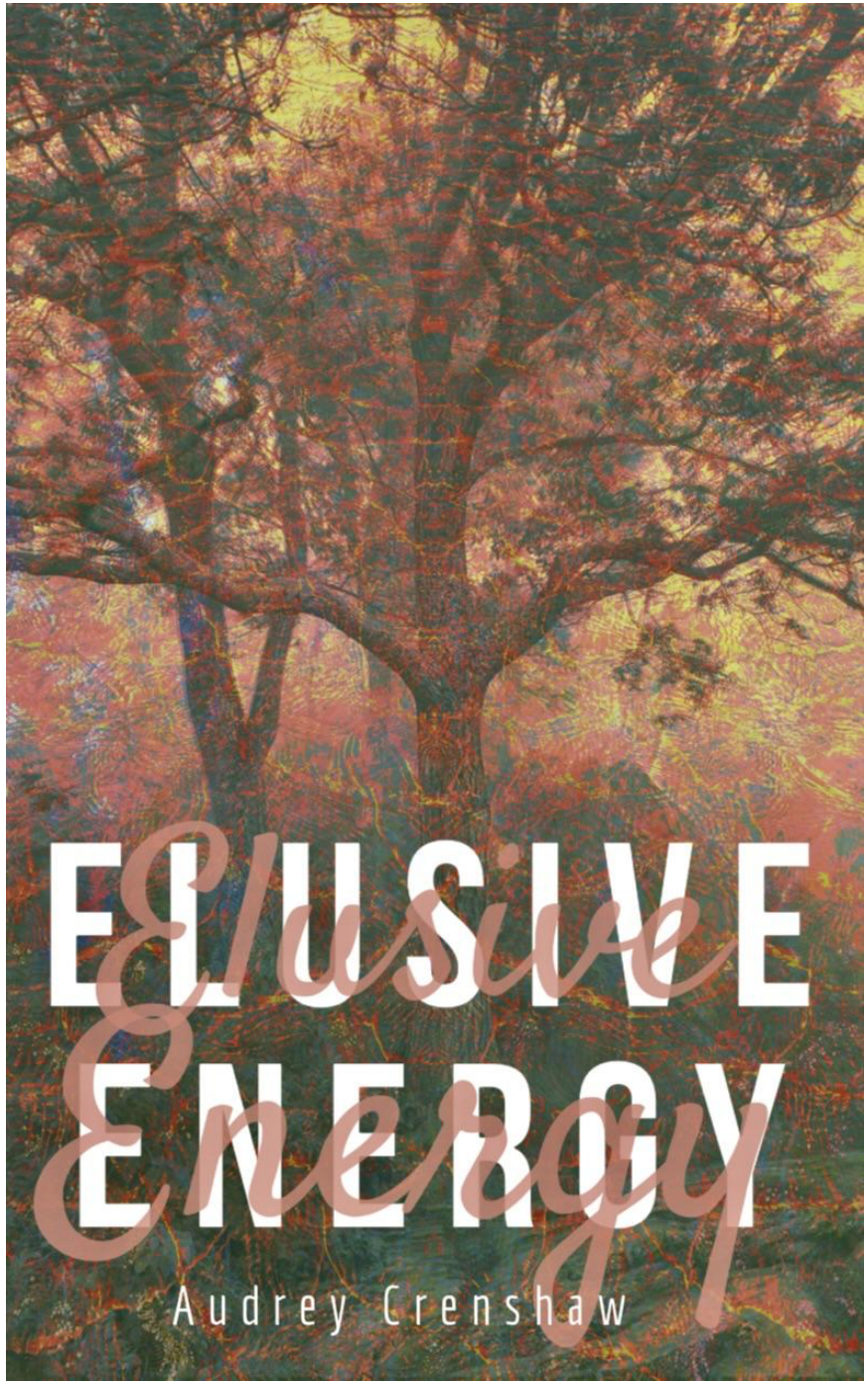

ELUSIVE
ENERGY
Elusive
Energy
Audrey Crenshaw

Elusive Energy

Elusive Energy

How unseen forces influence our experience

Audrey Crenshaw

For all extensions of Earth

Contents

Introduction

What is Energy?

Energy is anything and everything; energy is the invisible air that permeates our lungs, keeping us alive. Energy is the heat emitted from the sun, over 92 million miles away, still providing us with a form of warmth and light as we feel it hit our skin and bring the planet to life. Energy is the feeling of love that elicits a chemical reaction to be released throughout your body, in turn changing the overall state of your *energy*. Quite literally, energy is everything, and there are innumerable examples that could be given to describe the various similarities and differences between them, but most importantly, energy is not classified as anything other than everything.

