Albrecht, 'Cosmic Inflation and the Arrow of Time' in *Science and Ultimate Reality: Quantum Theory, Cosmology, and Complexity*, John D. Barrow and P. C. W. Davies Eds., (Cambridge, Cambridge University Press, 2004), pp. 363-401.

31. Arran Gare, *Nihilism Inc.*,op. cit., p. 313.

32. These speculations are based on Arran Gare's process metaphysical categories presented in Nihilism

because all order in the Universe, whether it be space-time, causation or structure, has emerged within the emergence and evolution of the Universe itself. Imagining a lack of order is difficult. Like Parmenides, I have difficulty conceiving of something emerging from nothing. Inflation theory seems to suggest that the Universe could have emerged from nothing, a singularity, or it could have emerged from a bubble in another Universe. Both sound like something to me. But what does this something sound like? Here I immediately encounter a limit to my understanding in that I can only conceive of the sound of a universe devoid of order in relation to already emergent order. However, this is not such a problem because as Astronomer, Mark Whittle explains it sound emerged within our Universe with the emergence of order. Just as modern Cosmologists and Astro-physicists are now seeing our Universe as vibratory and dynamic, scientists, such as Whittle, are conceiving it in terms of auditory analogies rather than visual ones. Whittle has created a representation of the sound of the *Big Bang,* or at least the first 400,000 years of our Universe the nature of which is revealed in the Cosmic Microwave Background, condensed into ten seconds.[33]

After the initial flash until just after Cosmic inflation, the Universe is silent. Whittle describes this silence paradoxically as a *quantum hiss* or *pure noise* that contains all frequencies. It is pure potential. This is because the extremely hot plasma that emerges is too uniform for sound waves to form. Inflation amplifies quantum fluctuations creating gravity pressure differences, or clumps, in the baryon-photon plasma. Sounds then emerge from the vibrations produced by plasma sloshing in and out of the peaks and troughs of dark matter clumps. As our Universe expands and cools frequencies become longer and gravitational pressure differences increase raising the volume, or amplitude until small dark matter clumps collapse to become the first stars. Whittle describes the sound of this process as a 'descending scream' which then settles into a deep roar followed by a high pitched hiss. The quality of the sound as revealed by a sound spectrum reveals a fundamental and broad harmonics similar to many musical instruments. The loudness is 110 decibels and the frequency is fifty octaves below human hearing due to the size of the waves which relative to a stationary observer would pass by every 20,000 to 200,000 years. The descent in pitch is due to the expanding cosmic horizon.[34]

Whittle's acoustic, or auditory conception of the creation of our Universe, challenges the materialist particle physics perspective that the conditions at the beginning of our Universe are analogous to opposing pairs of marbles being smashed by a hammer until this symmetry is broken. This is the position that Nobel Prize winning Physicist, Robert Laughlin argues against in favour of the concept of a phase transition. Laughlin's argument is within the context of his criticisms of those of his colleagues who continue to use particle metaphors while knowing fundamental entities are better understood as waves. He argues for a paradigm shift to concepts of emergence in physics.[35] Waves,

Inc., op. cit., Ch. 13.

33. Mark Whittle's acoustic story of the creation of our Universe can be found at, http://www.astro.virginia.edu/~dmw8f/BBA_web/index_frames.html, (accessed 2/8/09).

34. Ibid.

35. Robert Laughlin, A Different Universe: Reinventing Physics from the Bottom Down, (Cambridge,

while we can think of them as crashing, do not collide or get smashed like marbles but intersect, overlap and interrelate like ocean currents or orchestral arrangements. From an auditory perspective, phase transitions are a better way of conceiving of symmetry breaking. The conditions for the origin of the Universe can be considered to be a phase of potentiality and the beginning of order, a phase transition. Phase transitions, like the transition from water to steam, emerge from critical levels of interaction, not from breaking things. Rather than breaking things, waves, as vibrating, or oscillating systems, create relationships of varying durations and intensities. Complexity theorists, like Strogatz, have revealed how such relationships are created through the tendency of oscillators to synchronize, whether living or not.[36] It seems reasonable to suggest that the phase transitions that began the Universe emerged from the spontaneous synchronization of oscillators, conditioned by the existence of a realm of potentiality.

As Whittle further explains, as the initial fog of the plasma dissipates as light is released and our Universe becomes transparent, the sound ceases with the disappearance of the medium. The waves however, silently continue on and blend with new oscillations beginning to be created with newly emerging structures. Within these structures new mediums are formed able to again conduct sound, such as our own atmosphere. Cosmic inflation dramatically altered the acoustics of our Universe but in these early stages there was sound but no music. Using music metaphors I suggest that through later processes of re-heating, synchronizations of waves create basic rhythms, like drum beats. These beats reverberate, providing constraints for more complex ordering. Soon, other oscillators are joining in, creating similarly repetitive but more complexly patterned frequencies. This is the bass line. The beats and bass lines then provide the constraints for the emergence of melodies. The first melodies create the constraining conditions for further melodies to burst forth, creating a multitude of diversity following the proscriptive logic that whatever is not forbidden, is allowed.[37] Our Universe soon resounds with what ecologist Ramon Margalef calls, 'the baroque of nature'.[38] In a musical sense, therefore, it is the complex and vibrant fugue-like mix of polyphony and counterpoint.

