



Hello all,

Welcome to Coherent Breathing®, Volume 4, Issue 8: ***Coherent Breathing Is Not About Air***. There is something more fundamental than air – motion, a unique form of motion that creates and sustains wave action. The basic function of this wave is to maintain an internal ocean-like environment, an internal sea, which exists in all living things plant and animal. This is true both metaphorically and literally. It is literally true because the first “cells” to exist on Earth developed in the sea, seas providing the chemistry, stability, and energy to support the emanation of “life”. This was at a time before the Earth’s protective atmosphere proper had developed, making land masses inhospitable for life. Intense ultraviolet (high energy) radiation on the Earth’s surface would destroy living molecules. Free oxygen was all but absent.

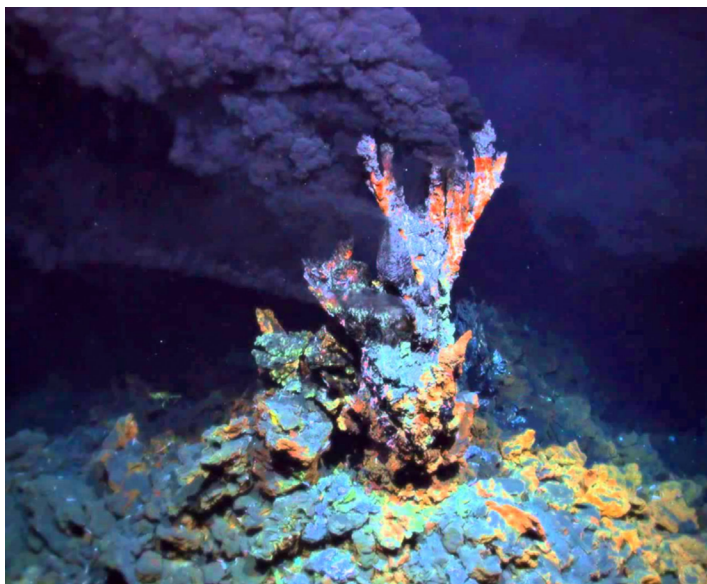


Figure 1: Hydrothermal vent on deep sea floor

Earth was churning out a pre-biotic ocean environment rich with chemistry including amino acids, nucleotides, and simple polymers, building blocks for the emergence of life. This is referred to as a period of protometabolism, where chemical networks began to form and propagate, producing cells of increasing complexity, ultimately with the fundamental machinery of life, i.e., RNA, DNA, enzymes, ATP production, and robust cell membranes. This is the stage from which LUCA evolved, the Last Universal Common Ancestor – approximately 4 billion years ago. The Earth’s age at this point was only a few hundred million years. LUCA is the *prokaryotic* common ancestor from which *all* cellular life on Earth descends. It had features of proto-archaea and proto-bacteria but technically was neither. But from it descended all archaea, all bacteria, and ultimately all eukaryotic cellular life. LUCA continued to evolve and replicate until the big split occurred, LUCA splitting into the independent cellular branches of archaea and bacteria. This division is a monumental moment in cellular biological history because it sets up the opportunity for archaea and bacteria to evolve independently for a period of time, each acquiring properties that would bring them back together as the foundational cell that would eventually evolve into the eukaryotic lineage – LECA, the Last Eukaryotic Common Ancestor, from which all plants and animals evolved.

Archaea possess uniqueness common-with (but not complete) with later cellular life forms, the eukaryotes. Archaea’s salient features include DNA replication, protein synthesis, and asexual reproduction via binary fission, a single cell dividing into two. Archaea inhabited extreme ocean environments, particularly volcanic vents deep in the ocean floor, where they found heat, hydrogen, carbon dioxide, and minerals which they used to generate ATP.