Ever since I was young, I have always been quite curious about understanding the why of things; oftentimes, I never quite understood something that was being explained to me if it were not spoken about from the very baseline or origin of it. This mindset has carried me through my childhood years and well into my current reality. Through the lens of curiosity, I have grown up to intently observe the world around me, observe the people in my surroundings, and everything in between. When connecting with others or watching them from a distance, my overarching “why” would shake and rattle around in my brain as I attempted to digest and decipher their every action and word. As my subconscious searched and scoured to find a deeper meaning, I have always looked at everything around me as if it were merely clues waiting to be solved. This resulted in my somewhat quiet and reserved nature around others; instead of spewing out clues into my inner world, I would collect all of the ones they displayed and begin

trying to solve their mystery. The curious mindset has at times been quite helpful and, at others, has felt like a limitation. I will say for certain that it has allowed me to view things from so many different possible angles instead of adhering to only one, believing it to be the only "correct" or "right" way to view or experience something. Further, I believe that is another beautiful reason as to why I find such eagerness in learning and expanding upon new things. Knowledge expands the mind and allows for many diverse streams of perspectives to fill your very own, resulting in an expansive answer to the "whys" of things encountered in daily life.

As I have been on my journey through this world, I have only begun to ponder and question ever more deeply about the things around me. Especially with the health of our lives and the conscious state of being that seems to be continually changing as time goes on. It only became a louder voice in my head, trying to grasp how all of those in my waking life always seem to be in pain of some sort. Whether it is mental pain that causes feelings of depression, anxiety, or a lack of something deep within their lives, or physical pain that manifests in the form of inflammation of their joints, pain in their back, legs, feet, and so on—there is always a mystery of why that arises in my brain. Why are so many people unhappy? Why are so many people in pain? Why are so many people disconnected from the world around them? So many questions have always scratched the inside of my head, searching for an exit or opportunity to escape and be answered. Of course there are innumerable factors that intercept with the happiness, longevity, and love that one person may experience throughout their lifetime, but it truly seems shocking when you are around others and cannot escape the thought that something more may be contributing to the state of many in our society.

What is interesting is that most of the time, when someone is experiencing an imbalance within their physical or mental life, they begin to solely focus on one perpetrator that has caused a

ricochet of visible problems. By looking only through one lens, we have forgotten about the entire landscape or picture as a whole. This has limited our understanding of what is fundamentally causing the issue or imbalance in the first place. For instance, let me use myself as the perfect representation of what I am trying to display. I never fully comprehended what my mom meant growing up when she said that genetics were a huge proponent as to why my acne was more challenging than most deal with. My father was not a part of my life and was much more than a mystery as I grew up; I hardly knew anything about him aside from the angry picture I painted in my head from the small details I got about his story here and there in short bits and pieces. Needless to say, as someone who is a "why" person and needs to see the truth in front of me before truly allowing myself to believe it, a lot of the time it was hard to grasp the validity behind his story.

I had always struggled with acne, and it was certainly something that affected my mindset when growing up in school. My mom had said that his was apparently quite bad, so it must have been genetic, and it was just something I had to live with and work through. Taking this into account, I most certainly still did what I could to lessen the impact it had on me. Trying so many things and still feeling the frustration of what I had to live with was disheartening at times. Aside from trying a wide range of different face washes, topicals, and so on, I would regularly go with my mom to my primary care physician and seek any other solutions. I remember getting put on birth control because it was speculated that it was hormonal; let's just say that being in a constant mess of emotional rage did not last very long. From the desperation of promised improvement, I tried using vitamin E, tea tree oil, adapalene, tretinoin, benzoyl peroxide, salicylic acid, spironolactone, birth control, clay masks, and even Nizoral shampoo that was recommended for its specific ingredients. A few years back, I had finally had enough of speculating and trying all

sorts of concoctions, so I began visiting a dermatologist. Upon starting care, we also tried many topicals and daily routines, some of which I have already mentioned. Even before this, I had finally begun to realize that no matter how you treat the already-appearing inflammation that manifests itself in the form of acne, external treatment is only part of the battle. Just like I was told, it may be hormonal, or genetic, or this or that or this or that; what you eat, stress, sleep, and who knows how many other things truly affect acne as well. So, after finally getting closer to some relief and somewhat mitigating the issues, I had merely decided to see a dermatologist for help with the last little signs of acne. It was not nearly as bad or even as bothersome, but it was still something I wanted to improve.

I distinctly remember multiple instances where I would visit and exclaim that it looked a bit more irritated today because of how I had eaten the past few days (whether it was a meal out with family that had more oil than I was used to or more sugar than normal, my acne was a clear indication of how my body reacted to the ingested inflammation). Within those multiple instances, multiple people reiterated that food has nothing to do with acne. I was beyond perplexed, not because I believed them but because they believed themselves and what they had learned. They were only focused on looking through one lens, the medical lens of medication and solutions that pertained to substances or treatments. After a while, I knew that this search would continue. My acne certainly lessened after puberty settled; that is a given, but what truly ended the uphill battle was when I switched to a plant-based lifestyle. Upon cutting out dairy, meat, and many processed foods, it was like night and day.

Now, in my current reality, I am able to use the infrequent acne appearances as my body's way of communicating with me that something is off. Instead of suppressing it or only looking at one causality, I have learned throughout my long and strenuous

journey that so many different influences are able to alter my body's health. With so many things able to influence my health, it is no wonder that only looking through one lens will never deliver the entire picture. Yes, that is only a small glimpse into the world of health, highlighting my journey with acne, and it certainly is not to say that every medical professional handles imbalances in the exact same ways. Instead, I aimed to show how easily it is to get caught up in one mentality and causality without assessing all of the other possibilities on the same playing field.