It is melody that creates interesting new vibratory patterns in the Universe. The bass line also introduces changes in frequency, or pitch, but these, like the back beat, are repetitive. Melodies are patterned changes in vibration frequencies. They introduce novel arrangements of frequencies with amplitude changes adding further light and shade. Melodies can both repeat and go in novel directions. They can move in and out of sync with the back beat and in turn become constraints for the emergence of

Basic Books, 2006) p. 113.

36. This is in Stevenn Strogatz, Sync. op. cit.

37. The idea of proscriptive logic comes from Francisco Varela's evolution theory that he calls Natural Drift. Orthodox theories,. he argues, are prescriptive taking the form of ,'whatever is not allowed, is forbidden'. Francisco J. Varela, Evan Thompson and Eleanor Rosch, The Embodied Mind: Cognitive Science and Human Experience,(Cambridge, The MIT Press, 1993), p. 195.

38. This is quoted in reference to the puzzle of diversity in ecosystems in Ricard Sole and Brian Goodwin, Signs of Life, How Complexity Pervades Biology, (New York, Basic Books, 2000), p. 179.

novel beats and bass lines. This rapid explosion of diverse melodies ends up constraining itself as further synchronization of oscillators leads to critical levels of interactions where a more stable hierarchy of enduring patterns emerge. Some of these enduring patterns have been identified as the laws of our Universe. But auditory analogies reveal that these laws are emergent. They are the product of synchronizing oscillators and not themselves primordial. An auditory approach gives support to Laughlin's thesis that all scientifically recognized, so-called fundamental entities in the Universe are themselves the emergent products of collective behaviour.[39]

As the expansion cools relatively stable order can be heard as particular genres, similar perhaps to the emergence of different musical styles. When the Universe is cool enough, a particular relationship emerges between order and chaos which affords a new phase transition, the emergence of life. The oscillatory nature of existence is particularly emphasized by Gare in relation to the emergence and evolution of life. For example, Gare supports C.H. Waddington's concept of morphogenetic fields in relation to the development of living structure. Using auditory analogies, Waddington argues that:

> We could not have a 'neural plate substance, a fore-limb substance, a hind-limb substance' etc. but neural plate, fore-limb or hind-limb oscillatory patterns, which could be regarded as analogous to musical themes or chord sequences. The later phases of differentiation into the various cartilages, bones, muscles etc., must certainly involve the 'activation' of different structural genes controlling the proteins in these different sorts of cells; but we could interpret these changes as similar to the development of the initial themes according to the conventions of some school of classical music composition.[40]

Gare also supports concepts of structural hierarchy put forward by those such as Howard Pattee as well as Ilya Prigogine's thermodynamic concepts of dissipative structure. He argues that '…hierarchical ordering can be achieved on the basis of oscillations generated by states of far from thermodynamic equilibrium.[41] Such an emergent hierarchy of oscillations constrains what the musician can do; as Norbert Weiner argues: 'You can't play a jig on the lowest register of the organ.'[42] Drawing also on concepts of oscillations and non-linearity of theorists such as A. S. Iberall, Gare concludes that it is oscillations that account for the distinctive characteristics of life. According to Iberall:

> Thus life is tentatively defined as any compact system containing a complex of sustaining non-linear limit cycle oscillators, and a similar system of algorithmic guiding mechanisms, that is capable of regulating its interior conditions for a considerable range of ambient environmental conditions so as to permit its own satisfactory preservative operation; that is capable of seeking out in the

39. Robert Laughlin, *A Different Universe*, op. cit.

40. C.H. Waddington, 'Cellular Oscillations and Development', in *Towards a Theoretical Biology 2 Sketches* (Edinburgh, Edinburgh University Press, 1969), quoted in A. Gare, Nihilism Inc., op. cit, p.p. 339-340.

41. Ibid, p. 341.

42. Norbert Weiner, 'Spatio-Temporal Continuity, Quantum Theory and Music', in *The Concepts of Space and Time: Their Structure and Development*, Milic Capek Ed., (Dordrecht, D. Reidel Publishing, 1976. p. 545.

> environment and transferring and receiving those fluxes of mass and energy that can be internally adapted to its own satisfactory preservative operation; that is capable of performing those preservative functions for a long period of time commensurate with the 'life of its mechanical-physical-chemical elements…'[43]

When we apply auditory analogies to such definitions, life seems less distinct from what led to it. This is perhaps what Whitehead was trying to convey about the organic nature of the Universe prior to life emerging. Life is distinguished, however. Life is the complex, non-linear, hierarchical, baroque arrangement of particular frequencies of beats, bass lines and melodies all synchronizing to self-regulate vibratory existence. Life can assert its independence (follow the beat of its own drum) while being in sync with the whole. Life is music that begins to hear music, that is; not only do musical patterns merely affect each other (as waves interact) but an essentially non-linear musical semiotic emerges. Unlike non-living processes, life transforms the music of the Universe into novel arrangements in order to regulate its own existence. But life at lower levels of complexity is limited in creative freedom and ability. It is with the emergence of the level of human beings, perhaps the most complex musical arrangements in the Universe, where singer/composers emerge; producers of music produced by music.

