



Hello all,

Following on the heels of *Jade*, welcome to *Breathe For Beauty*, Volume 2, Issue 6 of *Swan & Stone*. I'm optimistic that we've taken a large step toward understanding the riddle of giraffe circulatory physiology – which according to the past and current prevailing understanding is enigmatic. The fundamental question is how blood effectively reaches the giraffe's head, where physics and the giraffe heart don't add up. Physics says that the giraffe's heart, which is no larger than other mammals relative to its body mass, is incapable of supplying blood to its head on an ongoing basis against the force of gravity, due to the length of its neck. This question has resulted in decades of experimentation on giraffes, but without answer. With a fair amount of premeditation and a single trip to the Dallas Zoo, with the aid of the hospital staff I believe we've solved the riddle. The answer is that the giraffe's inhalation is so powerful that it *vacuums* blood both down the venous side, aided by gravity, but also up the arterial side of the neck, against gravity. (The giraffe happens to have the largest diaphragm of any land mammal.) So, the giraffe heart is beating, when the giraffe exhales it sends a large wave of blood up the carotid artery toward the head, and when it inhales it's thoracic pump generates a vacuum on the jugular vein that is so great, that it is exerted up the jugular vein and in and through the giraffe's head where it aids in drawing blood upward in the carotid artery, such that there is a continuous flow of blood through the head; again, contributed to by the heartbeat, by the positive respiratory arterial pressure wave generated during exhalation, and again by the negative pressure generated in the chest and ultimately exerted on the carotid artery via the head. Using *Valsalva Wave Pro*, which was attached to the tip of Jade's tongue, I could determine that this was the case within the first minute of observation, this being because I could see blood rise in Jade's tongue both when she exhaled and when she inhaled – and blood activity was heavily dominated by her breathing, where her heartbeat was barely visible, which makes sense, as the pulsatile heartbeat is integrated out over the length of the neck. So my assertion is that the giraffe's diaphragm allows it to exist – *no, its learning and adaptation as to how to use its consciousness to control its phrenic nerve, ergo its diaphragm allowed its evolution.* This is my theory on the matter. Note that while Jade was sedated, this instrumentation simply involved placing a plethysmograph on the tip of her tongue during a hoof trimming procedure. Jade's torso was lying on the ground with her rib cage and diaphragm free to move, and her neck raised on a ramp at about 45 degrees.



Figure 1: Breathing facilitates circulation of fluids that hydrate, nourish, and cleanse the skin from the inside out.

Circulatory Physiology: A Functional Model

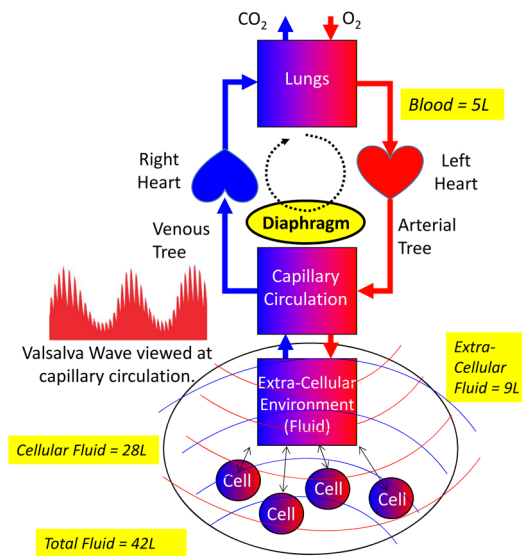


Figure 2: Action of the blood facilitates fluid motion and exchange. We see the Valsalva Wave in the capillary circulation everywhere we look.

and upward from the legs and body. Upward movement sends blood upward to the head and downward to the legs and body. Figure 2, presents a generic model of circulatory physiology addressing both blood and fluid flow and motion. In this model, the capillary circulation, the extra-cellular environment, and the cells, are representative of the entirety of the body, feet, organs, head, and skin, inside, and out. It is not meant to connote direction, but if we want to think of it directionally, in its current orientation the extremes of the cellular environment would be the feet, toes, skin, nails; and if flipped upside down, the head, face, eyes, teeth, and brain.

Now, the argument I want to make is that *verticality requires that the diaphragm move*, where I hypothesize that this is a key reason for its existence, that evolution of the diaphragm in land animals follows verticality with a few exceptions, e.g. birds. Downward movement of the diaphragm draws blood downward from the head and upward from the legs and body. Upward movement sends blood upward to the head and downward to the legs and body. Figure 2, presents a generic model of circulatory physiology addressing both blood and fluid flow and motion. In this model, the capillary circulation, the extra-cellular environment, and the cells, are representative of the entirety of the body, feet, organs, head, and skin, inside, and out. It is not meant to connote direction, but if we want to think of it directionally, in its current orientation the extremes of the cellular environment would be the feet, toes, skin, nails; and if flipped upside down, the head, face, eyes, teeth, and brain.



So in this issue, we discuss the importance of breathing to cellular health and specifically to “fluid flow” in the body, though we can generalize that movement of the diaphragm facilitates all flow: blood, fluids, digestive matter, cerebrospinal fluid, etc.

There is something very subtle and hidden from the naked eye (and consciousness) that is going on here, this being that the flow of the 5L of blood in the average adult body hydrates, nourishes, cleanses, and maintains all of the cells in the body, specifically including those functional cells (making up the organs – roughly estimated at 88 trillion) that are dependent on the 37L of fluid that is not blood. In 2017, I had the opportunity to validate, on four separate occasions, from specialists in the field, the knowledge that “deeper breathing” reduces pressure in the eye, where ongoing excessive ocular pressure (a.k.a. ocular hypertension) – caused by lack of fluid exchange and resultant pressure regulation in the eye *is known* to be a significant contributing factor to glaucoma!