Thus, I was eager to begin this book and explore some of the possible reasonings as to why imbalance is so prevalent in this current day and age. My goal when creating this project and further looking into this research was to pinpoint some of the hidden forces that have a say in altering and influencing our overall health. More so, I wanted to focus on the "invisible" energies that are often smaller, unseen, and overlooked and how they contribute to determining not only our health and longevity but also our everyday actions. I decided to use the word "energy" to encompass the vast array of forms and meanings it molds to. When used in this context of work, it can be defined as the fundamental force that animates, connects, and influences all forms of life—from the smallest form of vibrational energy within a cell that creates a magnetic field to one of the biggest depictions displayed through the electromagnetic patterns of the Earth, energy is found in, around, and between all of these beautiful layers.

In this context, I also use the word "energy" to demonstrate the emotional and mental frequencies that are expressed through human experiences—how these emotions and experiences can impede the functioning of all systems in the body, preventing them from working properly. Discussing how the emotions felt within our daily lives can create a buildup of physical effects, with the prolonged feelings or triggers that elicit emotions like stress and

anxiety, they create detrimental effects within the inner workings of the body's systems. Because the word "emotion" is derived from the Latin word "emovere," which means "to move out" or "to stir up," it creates a better understanding of this *energy* in motion (Online Etymology Dictionary, 2020). We can correlate emotions with energy due to the way that they enhance or attune our sense of well-being; through the expression of emotions, our energetic response is shifted. The same can be said for emotions or energy that is repressed and begins to accumulate within the body. Through repression and suppression, this work also walks you through the effects of energy/emotions that have not been moved out of the body and instead are entwined within our own internal systems. Showing themselves through various ways, they not only reside within the memory of the mind but also shape the body's response to everyday situations and scenarios.

Through the different layers of energy, I have depicted them in a vast array of ways, starting with the basic fundamental building blocks and true essence of what energy is, an atom, and how that small mechanism plays a major role in the planet that we all reside on. This project begins with the importance and understanding of electrons, discussing how one of the most basic components of energy has such a substantial ripple effect on us as human beings. From the Earth's natural vibration, the Schumann resonance, to the magnetic field, the first section of this book explores how our planets' frequencies interact with our own energy. Through studies and discussions, this first part walks you through the background and importance of how we connect with them and how they correlate with our daily lives. After the discussion of the more "invisible" energies from Earth, this section then transitions to physical mechanisms of Earth that can influence our health and connectivity. Considering the most fundamental component of energy, it displays the destructive influence that can occur on the body from an imbalance of properly paired electrons

in the form of free radicals. By discussing the mechanisms behind it, I also explain some of the tools that can be used throughout the Earth to lessen these impacts. From rain, trees, and the earth's surface, it contains innumerable resources to aid in our health and longevity. With scientific studies and everyday comparisons, this segment also displays the possible impacts that can occur without reaping the benefits from the resources all around us and indicates how the modern-day lifestyle has become increasingly disconnected from the true essence of Earth.

Within the next section, it discusses microorganisms that reside within the human body. More specifically, the gut microbiome. This second section provides an overview of how the gut and the brain are deeply intertwined and how the bidirectional communication between the two can influence the direction of the body. By first walking through the importance of a healthy, balanced, and diverse microbiome and explaining the detrimental impacts when dysbiosis is present, it begins to lay out the link between the gut and the brain. In discussing the three major communication pathways of the gut and brain, it displays the foundation to better understanding how this mechanism, formerly known as the gut-brain axis, is pertinent to the overall health of the body. Furthermore, once the major route and inner workings of how the gut-brain axis functions are understood, the second portion then goes on to display the three major implications that impede the gut-brain communication and further cause detrimental effects on the entire body. Discussing how certain pharmaceuticals and medications can impact the diversity of the gut in some cases for over two years. In this we learn some beneficial things to think about, as well as some information to consider. This first factor equips us with the knowledge to go out into the world and better understand how we have been accustomed to certain things that may cause more harm than we first knew about when they were integrated within society. The second factor that greatly influences

the diversity of the microbiome is attributed to the different foods we ingest, as it mainly focuses on ultra-processed foods and the destructive impacts that sugar has on the body. Many shocking statistics and results from studies are shared, which help to put these puzzle pieces together within the framework of the gut-brain axis. Lastly, one that seems to be under-communicated yet over-impactful is stress; discussing how stress is one of the most detrimental influences on the body's health is so pertinent to maintaining a healthy body. From fundamentally changing the function and path of certain cells to inhibiting the regulation of specific chemicals and hormones, stress is not only an emotion, but it also produces physical changes within the makeup of the human body that cause detrimental effects when persistent for a long period of time. The ending on stress leaves the reader with a small piece of insight as to what the next part will be about.