The singer/composer is able to consciously synchronize other levels of oscillations with their own compositions. They are able to reflect upon and narrate the stories of other levels. They are also able to give form to thought, transfer the patterns of less stable frequencies to more stable ones. They are able to remove sections of patterns and represent them as dots on straight lines. They are then able to manipulate their new creations while obscuring their origins and nature. Now and then they can synchronize multiple oscillators with their abstractions (melodies and words) and through mechanism and organism, create profound, insightful musical experiences, or relationships. Paradoxically, however, it is through some limited awareness of the nature of patterns of oscillations that humans have become capable of consciously destroying their relationships to vibratory existence.

My argument so far has been that all in the Universe exists as vibrations, that vibratory existence can best be understood through the use of auditory metaphors and that this position is consistent with Gare and Whitehead's process view. These auditory metaphors and analogies may sound ridiculous and incur the wrath of analytical philosophers, mechanistic materialists and others lacking in imagination, but they are no more ridiculous than physicists talking about particles. As Laughton says, while physicists still speak of atoms using metaphors of billiard ball-like particles: 'Atoms are not billiard balls at all but waves, as are their constituents, which bind together to form atoms the way waves of water bind to make a surge.'[44] We may as well go further though and suggest that the Universe is like music, not matter. As Weiner, a pioneer of harmonic analysis, said in reference to a talk he gave at Gottingen in 1925:

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43. A.J. Iberall, 'New Thoughts on Bio-Control, in *Towards a Theoretical Biology 2 Sketches*, quoted in A. Gare, Nihilism Inc., p. 342.

44. Ibid, p. 31.

> […] I had clearly in mind the possibility that the laws of physics are like musical notation, things that are real and important provided that we do not take them too seriously and push the time scale down beyond a certain level. In other words, I meant to emphasize that, just as in quantum theory, there is in music a difference of behaviour between those things belonging to very small intervals of time (or space) and what we accept on the normal scale of every day, and that the infinite divisibility of the universe is a concept which modern physics cannot any longer accept without serious qualification.[45]

VIBRATORY EXISTENCE AND CLIMATE CHANGE

In this section I will apply the concept of vibratory existence I have outlined to the developing problem of anthropogenic climate change, arguing that to understand the nature of the problem we will need to conceive of it in auditory terms of relational oscillating processes. The term anthropogenic of course implies that humans are somehow involved in producing changes in climate. From an auditory perspective this is a trivial argument as the synchronization and interrelatedness of oscillations reveal that there is no sense in which humans cannot be involved in creating and maintaining the climate. This gives further support to James Lovelock's Gaia theory in which living organisms help create the conditions for their existence.[46] I am not, however, going to get involved in all of the data and arguments for and against anthropogenic climate change but focus on human beings' relationship to one particular oscillator, the North Atlantic Current.

OSCILLATING OCEAN CURRENTS AND CLIMATE CHANGE

In 2003, the then President and Director of Woods Hole Oceanographic Institute, Robert Gagosian, prepared a report on abrupt climate change for The World Economic Forum meeting in Davos.[47] In it, Gagosian argues that, historically, the effects of climate change are non-linear; that is, there are quick jumps from one stable pattern to another. The de-stabilizing of the Earth's weather patterns could produce abrupt shifts and potential counter-intuitive effects such as regional cooling within a gradually warming overall climate. While the complex and dynamic climate system of the Earth has several modes producing different patterns, Gagosian argues that:

> Scientists have so far identified only one viable mechanism to induce large, global, abrupt climate changes; a swift reorganization of the ocean currents circulating around the earth. These currents, collectively known as the Ocean Conveyor, distribute vast quantities of heat around our planet, and thus play a fundamental

45. Norbert Weiner, 'Spatio-Temporal Continuity, Quantum Theory and Music', op. cit., p. 545.

46. James Lovelock, *Gaia: A New Look at Life on Earth*, (Oxford, Oxford University Press, 2000).

47. This report, Robert B. Gagosian, *Abrupt Climate Change; Should We Be Worried*, is at www.whoi.edu/page.do?pid=12455&tid=282&cid, (viewed 12/2/09).

role in governing Earth's climate.[48]

The Ocean Conveyor, together with atmospheric systems, acts as a heat pump helping moderate temperature differences between the equator and the poles as well as having a pivotal role in rainfall distribution. Its effect is to help create and maintain conditions conducive to life. The North Atlantic Current is part of this conveyor that is driven by varying salt concentrations and temperature changes in a process called thermohaline circulation. Warm salty water, carried North up the East Coast of North America from the equator by the Gulf Stream, becomes colder and denser the further North it gets, until it sinks and returns South. According to Gagosian, the '…plunge of this great mass of cold salty water propels the global ocean's conveyor-like circulation system.[49] What he suggests is that any abrupt shift in the North Atlantic Current will have a significant impact on the Ocean Conveyor as a whole. It would also have the effect of cooling the North Atlantic region by 3 to 5 degrees Celsius.