Bacteria on the other hand went their own way, toward simplification, with reduced internal cellular machinery, reduced DNA replication complexity, and simplified cell walls adapted to different environments than those inhabited by archaea, a move toward ever shallower waters and shorelines vs. the deep sea floor. A unique group post-LUCA breakaway was cyanobacteria, destined to achieve photosynthesis capability, the ability to use sunlight to split water molecules into hydrogen and oxygen, hydrogen being used for ATP production, and oxygen being released as metabolic exhaust. This period in time is referred to as the Great Oxygenation Event (GOE), circa 2.4 billion years ago. For hundreds of millions of years this free oxygen was immediately consumed by Earth elements that were poised to oxidize, this period marked in the geological record as “red beds”, a concentrated period of oxidation. This relatively rapid release of free oxygen led to a mass explosion of aerobic microbial life but a mass extinction of anaerobic microbial life for which oxygen is toxic.



A next step to realize the ancestor common to both plants and animals (LECA) is termed “the remarkable event”, an archaea engulfing a cyanobacterium, but instead of digesting it the host archaea kept it alive, over generations the two developing a profoundly successful symbiotic relationship. Amongst many other evolutionary adaptations the bacterium evolved into what we know today as the mitochondrion, the powerhouse of eukaryotic cells. This symbiotic evolution giving rise to cells with oxygenic photosynthesis, chloroplasts, and eventual plant life. It is the common ancestor of all eukaryotes including plants, animals, and fungi but excludes archaea and bacteria. From this eukaryotic ancestor, LECA, plants developed first and animal life second. This is because animal life depended on plant life for free oxygen produced by photosynthesis, and as a primary source of food. All of this occurred in the ancient ocean environments of planet Earth 1-2 billions years ago giving rise to the entire tree of life, plant and animal, from the simplest to the most complex. The reason that the event is considered remarkable is that evidence suggests it only ever happened a single time throughout all of history, a single archaeon engulfing a single cyanobacterium and them forming a sustained symbiotic relationship, thereby producing the prototype eukaryotic cell with DNA replication, metabolism, oxygen respiration, and the eventual nucleus – this giving rise to the entire eukaryotic tree of life. How is it known that it only ever happened a single time(?), because the mitochondrial DNA of every organism today all has a single original source, the mitochondrial DNA of the single engulfed bacteria of LECA. It does give one pause to wonder about creation.

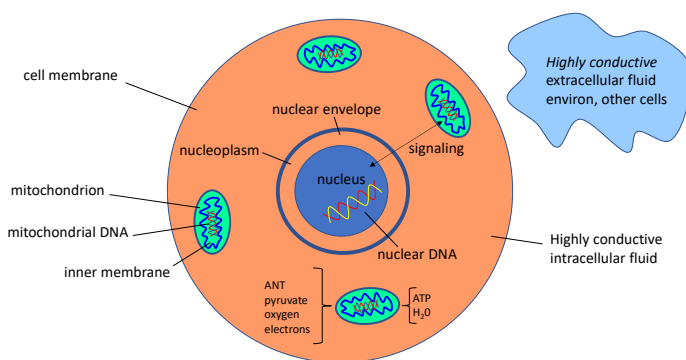


Figure 2: The eukaryotic cell

Fast forward to today, billions of years later, where all life forms existing on either land or water carry the sea within: the basic chemistry, pH, salinity, ion gradients (required for electro-chemical action of cells), archaea, mitochondria, ATP production, all of it, inherited from the ancient seawater environment of the Archaean period ~3.5 billion years ago, when the salinity of ocean water was approximately that of the human body today. In this regard, each of us is a living, breathing aquarium bounded by our skin in which an early ocean environment exists. With this in mind, what we refer to as “breathing” is in fact an action that generates waves that move/circulate the blood and fluids in the body just as the tides serve to circulate and refresh life that exists on the water’s edge, e.g., estuaries, tidal marshes, and wetlands, the most biologically productive environments on Earth. The reason why they are the most productive is that they are constantly being “refreshed” with water, nutrients, free oxygen, etc., and cleansed of carbon dioxide, waste, decay, and detritus. Not unlike ancient estuaries and marshes, it is the motion of blood and fluid in the body that keeps us healthy and alive. It is wave action – when we breathe with depth and rhythmicity – *coherently*.