This third section entwines the effects of not only stress but also how the body has evolved based upon the brain's perception of the world. Through previous encounters and experiences throughout our lives, our bodies adapt and mold to the responses we once encountered. All of which can have drastic impacts on how we perceive and continue along our journey in the present reality. By diving further into specific mechanisms that are quite powerful in influencing the communication and health within our bodies, this third section begins by discussing the interconnected web of connective tissue that weaves throughout the entire body: fascia. It presents the mechanisms and wonder fascia entails. After portraying the system and inner workings behind this fascial web, this portion then dives into the impacts and ways hardened fascia can affect the body. Following the detangling of fascia's complexity, this section then opens up a new influential mechanism that is impacted through the way the brain perceives the outside world, heart rate variability, and its electromagnetic field. By bringing this beautiful ripple back to the beginning of the

work, we take a deeper look at electromagnetic fields (EMFs), firstly the heart and brain and lastly the external or man-made electromagnetic fields. After exploring the insight and appreciation into our own internal world of EMFs, we connect those to the outer world, attempting to discover more about the inextricable connection we have with the modern-day lifestyle of technologies and frequencies. Through this, I review a vast array of research and begin articulating my perception of these findings while expressing possible correlations.

Through the entire exploration of this work, I aimed at expressing and answering my "whys" to possible ways not only environmental and ingested energies but also interpreted energies affect our overall internal state of health and well-being. Because there are innumerable components that have a say in our livelihood and not one single factor can be to blame, I was intent on seeking out some of the possible influences that are not frequently spoken about. So this exploration may seem like a string of separate things that do not directly display their connection, but through this work, I hope the reader understands how, on the surface, many things that seem unconnected actually share many similarities when diving a bit deeper. My hope in sharing some of the unique findings from my research journey is to bring more awareness to the multitude of "invisible" moving parts (or energies) that influence our daily lives. As well as to provide the reader with even an inkling more information on the diverse and complex mechanisms that make up the human body while purely bringing them along on my exploration and curiosity behind the "why" that formerly only resided within my mind. With a different perspective and more knowledge, each of us can better understand the magnitude of factors that may influence not only our physical health but also our mental health as well. Instead of only seeking out one answer through the viewpoint of one lens, this work reflects the importance of broadening that perspective to begin

attempting to decipher the mystery of the entire image. In ways we formerly sought out one means of resolution, I hope to reflect the beginning of what may be millions of ways we begin understanding the influence our external world has on our internal world. One piece of an enormous jigsaw puzzle may look like nothing on the surface, but through time, and with the help of many, the mystery may one day be solved. May this body of work help to provide the reader with a better blueprint of their own unique individuality of energy.

SECTION I: EXTERNAL ENERGIES

Part 1: The Allure of Earth

Chapter 1

Under Our Very Eyes

When we try to pick out anything by itself, we find it hitched to everything else in the universe.

—John Muir

There is something quite beautiful and entrancing about the complexity of the earth. Not just through the vast array of creation that is luscious and green, reciprocating life between itself and living animals that roam the planet. As they each provide what the other needs to sustain life and continue evolving. It is also not just through the bountiful and vibrant gifts she provides in the form of sweet, juicy sustenance or through the almost unbelievable species of animals she has birthed. I mean, imagine attempting to describe such diverse animals and their undeniably unique qualities to a hypothetical individual who has never been to planet Earth before.

Just listen to this as if you were that hypothetical someone: Envision an animal that can reverse its life cycle; birds that can reach speeds of over 200 mph; species born with gills just to grow lungs and live on land; species that lack both a brain and a heart; insects that eat their entire bodies and rebuild a completely new one; species with more than 200 eyes; species with more than 1200

legs; some that breathe through their skin; animals that use biological sonars or sound waves to "see"; animals with the ability to regenerate limbs; some that can literally change colors—and my goodness, I could go on forever, but I imagine you get the point. That in and of itself is mind-blowing, and once you begin to see how interconnected everything created from the natural world is to one another, that ripple of astonishment begins to expand.

I truly believe we have become so accustomed to the insanity and wonder of this planet; over a decade ago, a study estimated that there were a little under 9 million species on Earth, with almost 8 million of them pertaining to animal life (Mora et al., 2011). As we compare it to what scientists estimate today, that number is deemed to be largely underestimated. With so much life, whether it be plant or animal life in the ocean or on land, barely 20 percent have been discovered and identified. When we solely look at the ocean's discoveries, less than 5 percent has been explored despite it covering almost three-fourths of our planet. That is the true, entrancing astonishment of this world. The amount of interconnected minutiae that can be found upon every single layer of this planet. All of the moving parts that Earth has created benefit through this dynamic cycle of life in such a magnificent way.

Just looking out my window, the evidence is apparent: squirrels innately bury tree seeds to aid in the cycle of life; vultures seek out dead flesh without knowing that their stomachs are one of the few that can neutralize and stop the spread of disease; and bees seek out pollen by going from flower to flower without knowing that they are vital to plant fertilization, pollinating roughly one third of our food. Not to mention the inextinguishable connection to plant life we have; without the moving parts of each diverse extension of earth, the effects ripple just as profoundly.