What would cause a shift in thermohaline circulation is a change in the salt concentration of water, or 'freshening', and this appears to be happening. According to Peterson et. al., the past fifty years has seen significant increases in freshening of the Arctic and North Atlantic oceans. Their research found that:

> Increasing river discharge anomalies and excess net precipitation on the ocean contributed ~ 20,000 cubic kilometers of fresh water to the Arctic and high-latitude North Atlantic oceans from lows in the 1960's to highs in the 1990's, Sea ice attrition provided another ~ 15,000 cubic kilometers, and glacial melt added ~ 2,000 cubic kilometers. The sum of anomalous inputs from these freshwater sources matched the amount and rate at which fresh water accumulated in the North Atlantic during much of the period from 1965 through 1995. The changes in freshwater inputs and ocean storage occurred in conjunction with the amplifying North Atlantic Oscillation and rising air temperatures.[50]

A higher concentration of fresh water has the effect of slowing the rate of water sinking and thus the rate at which the current circulates. According to Gagosian, geological records indicate that there have been periods in which the current has slowed and caused major climate shifts, one, 12,700 years ago and another 8,200 years ago. There is also speculation that the slowing of the current may have had a role in the 'Little Ice Age' between 1300AD and 1850AD.[51] As was mentioned before, however, there is no simple linear cause and effect relationship here. Rather, the North Atlantic Current as a circulating system is an oscillating system that is interrelated with multiple others, so the effects of its change cannot be accurately predicted. For example, according to a 2009 article in the Woods Hole magazine, *Oceanus*, the North Atlantic Current has been slowing for 15 years with water not being dense enough to sink to great depths.

48. Ibid, p. 2.

49. Ibid, p. 4

50. Bruce J. Peterson, James McClelland, Ruth Curry, Robert M. Holmes, John E. Walsh, Knut Aagaard, 'Trajectory Shifts in the Arctic and Subarctic Freshwater Cycle', *Science*, Vol. 313, August 2006, p.1061.

51. Robert B. Gagosian, op. cit., p. 5.

The article reports, however, that the 'pump' started again in 2008, probably due, they believe, to the cooling effect of increased amounts of pack ice moving South from the Arctic due to global warming.[52] Recent evidence also suggests that a temperature drop in Northern Europe is becoming less likely as the decreasing density effects are not happening quickly enough to reverse atmospheric warming.[53]

Whether Northern Europe will fry or freeze is a complex issue. What is common to the research, however, is that anthropogenic climate change is having some effect on the conditions for oscillation of the North Atlantic Current and therefore the Ocean Conveyor as a whole. What is emerging are dysfunctional relationships between humans and these oscillators that reflect many other dysfunctional relationships that threaten the conditions for life on this planet. These relationship dysfunctions can best be understood through a vibratory and auditory approach which reveal the ways in which vibrations facilitate the flourishing of life. Two examples that I will now compare to large ocean oscillators are the human insulin secretion oscillator and circadian cycles.

INSULIN SECRETION OSCILLATORS AND CIRCADIAN CYCLES

The human insulin secretion oscillator is a highly complex system that is perhaps most simply explained in the following extract from Wikipedia:

> The insulin concentration in blood increases after meals and gradually returns to basal levels during 1-2 hours. However, the basal insulin level is not stable. It oscillates with a regular period of 3-6 min. After a meal the amplitude of these oscillations increases but the periodicity remains constant. The oscillations are believed to be important for insulin sensitivity by preventing downregulation of insulin receptors in target cells. Downregulation is the process by which a cell decreases the number of a cellular component, such as RNA or protein, in response to an external variable. An increase of component is called upregulation. An example of downregulation is that the cell decreases the number of receptors to a given hormone or neurotransmitter to reduce its sensitivity to this molecule. This is a locally acting negative feedback mechanism. Such down regulation underlies insulin resistance, which is common in type 2 diabetes. For this reason it has been suggested that it would be advantageous to administer insulin to diabetic patients in a manner mimicking the natural oscillations. The insulin oscillations are generated by pulsatile release of the hormone from the pancreas. Insulin originates from beta cells located in the islets of Langerhans. Since each islet contains up to 2000 beta cells and there are one million islets in the pancreas it is apparent that pulsatile secretion requires sophisticated synchronization both within and among the islets of Langerhans.[54]

52. Lonny Lippsett, 'Ocean Conveyor's 'Pump' Switches Back On', *Oceanus* (posted 9/1/09), at www.whoi.edu/oceanus/viewArticle.do?id=54347, (Viewed 12/2/09).

53. Walter Gibbins, 'Scientists Back Off Theory of a Colder Europe in a Warming World', *The New York Times*, May 15, 2007.

54. Insulin Oscillations at http://en.wikipedia.org/wiki/Insulin_release_oscillations, (21/10/08).

The negative feedback loop mentioned ensures that insulin is released in oscillations to allow it to be absorbed by the receptors. According to Niels Porksen et. al., insulin oscillations, through a process of entrainment, are synchronized with glucose release oscillations and type 2 diabetes is associated with the impairment of these pulsatile secretory patterns.[55] The consequence for us is that we do not experience any surges or deficits in insulin release in response to consistent dietary habits. This is another example of how a complex, discontinuous vibrating reality on a lower level produces apparent continuity at a higher level. As Jack Cohen and Ian Stewart characterize it, it is the collapse of chaos into emergent simplicity.[56] With consistent and moderate dietary habits and an absence of disease, our complex insulin oscillator will be transparent; it is in sync. with the larger constraining oscillator of the whole organism. It will only become opaque when there is a major perturbation such as particular extreme behaviour events or the breakdown of the oscillator due to conditions such as obesity and related type 2 diabetes.