The master clock for this motion is the diaphragm – the master oscillator in the body. Via oscillation it creates a rhythmic pressure gradient between abdominal and thoracic cavities, and with it wave action in the circulatory system and the body at large, down-to and into every cell, and further yet, into every component of the cell: the nucleus, DNA, mitochondria, organelles, all of it. Just as with the tides, there is ebb and flow, negative energy followed by positive energy. It is “energy” that is being transmitted, the rhythmic force of the diaphragm modulating the pressures between abdominal and thoracic cavities that generates a traveling wave, this wave having venous emphasis during inhalation and arterial emphasis with exhalation. Other organs are also involved in their respective cavities, but the motive force is the diaphragm which imparts the energy that sets the process in motion. Of course, gas exchange is necessary to sustain life, but gas exchange occurs as a consequence of motion. It occurs as blood flows through the lungs. Without motion, there is no life.

Wave action in the body is necessary for cellular health. It is our inheritance.



Gravity also plays a part, just as it does with the tides. It aids in blood and fluid flowing downward, but works against blood and fluid flowing upward. In fact, gravity is the reason why it is critical that the act of inhalation be purposeful, to move blood and fluids upward against gravity, where otherwise, blood and fluids want to pool in the lower half of the body. This is the crux of essential hypertension from which we all suffer to some degree. And what is the organ that suffers most? The one at the opposite end of the vertical fluid column that is the human body – *the brain*. I consider this to be the primary anatomical function of the diaphragm, to aid in moving blood and fluid upward against gravity.



Figure 3: The complex wave of resonance

The diaphragm is the master pendulum of the body – the central oscillator – *a sinusoidal harmonic oscillator*, given that it is not “overdriven”. A sinewave has many special properties, one of them being that it is the most efficient form of motion in general and for an oscillatory system in particular, many of which the human body is comprised, including respiratory, circulatory, neural, fluid dynamic, musculoskeletal, biochemical, cellular and electrical. The entire body is a coupled sinusoidal oscillatory system that synchronizes with the sinusoidal action of the diaphragm *which imparts energy* into the coupled oscillatory systems of the body. This is the fundamental mechanics of what we refer to as physical “resonance”, resonant subsystems synchronizing with a master clock, this master clock being the action of the diaphragm, but only if diaphragm action is rhythmic. Only then do other oscillating aspects of the body synchronize with it. Alternatively, if diaphragm action is completely arrhythmic, then other systems have nothing with which to synchronize – sometimes chaos. My position on the matter has been and continues to be that resonance is a function of the breathing induced wave of blood entering and exiting the brain with each breath.

The human body is a configuration of resonant systems where the diaphragm is the master clock, to which all other systems synchronize, i.e., phaselock. I posit that this includes every cell in the body, each of which depends on the fluid dynamics of wave action, this wave action being a function of: a) diaphragm motion, b) the heartbeat. We can see their relative contribution in Figure 3 above, where diaphragm action produces the large slow wave and the heart produces wavelets riding atop. This is the wave that propagates throughout the body when we are breathing *resonantly*, when the entire body, including every cell is resonating. The function of the slow wave is to move blood and fluid volume through the capillary circulation and into the extracellular fluid. The function of the heartbeat is to propagate fluid flow into the intracellular fluid, i.e., the cells.

There are 5L of blood in the average adult body. The prevailing understanding is that it moves around the circulatory “circle” one time per minute (5L/minute). Note that this is the typical adult population from which this number comes, a population that is understood to be breathing at an average rate of between 17 and 19 breaths per minute, ergo breathing without significant depth. When we do breathe in a resonant manner, i.e. relatively slowly, deeply, and rhythmically, the action of the diaphragm and thoracic pump doubles blood volume such that the 5 liters moves around the circle 2 times per minute (10L/minute) in waves that facilitate propagation into and out of the trillions of cells that exist in the body. Wave action is the *raison d’être* of the resonance phenomenon, the health and well-being of every cell floating in the highly conductive saline environment of the body. *It is our inheritance.*

Stephen Elliott, President, COHERENCE LLC

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A Note Of Interest: Electromagnetic activity of the body is near-field in nature, the definition of near-field being within 1 wavelength of the emitting source, where the frequency of Coherent Breathing is .085 Hertz. Therefore, the theoretical wavelength is extremely long, i.e., the speed of light $(3.0 \times 10^8)/.085 = 3.5 \times 10^9 = \sim 3.5$ million kilometers, 9 times the distance from Earth to the Moon in every direction.