All the life on this planet contains intricate details with such innate functions. Without even knowing, some navigating species, such as specific birds, salmon, honeybees, butterflies, and

even sea turtles, all have something very unique in common. Not just that they migrate from time to time, but also that they contain a magnetic mineral called "magnetite," mostly found within areas of their heads. These magnetic crystals act as their own internal compasses, helping them to align with the Earth's magnetic field, which in turn aids in guiding them during migration.

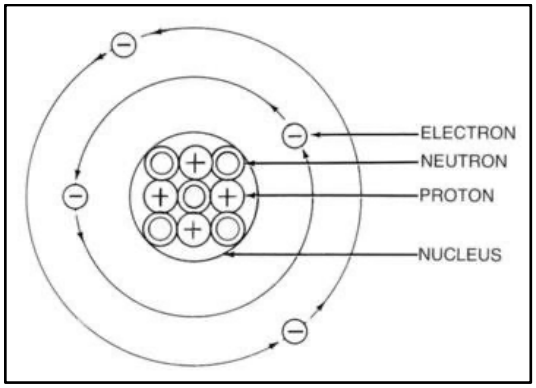
Now, I understand that I have spent too much time discussing the intricacies of animal species, their innate biological adaptations, and their uniqueness. However, I felt drawn to do so, as they are an extension of earth that we likely understand the most and can visually depict the immense diversity they contain. Understanding and truly grasping the utter complexity from other extensions of Mother Nature are likely less noticeable; for instance, the highly invasive plant kudzu can grow up to a foot a day, or trees experiencing severe drought or injury emit ultrasonic sounds. Essentially, animals are another thing; we can grasp much more about their complexity. From the moment babies begin learning about the world around them, they are commonly introduced to animals. They play an integral role in understanding diversity as we grow up and have been taught all throughout our lives, so before you begin to ask yourself if this is a book about the innumerable number of animal species on this planet with countless fun facts, no, unfortunately, it is not. Instead, it is an invitation to see this planet through a different lens, as this work begins to weave the allure of Earth back to you, as you are the very extension of her creation. By introducing you to a new realm of wonder, I figured, what better way to do that than to reflect that those very same magnetic crystals found within navigating species to connect with the magnetic field of Earth are also produced and found by the billions within our own heads?

Magnetism Within & Around

The mechanism is truly more mind-blowing, and to further understand just exactly how this process works, we have to begin with the foundation of magnets and magnetic fields at their core. Literally and figuratively speaking, of course. As all are likely familiar with the fundamental understanding of what a magnet is, I will quickly recap. Magnets contain both a north and south pole, with opposite poles attracting and like poles repelling. To understand how this truly works, we have to dive even further into the basic components of what makes up all matter: atoms. While atoms contain positive protons and negative electrons, magnetism is almost entirely governed by the electrons. In most matter, electrons exist in pairs where they "spin" in opposite directions, effectively canceling each other's magnetic force. As the protons are housed in the middle, providing structure, the electrons exist in "orbitals," which are located around the nucleus, or middle, of the atom. Here is a better representation of that in action (Pearson Scott Foresman, n.d.).

Figure 1

Visual Representation of an Atom



Note. While this figure uses a simplified depiction for visual clarity, it illustrates how electron placement within the atom dictates magnetic potential. From Pearson Scott Foresman, n.d., *Wikimedia Commons* (https://commons.wikimedia.org/wiki/File:Atom_(PSF).png). In the public domain.

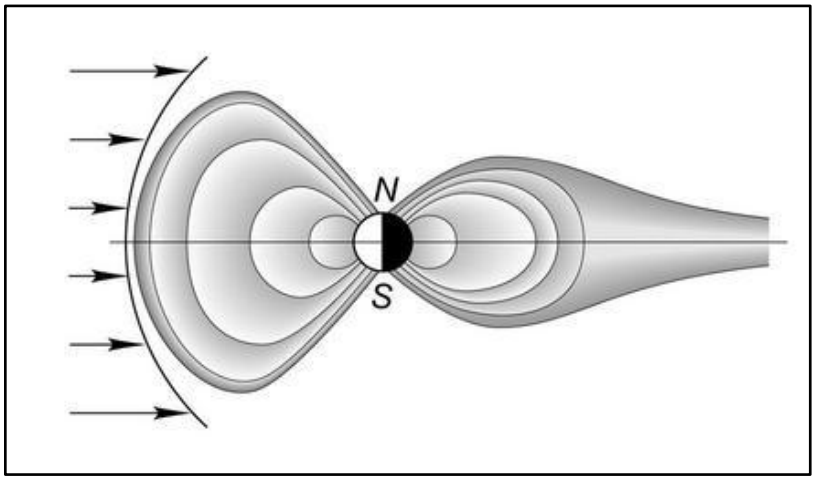
In a permanent magnet representation, the electrons do not cancel out. In materials like pure iron, these unpaired electrons align their spins in the same direction or parallel manner. However, the mineral magnetite is unique; due to its crystal structure, some iron ions point their spins in the opposite direction, or in an antiparallel manner. Essentially, some point up and some point down; because the "up" spins are greater than the "down" spins, they do not fully cancel out. This creates a tiny, permanent magnetic force at the atomic level, and when added together across billions of atoms, it gives the mineral its resulting magnetic power.