Another example are our circadian rhythms. Throughout most of human history we have lived within variations of cycles of night and day with 24-hour periods. Over millions of years we have evolved to harmonize automatically with these cycles at multiple levels. Steven Strogatz has been investigating this phenomenon and using mixed, but mainly musical metaphors, summarizes what we currently understand:

> The picture that is emerging suggests that we are like wheels within wheels, hierarchies of living oscillators. Or to put it more vividly, the human body is like an enormous orchestra. The musicians are individual cells, all born with a sense of 24-hour rhythm. The players are grouped into various sections. Instead of strings and woodwinds, we have kidneys and livers, each composed of thousands of cellular oscillators, similar within an organ, different across organs, all keeping a 24-hour biochemical beat but entering and exiting at just the right times. Within each organ, suites of genes are active or idle at different times of day, ensuring that the organ's characteristic proteins are manfactured on schedule. The conductor for this symphony is the circadian pacemaker, a neural cluster of thousands of clock cells in the brain, themselves synchronized into a coherent unit.[57]

Like our insulin oscillators, our circadian rhythms are largely invisible as long as we remain in sync. with them, in other words, get a regular and consistent good nights sleep between around 10 pm at night and 6 am in the morning. Problems emerge when we get out of sync., particularly over extended durations. As Bruce McEwen reveals, the secretion of the stress hormone, cortisol, is tied to our synchronization with circadian rhythms. Because for most of our history we have been more active in daylight, we receive rhythmic cortisol surges, or high amplitude waves, in the morning, which ebb in

55. Niels Pørksen, Malene Hollingdal, Claus Juhl, Peter Butler, Johannes D. Veldhuis, and Ole Schmitz, 'Pulsatile Insulin Secretion: Detection, Regulation, and Role in Diabetes', *Diabetes*, (51:S245-S254, 2002).

56. This is argued in Jack Cohen and Ian Stewart, *The Collapse of Chaos, Discovering Simplicity in a Complex World*, (London, Penguin, 2000).

57. Steven Strogatz, *Sync.*, op. cit., p. 72.

the afternoon and reach their low point at night. Behaviour that continues high stress levels over the cycle which may be associated with anxiety and depression, or continued activity during low points of the cycle without adequate rest (partying or shift work), lead to what McEwen calls, allostatic load, a chronic stress condition associated with a range of current common pathologies. Some of these include depressed immune systems, obesity, osteoporosis, cardio-vascular disease and cancer. McEwen suggests that '…a flat cortisol rhythm is a bad thing.'[58]

So for both our insulin and cortisol secretion oscillators, flattening them out is a bad thing.[59] Such flattening, whether it be related mainly to behavioural or environmental effects, signifies that the constraining oscillation, or organism, is itself flattening out and is in trouble, which means that the orchestra is losing its integrity, its ability to generate interesting, life augmenting melodies. Without the melodies, complexity is lost. To understand this we need to think in terms of hierarchies of oscillations distinguished by different frequencies with slower frequencies constraining faster ones. Vibrations can be characterized by metaphors such as going up and down or contracting and relaxing or in the case of living systems, growing and decaying. In oscillations, the down phase is the conditon for the emergence of a new up phase, relaxation is the condition for a new contraction and decay is the condition for new growth. The continual creation of oscillations of insulin or cortisol secretion, however, is only possible within the constraints of longer frequency vibrations, or life cycles, of whole organisms which are themselves constrained by longer frequencies of climate patterns. If the longer frequency constraining oscillator is flattened, then the capacity for constituent oscillators to renew their frequencies is diminished.

This is a central theme in Thomas Homer-Dixon's book, *The Upside of Down*, in which he uses the example of wildfires to explain this phenomenon which is now much better understood within more enlightened areas of ecological science.[60] Wildfires, which occur naturally at irregular intervals, create conditions for the emergence of new life provided that higher level constraints conducive to life, such as climatic conditions that produce adequate rainfall within their relatively longer cycles, remain consistent. If there are periods of prolonged drought, or a flattening of the climate oscillator, occurring together with wildfires, then the capacity for renewal of smaller oscillators is compromised leading to collapse on massive scales. To use a musical analogy, the multiplicity of vibrations created within an orchestra are constrained by the conductor who brings order and coherence to the whole. The collapse of a few musicians will not compromise the integrity of the conductor but the collapse of the conductor will bring the music to a halt or produce chaos. This is the possibility we face in regard to climate

58. Bruce McEwen, *The End of Stress as we Know It*, (Washington, Joseph Henry Press, 2002), p. 25-26.

59. Another example is the use of vibrato when singing that enables the sustaining of pitch when fatiguing without damaging the vocal chords.

60. Homer-Dixon is here drawing on ecologist, Crawford Holling's theory of 'Panarchy', that seeks to identify the various stages an oscillating ecosystem goes through between its emergence and eventual decay and its relationships with higher and lower levels. In Thomas Homer-Dixon, *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*, (Washington DC, Island Press, 2006), Ch. 9.

change and the North Atlantic Current.