Most of this exchange occurs via a very sophisticated biological construct referred to generally as “the capillary membrane”, where blood and the fluid ultimately meet and interact. The capillary membrane consists of thousands of miles of microscopic arterioles and venules that interact with the fluid environment to exchange water, oxygen, CO<sub>2</sub>, minerals, glucose, and every other constituent that cells need. Arteries and veins branch 6-8 times to reach the microscopic proportions making up the capillary membrane. The critical matter is how and why fluid exchanges across this boundary – where the answer is extremely subtle variations in pressure generally attributed to the heartbeat and muscular action of the arterial tree, as well as chemical signaling under control of the nervous system. A gross depiction of that network and its many divisions is depicted in Figure 4. The capillary membrane is where the action occurs relative to cellular health, all cells and all organs. *Very subtle* differential pressures across both the capillary membrane and cell membranes facilitate flow and exchange, *where it has been generally accepted that the heartbeat is the primary motive force.* And, when we monitor the capillary circulation with [Valsalva Wave Pro](#) in the absence of significant diaphragm motion, the heart-beat is all we see. When Coherent Breathing begins, we see wave action begin to build, the amplitude of blood activity as reflected by the heartbeat and Valsalva Wave in combination, roughly doubling, the heartbeat producing a relatively fast wave (~72 cycles per minute), and breathing producing a relatively slow wave (~5 cycles per minute), each contributing about half the amplitude of the complex wave seen at the capillary circulation. A question is, do these wave functions offer unique biological value relative to the health of the *milieu interieur*. It stands to reason that wave action that is 2X the amplitude facilitates greater pressure differential across capillary and cell membranes than a wave that is 1X, but does it yield improved cellular health, and if so how? ***This is research that needs doing.*** There is a saying in Traditional Chinese Medicine, that *after age 40, the outside begins to reflect the inside.* Is this a consequence of the health of the *milieu interieur* and its eventual reflection at the termini of the capillary circulation, i.e. the eyes, face, skin, hair, teeth, and nails? *I posit that it is, and it is the means by which we can affect both beauty and health from the inside out – versus the outside in.*

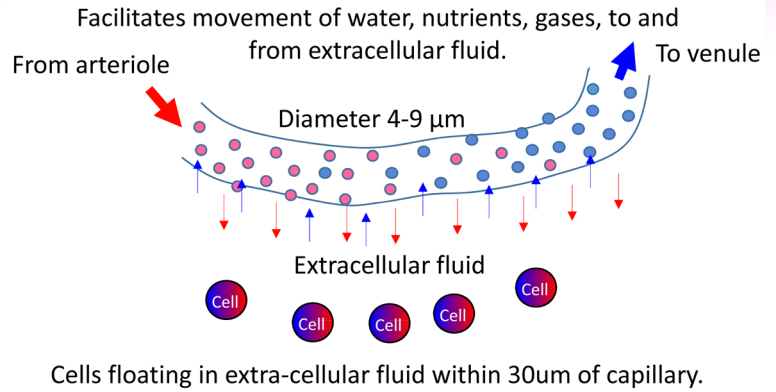


Figure 3: The Capillary Membrane - Where The Action Is.

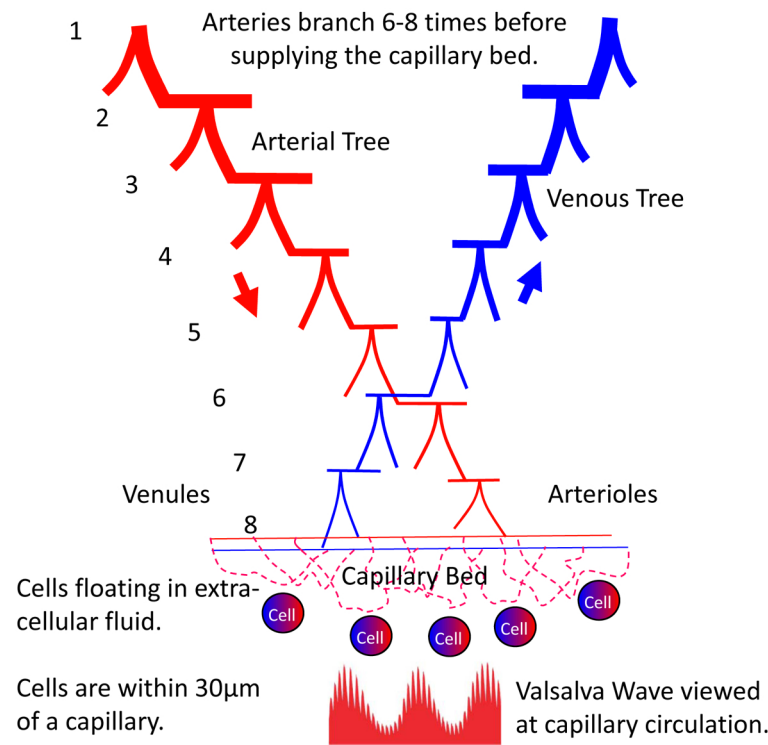


Figure 4: Blood vessels branch 7-8 times to reach microscopic proportions in order to serve the miniscule capillary membrane and the extracellular fluid environment.

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