Let us transition from the microcosm to a visual representation of the macrocosm—Earth. To better envision how these pieces work together, Earth can be depicted as a larger version of a magnet or, in this case, an *electro*magnet. In a basic magnet, the two distinct sides, the north and south poles, create varying pulls. Using what we just learned, spin orientation from this magnet causes lines of force to follow in one direction, which creates a closed loop also seen as the Earth's magnetic field. Because of Earth's molten iron core, the magnetic field it generates is immensely huge. As it extends greatly into space, it acts as the planet's shield from incoming charged particles emitted from the sun. When the sun emits charged particles, caused by plasma being dispersed into space, and they reach the earth's magnetic field, they essentially battle, and the earth's magnetic field acts as a funnel, bringing these particles closer to the north and south poles. This occurs due to something called the Lorentz force, which is a force that entrains these ions to follow a specific path when interacting with both an electric and magnetic field (Robinson,

2010). This is what creates the beautiful etheric lights that are known famously all throughout the world: the aurora borealis.

Figure 2

Visual Representation of the Magnetic field & Lorentz Force



Note. This figure illustrates the deflection of the solar particles created from the magnetic field of Earth. From A. Baravik, 2012, *Wikimedia Commons* (https://commons.wikimedia.org/wiki/File:Solar_Wind_and_Earth's_magnetic_field.png). In the public domain.

Tying all of this back to the magnetic crystals found within the heads of navigating animals and our very own, the electrons within magnetite will align themselves with the magnetic field of the earth. From the imbalance of “up” and “down” spins, the permanent magnetic pull naturally wants to interact with Earth’s poles (Nordmann et al., 2017). These animals are said to develop an ability to determine not only the direction in which the geomagnetic field is but also gauge the intensity of the field as well (Shibata et al., 2024). The innate biological creation of their abilities and characteristics has aided them in survival and

adaptation throughout their evolutionary history. As studies relaying these discoveries can be found from nearly 60 years ago in the late 1960s, in 1992, the first study was published that reflected proof of the human brain naturally containing magnetite as well (Kirschvink et al., 1992). To all animals in the natural world of the past, these were vital and dire tools that helped many stay alive by remembering their routes, homes, directions, and overall location. However, as time has progressed and more development has taken place at astonishing rates, it is not surprising that these navigating crystals, once a gift, may be slowly disappearing and being replaced by a curse. Just take a minute to look around your nearby surroundings, and I am willing to bet that you are enclosed by multiple sources of modern-day magnetic field examples. Essentially, because magnetic fields are generated by moving electric currents, all things that emit electromagnetic fields likely have the potential to impact magnetite crystals (Burnei et al., 2012). And practically all atoms obtain an electromagnetic field. This means anything from phones, headphones, appliances in your home, power lines, wires behind your walls, Wi-Fi routers, and the hundreds of other man-made technologies emits an electromagnetic field. Because these magnetite crystals spin and align when they interact with magnetic fields (like a compass needle), the interferences from the handful of examples I displayed above are almost inescapable. Furthermore, you can likely guess how the modern lifestyle is impacting the navigating animals that also contain this mineral within their heads. Exactly how these man-made frequencies have the potential to impact our own will be discussed in depth in the third section of this work, but for now just hold on to the possibilities of what this truly may mean. With interference likely affecting the navigating potential of these animals, it can impede their ability to “tap” into the Earth’s communication. The same is said for our former connection our ancestors had with the earth's energies. Not being able to tap into

the natural vibrations that are produced from the immense electromagnetic field of this world certainly takes its toll on us in more ways than we are even currently aware of.

That same 1992 study, as discussed previously, attempted to calculate the amount of magnetite crystals per gram of the human brain; with their data calculations, they exclaimed, “We estimate that brain tissues contain a minimum of 5 million crystals per gram, distributed in 50,000-100,000 discrete clusters. Similarly, the meninges contain a minimum of 100 million crystals per gram in 1-2 million clusters” (Kirschvink et al., 1992, p. 7685). What does this mean in simple terms? Well, understanding that the average weight of the human brain varies from person to person but is roughly 1,400 grams and that the meninges are much lighter and weigh 30 to 50 grams. The number of magnetite crystals in the human brain was estimated to be anywhere from 7 to 10 billion. So, considering that this was calculated in the 1990s, before the urban environment skyrocketed and development was nearing every corner of the world, that number is likely the lowest estimate of magnetite within the brain that we will get.

Upon the discovery of that 1992 study, researchers have continued the exploration, attempting to understand just exactly how this works and what this means for not only humans but also all species that carry this crystal within them. Through my own curiosities upon learning about this subject, I could not help but fathom the implications of our current society and how metals or magnetic-containing particles from the world around us contribute to this matter as well. Interestingly enough, scientists have been able to examine and distinguish the two types of magnetite in human anatomy: those from the external environment that have made a new home within our bodies and the other type that was formed from the brain/body itself. Within the brain there is something called the blood-brain barrier (BBB); it is meant to protect the brain from toxins, chemicals, and harmful bacteria.