Like the human orchestra, the North Atlantic Current is a large scale oscillator continually created and sustained by a multitude of lower level, smaller scale oscillators as well as being constrained by larger processes at higher levels. Because humans contribute to creating and maintaining their climate, we are one of those smaller scale oscillators; we are part of the orchestra. A problem for the North Atlantic oscillator is that the human one is flattening out. Our melodies are being transformed into more of an incessant drone that is having the effect of drowning out other melodies. How and why is this happening? The range of melodies or vibrations of human existence relate to ecosystem diversity. Throughout human history there have been those individuals and civilizations who have valued and understood the importance of polyphony (multiple melodies or voices) and living harmoniously with other levels, while others have sought to destroy diversity to achieve the goal of monophony. Arran Gare, in 'Nihilism Inc.', characterizes these opposite positions as a dialectic between two metaphysical traditions, process and mechanistic materialism.[61] Process thinkers like Gare and Whitehead understand the vibratory, interrelated nature of existence and the requirement for life of open, non-linear, diverse, baroque ecosystems. Mechanistic materialists, through their obsession with certainty, linearity, quantification, control and immutability, have sought to reduce complexity to facilitate greater control over natural processes.[62]

We can think of this as being like the difference between artists and engineers, while acknowledging that some engineers are artists and vice versa. Artists, whether aural or visual, have an awareness of vibratory existence. They seek to create patterns which themselves create novel relationships through being open to multiple interpretations. These oscillations are created to synchronize with others and generate new potential. They operate following the proscriptive logic that whatever is not forbidden, is allowed. Engineers, on the other hand, seek to dampen vibrations in order to channel energy into pre-determined goals. Their logic is prescriptive; whatever is not allowed, is forbidden. In car engines, for example, too much vibration is considered a waste of heat and motion and so vibration must be dampened in order to channel energy into the drive shaft. The dampening of vibrations is associated with the quest for order and efficiency which is often associated with the rejection of a relationship with chaos as being necessary for existence. The logical extension of the engineer's world is monophony, but it is monophony that seems to eventually seek even the flattening of its single melody. An example of the consequences of such monophony, I argue, is the drive toward a homogeneous globalized world with a homogeneous 24/7 economy in which vibrations are gathered from all available sources and excessively dampened in order to be focused like a laser on the construction of a flatland.[63] Such a flatland has its roots in 'Enlighten-

61. Arran Gare, *Nihilism Inc.*, op. cit..

62. I have also developed this central theme of Gare's thought in Glenn McLaren, 'Unifying Process Philosophy: Secular Metaphysics and Fragmentary Influences', in *Applied Process Thought 1: Initial Explorations in Theory and Research*, Mark Dibben and Thomas Kelly (Eds.), (Heusenstamm, ontos verlag, 2008), p.p. 43-118.

63. Here I am not referring to the 1884 Edwin Abbott book, Flatland, but no doubt some oscillations

ment' concepts of progress through science, concepts such as utopian visions of a world free of spontaneity; a world in which science succeeds in making the future totally predictable as was characterized in the Twentieth Century by Aldous Huxley in his novel, *Brave New World*.[64] It is potentially, however, the dystopian outcome of the 'grey goo scenario' in which self-replicating machines destroy all life in the name of efficiency.[65]

I am not saying that John the engineer is flattening the North Atlantic Current. Engineers understand the mechanics of vibrations better than most. It is the engineering mentality that is associated with the primarily analytical and reductionist mentality of mechanistic materialism that is the problem. Through the research of those such as Strogatz into complex oscillating systems and the insights of process thinkers such as Whitehead and Gare, we are beginning to understand more about the nature of vibratory existence and its role in the flourishing of life. But while complex thinkers are revealing the importance of creating and sustaining vibrations, engineers are more active than ever in trying to excessively dampen them. Today, this is most often in the service of business which is trying to excessively dampen vibrations in order to channel energy into profits.. The irony is that such efforts to strictly control natural oscillating processes in order to concentrate them require the use of enormous amounts of energy. This seems inefficient, as is allowing massive amounts of the waste products, including vibrating carbon dioxide, to escape into the atmosphere. This irony is a consequence of the narrowly focused mentality of mechanistic materialism.

Like a diabetic or a chronically depressed shift worker, the North Atlantic Current is suffering a loss of integrity from an excessive flattening in the oscillations of an influential global constituent, human beings. Unlike the single trumpet or violin player within the orchestra, humans have acquired too much influence over larger natural constraints through our ability as engineers to subvert such constraints. Our success in this regard has led to the flattening of multiple other levels as we consciously seek to destroy polyphony for our own ends.

SUBVERTING FLATLAND

In his paper, 'The Semiotics of Global Warming', Arran Gare argues that the ability to mobilise a concerted and effective response to climate change is being thwarted by semiotic corruption. In Pierceian terms, the interpretant is constantly being confused by signs indicating that the scientific consensus is just one opinion amongst equally valid others.[66] In other words, semiotic corruption is the flattening of different vibrating levels of knowledge, subverting efforts to synchronise with the consensus oscillator.

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could synchronize.

64. Aldous Huxley, *Brave New World*, (Penguin Books, Middlesex, 1969). Huxley's famous dystopian novel warns us that any interpretation of such a possible future as progress reveals imperviousness to irony.

65. A discussion of the 'grey goo scenario' is in Martin Rees, *Our Final Century: Will Civilisation Survive the Twenty-First Century*, (London, Arrow Books, 2003) p. 58-59.

66. Arran Gare, 'The Semiotics of Global Warming: Combating Semiotic Corruption', in *Theory & Science*, 2007, at http://theoryandscience.icaap.org/content/vol9.2/Gare.html, (accessed 24/10/08).

The slowing of the North Atlantic Current can also be thought of as a consequence of semiotic corruption. Synchronization between oscillators involves vibrations recognizing each other's frequencies. At higher levels of organization these processes are semiotically facilitated creating the feedback loops that help generate non-linear emergence. The human flatland is introducing semiotic corruption into the Gaia system. For example, the 24/7 economy uses vast amounts of energy and technology to maintain constant artificial daylight. This sends confusing signals to a Gaia system that has evolved with circadian rhythms, rhythms that have helped create the climatic parameters conducive to life. It particularly confuses the behaviour of various nocturnal creatures.[67] It is subverting the ability for multiple oscillators to synchronize, leading, for example, to extinctions. Over-fishing is another example of semiotic corruption leading to extinction when longer-lived, low reproduction-rate species are removed from systems, therefore changing the signals.

In order to counter this corruption, humanity must synchronize an effort to subvert the drive to flatland. This cannot be accomplished through technical means as some kind of engineering issue; it is this thinking that has created the problem. Anthropogenic climate change is a moral issue. But moral issues require a consensus on standards. Despite claims from a multitude of belief systems and ideologies throughout history, including the utilitarianism that forms the basis of liberal and neo-liberal democracies which have underpinned the successes of modern engineering, a universal moral consensus has never been established. It is the historical failure to establish such a consensus that has led humanity to turn to utilitarian-based engineering to find mechanical ways to determine their decisions, for example, computerised data collection. It is my contention that Process Philosophy can deliver a moral standard that can be used to subvert flatland. A process moral standard, however, is proscriptive and not prescriptive as the moral standards of Kantianism and most religions tend to be. Proscriptive logic transcends the naturalistic fallacy because it characterizes the conditions for emergent potential and what is actualized is understood as only being knowable after the fact. It is the continual creation of potential which is the condition for the flourishing of life. From within this potential a range of general constraints can be identified which are conditions for the creation of potential; constraints such as diversity, community, freedom and self-realization, which themselves must be continually tested dialectically. It is within this framework that Gaia and the North Atlantic Current constrain morality within a hierarchy of constraints whose larger scale oscillations provide the limits, or boundaries to our development. Like all developing and sometimes naughty children, we need to learn what our boundaries are. It is more enlightened views from Process Philosophy and complexity science that are guiding us in this direction.

One important boundary, or constraining oscillation, is the seemingly universal phenomenon called edge of chaos. Far-from-equilibrium conditions exist within the Universe because regions of the Universe are oscillating between the chaotic condi-

67. Examples of this corruption can be found in, *Ecological Consequences of Artificial Night Lighting*, Eds. Catherine Rich and Travis Longcore, (Washington DC, Island Press, 2006).

tions of its origin and the lifeless order of its possible future. We also exist and flourish in this dynamic phase within which we can create and maintain our integrity in the face of uncertainty. Edge of chaos conditions are non-linear, or emergent phase transitions which occur when interactions or synchronizations of lower level oscillators reach critical levels such that a new level of order emerges. This vibratory existence endures within relatively narrow parameters; too much or too little interaction and the order will disintegrate. In musical terms, edge of chaos can be understood as $1/f$ noise, the range of sound frequencies that lie between chaotic white noise and the flat line of a single note.[68] It is within such a range that interesting scale-free fractal patterns emerge at multiple levels such as in the complex structure of a Bach fugue.[69] It is the nature and parameters of edge of chaos conditions that complexity scientists are continuing to explore and while we must be cautious about their implications, these parameters I believe have the potential to become moral constraints that are the conditions for the possibility of life flourishing.

How could these work as moral constraints? First, people would need to be educated in the nature of complex processes and understand the difference between such processes and the traditional, orthodox mechanical and materialist view. Secondly, understanding of complex processes would need to be integrated within a coherent ethical framework. Fortunately complex systems have redundancies lingering within them so rather than create an ethical framework from scratch, we can utilize existing ones. Out of all of the major moral and ethical frameworks developed by human beings, I argue, there is one that perhaps comes closest to conforming to process metaphysics which can account for concepts such as edge of chaos. This is Aristotle's Virtue Ethics and particularly his concept of 'the mean' from his Nichomachean Ethics.[70] In simple terms, Aristotle's 'mean' lies between two extreme vices of excess and deficit. The 'mean' is relational. It is dynamically created and maintained through the interactions of individuals with their communities. In other words, virtues, or appropriate modes of behaviour within different contexts, are the emergent products of networks. Moral Philosopher, Alasdair MacIntyre, has rightly criticized Aristotle's concept of the 'mean' for being too abstract and arbitrary.[71] Married to process metaphysics and new understandings in complexity theory, however, Aristotle's concept can have a recognized naturalistic orientation, one that itself recognizes the uniqueness of human self-consciousness and our ability to subvert moral constraints, whatever their basis.

For example, a characteristic of $1/f$ noise at the edge of chaos is that its frequencies and amplitudes are irregular. As Mark Ward points out, the interbeat intervals of the

68. This characterization is in John Gribbin, *Deep Simplicity: Bringing Order to Chaos and Complexity*, (New York, Random House, 2004), p. 154.