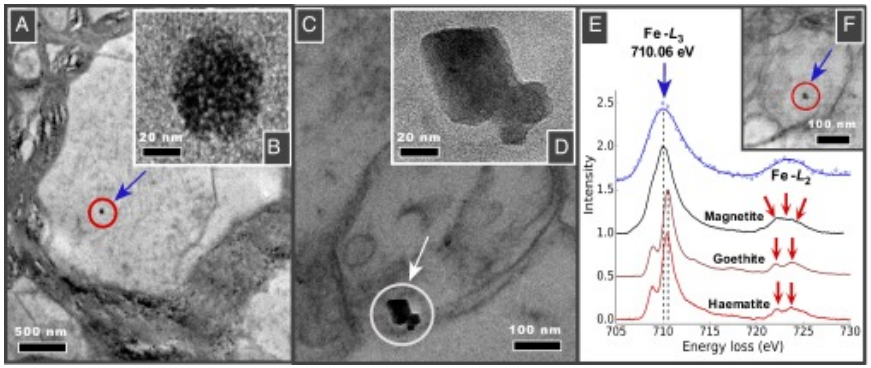
Because this barrier is meant to protect things from breaching the control tower of the body, when that line of defense is broken, the brain itself is vulnerable to all incoming enemies.

Things that have the ability to surpass the blood-brain barrier are water, oxygen, carbon dioxide, and a few other molecules. This means that the very act of breathing in harmful substances that have mixed with the oxygen in the air can easily permeate through the BBB and enter into the territory of the brain (Dotiwala et al., 2023). Because this barrier is meant to be the defense of the brain, the brain itself does not have the specialized enzymes to break down and degrade foreign substances that have surpassed the protective barrier. Consequently, they essentially stay within the brain and accumulate throughout time. Plastic particles and heavy metals are among the main invaders, and recent studies have revealed that roughly 0.5% of the brain's weight consists of microplastics (Nihart et al., 2025). For visual representation, envision a wooden pencil, a lithium AAA battery, or even the common example, a plastic spoon, all housed inside the delicate and consequential organ of our bodies. Furthermore, instances such as being in the city where there is a continuous influx of vehicles braking, residing near factories/industries, and taking underground subways are among the most harmful in terms of exposure to these external magnetite particles. This is due to the fact that they stem from high-temperature, combustion-based situations as well as friction that involves high heat. When we think about being near cars that brake constantly, either from living in the city or working as a roadside worker and so on, these cars brake from friction and have been shown to emit more magnetite than emissions from diesel engines do (Gonet et al., 2020). For example, when particulate matter from these few examples is heated up to such high temperatures, it melts and will turn smooth and round upon cooling with the air. These particles, considered nanoparticles due to their extremely small size, are so tiny that they

are able to be breathed in by the nose and surpass this blood-brain barrier. Below is an image taken from that very research study, displaying the vast differences between the externally made magnetite (depicted on the left, with B being a zoomed-in version) and internally made magnetite (the image on the right, with D reflecting the zoomed-in particles) (Maher et al., 2016).

Figure 3

Comparison between the naturally occurring magnetite and environmental magnetite



*Note. [*Transmission electron micrographs of brain thin sections, identifying two distinct types of magnetite morphologies within frontal cells: (*A* and *F*) rounded particles (*A* shown at higher magnification in *B*); and (*C*) angular, euhedral particles, which we attribute to endogenous formation (particles from *C* shown at higher magnification in *D*)*].* From "Magnetite pollution nanoparticles in the human brain," by B. A. Maher et al., 2016, P*roceedings of the National Academy of Sciences of the United States of America*, *113*(39) (https://pmc.ncbi.nlm.nih.gov/articles/PMC5047173/). CC 2026 by PMC.

What is scary about this, among other things, as you can likely envision, is that they are quite toxic to the brain and, further, have the ability to respond to magnetic fields. Their toxicity is due to what happens once they mix with the already existing hydrogen peroxide inside of cells. They are able to break it apart, turning it into a highly unstable molecule that is destined to essentially steal electrons from other molecules. Also referred to as the "Fenton reaction," this process is harmful specifically because it contributes to something called "reactive oxygen species" (ROS), which can be highly detrimental. ROS is something we will revisit in depth later on, but for now, understanding that it has the capability of breaking down essential parts of the body, such as DNA, proteins, and fats (of which the brain is almost entirely composed), displays a bit more about how this can impact our health ("Fenton Reaction," n.d.). This chemical reaction does not just end there; it also has the ability to stir up plenty of other areas within the body, contributing to systemic inflammation and indicating close connections to neurodegenerative diseases (Gonet & Maher, 2019).

Taking the current reality into consideration, that initial number calculated from 1992 could be in the hundreds of billions in today's world, and we are just beginning to discover the true impacts that these effects have on the human body. To tie this back to the beginning of this section, what does this say about the animals that also exist within this world and have not had a choice but to adapt to our newly modernized environment? How does this impact these navigating animals? Or even those that have not been studied to have internally produced magnetite in their anatomy? I am sure they are not exempt from the effects of these changes either. What about us? What is the purpose of magnetite produced within our bodies? This has still yet to be truly understood, as there are many debates, theories, and so on, but from my own perspective, I wholeheartedly believe that it may have been a navigation tool that our ancestors used when they solely lived

through the beat of the earth and were entirely tethered to the natural, enchanting world. As time has progressed and as we have advanced, these pollutants of magnetite have abundantly overpowered the naturally forming ones within our brains, which may be another reason as to why it is quite difficult to decipher their true initial purpose.