69. Mark Ward uses such musical metaphors to explain edge of chaos in Mark Ward, Universality: the underlying theory behind life, the universe and everything, (London, Pan Books, 2001), p.p.. 150-151.

70. Aristotle, 'Ethica Nichomachea', Book II, Chapter 6, in *The Basic Works of Aristotle,* ed. Richard McKeon, (New York, Random House, 1968). This use of Aristotle relates to the development in my Ph.D Thesis of a Process Philosophy definition of health.

71. In Alasdair MacIntyre, *A Short History of Ethics*, (Oxon, Routledge, 2006), p.p. 62-64.

heart are constantly changing in anticipation of uncertainty.[72] In auditory terms, the orchestra is continually playing different rhythms and melodies as possible scenarios of an indeterminate future. Alternatively, an unhealthy heart is more like modern dance music, locked into a future that can only be a regular number of beats per minute. Cardio-vascular exercise, particularly done in a slightly chaotic fashion, helps maintain the heart in edge of chaos conditions. It too is a process that plays out a range of possible scenarios in order to better anticipate them. Such exercise therefore, or the active performance of it, from a process perspective, becomes a moral constraint, or a virtue or mean. Human beings, however, are able to subvert this constraint by constructing an abstract flatland in which engineering, geared towards efficiency, is able to reduce the need for exercise. This then leads to flattening of the insulin and cortisol oscillators and a loss of sync. Such actions should be considered immoral.

Similarly, the North Atlantic Current, an oscillator at the edge of chaos that creates edge of chaos conditions at lower levels of vibratory existence, is a moral constraint, or mean, that can be consciously subverted by engineering's drive to replace the melodies with one note; that note being the incessant hum of machinery. This machinery produces the greenhouse gases and heat that melts the ice that alters the constitution of the current that causes it to slow, or flatten out. But unlike the human being consciously choosing to drive the car instead of walk, the North Atlantic Current is the hapless constraining level suffering the ravages of a malignant constituent that chooses a particular growth path and is seemingly oblivious to the need for constraint. The drive toward Flatland therefore, creates and is therefore characterized by, cancer-like oscillations in which phases of continual growth end in catastrophic plunges. Such plunges obliterate relationships and much, though usually not all, of the oscillations history. Not all, because such oscillations in the universe are related in some way to others; for example, we knew and can still talk about friends who died of cancer. Flatland on the other hand, is the consequence of the destruction of all relationships and is therefore not a life-affirming goal to have. It is in fact the product of a culture of death. Unlike flatland, an Aristotelian mean is relational. It is intrinsic to vibratory existence and therefore aiming towards it, as Aristotle suggested, is a life-affirming goal.

The developmental processes of human lives are unique. The emergence and development of self-consciousness sees us oscillate between self and other. In normal processes, this is the sometimes painful experience in early years of denying your vibratory existence, or becoming polarized, then in later life, becoming consciously aware of your oscillating nature; a process recognized in many Eastern philosophies which have been influential on Process Philosophy. Returning to auditory analogies, this can be likened to an improvised jazz piece which starts out with a recognized melody then bifurcates into a complex assortment of heuristic experiments that, while still constrained by a rhthymic structure, push and prod the boundaries of that structure. Sometimes a solo gets stuck on one note, but eventually, the musicians find their way back to the original melody and create it anew. The musicians have pushed the boundaries but have never

72. Mark Ward, *Universality*, op. cit., p.p. 142-144.

lost their feel for the whole. To lose this feel, to become lost in your abstractions, is to commit the fallacy of misplaced concreteness It is to deny the artist and become only the engineer.

CONCLUSION

The future of humanity within our present limited context, having access to only the resources of this one planet, will be strongly determined by our ability to subvert the drive toward flatland. This can be achieved by developing a new ethics based on the recognition and understanding of the nature of vibratory existence. This will be contiguous with the replacement of many visual metaphors with auditory ones. The drive towards flatland, the continual excessive dampening of vibrations for the purpose of meeting particular human wants at the expense of all others, reveals a lack of such understanding and resembles more the often polarized thought processes of adolescents. A mature humanity will be one that identifies and recognizes the mean, the boundary constraints that condition the flourishing of life, the complex synchronizing of multiple oscillators at different frequencies. As almost all holistic traditions have argued, when we stray from well-worn paths as we sometimes should, we must be able to find and create them again. In other words, we oscillate in relation to a mean. The search for the meaning of life, is the search for the mean. The North Atlantic Current has profound meaning for us, as does the Gulf Stream and Southern Oscillator, which needs to be continually created and maintained.

Finally, vibrations are durational events and not instants. They are processes, not points. The subversion of the drive to flatland must start with an understanding of this. Engaging with the process metaphysics of those such as Gare and Whitehead within the tradition of Process Philosophy can greatly assist this understanding. As a multi-disciplinary academic field rooted in the concepts of vibratory existence, Process Philosophy is uniquely positioned to do the important work of integrating into a new whole, Western and Eastern philosophy, holism and mechanism, the sciences and the humanities. Process Philosophy is about creating Baroque arrangements of melodies, not single notes.

Philosophy and Cultural Inquiry
Swinburne University

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