So, what does this say about all of the other "invisible" strings within our everyday lives that we are still completely oblivious to? In what other ways does this magnetic field of Earth affect the world and all organisms within it? Or the air permeating our lungs, water filling our bodies, and the infinite other things throughout this planet? Well, by expanding more about the invisible magnetic forces that lie right beneath our eyes, and as we begin to imagine what other elements of Earth we are entangled with, may my curiosity allow us to dive into a different, unforeseeable layer of this planet.

Chapter 2

The Waves of Life

The goal of life is to make your heartbeat match the beat of the universe, to match your nature with nature.

— Joseph Campbell

The debate on whether this planet is alive is one that has been scoffed at for quite some time. I am sure it is not such a far stretch to suggest the interconnectedness of many moving parts that aid in the stability and health of life, as that is the entire premise of this body of work. However, diving a bit deeper into small crevices of those interconnected realms, overlapping them instead of thinking of each piece separately, is oftentimes something we experience difficulty with. What is considered life? What is the driving force that brings that organism to life? For us, is it our hearts? Is it the oxygen we breathe in? Is it the nutrients and sustenance ingested regularly? Is it the water we consume? Or maybe, similar to plants, is it the warmth and sunlight we receive? Not one of these is considered more vital to sustaining life; sure, you could argue that food is not as important as oxygen or our pumping hearts are, and because of their lack of displaying immediate effects, they are viewed as less important when amongst

the others. However, although the impacts are not visible right away, they surely show their significance in various ways; through time, food eventually becomes viewed as equally, if not more, important than the other forces I exhibited. Essentially, what I am pointing at is the fact that if invisibility is able to stop us from believing something very prominent that resides right beneath our eyes or even all around them, that does not mean it is not real. The air, the magnetic field, gravity, electromagnetic waves, sound, heat, emotions, our heartbeat, and even atoms are all very real. We are not able to see them, unless someone next to you at a stoplight has their windows down and massive subwoofers blasting as they shake the entire car and your own… In that case, sound is technically visible, but you get the idea. Even without our visible perception of these phenomena, they live and breathe through our very bodies, curating our unique, individual experience of this world.

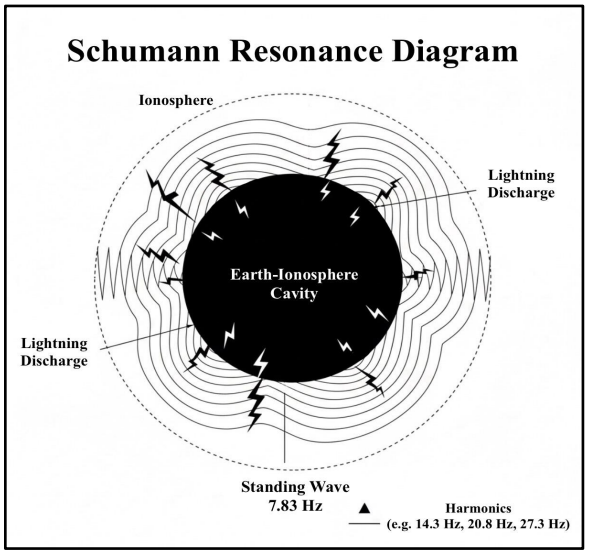
So, what about for the planet itself? What sustains her life? Or is her life considered the life created on top of this planet, such as plants and animals? Well, what about the earth itself? Taking the side of seeing this planet as alive, for her, it is an abundance of various things, and ultimately, we survive because of *her* ability to survive and provide us with vitality and habitable environments. Similar to us, we could see Earth as obtaining her life force energy in a multitude of ways, from the magnetic field that is generated by the immense heat and conductivity of the earth's core to the sun particles absorbed into the atmosphere and converted into fuel by the millions and billions of plant matter. Or even, through something less commonly considered, thunderstorms. These all aid in the continued animation our planet extends to all organisms she has breathed life into.

Thunderstorms

The "heartbeat" of this planet can be viewed as like our very own, resulting in a measurable frequency that is fairly stable but also reflects fluctuations when needed. Between a layer of the atmosphere, called the ionosphere, and the surface of the earth, lightning strikes run wild. These vigorous drumbeats of lightning, like two people playing ping pong back and forth in the quietest library to ever exist, are what create the beautiful "heartbeat" of Earth. Almost 5 times hotter than the sun's surface, these lightning strikes occur anywhere from 8 to 10 million times per day all around the globe and result in the planet's fundamental frequency (National Weather Service, 2019). Although there are many different fluctuations, and 8 distinct frequencies have been acknowledged since lightning can emit varying electromagnetic waves, the most dominant of them is 7.83 Hz. This occurs because the continuous lightning strikes ricochet and emit electromagnetic waves that course throughout the cavity between these layers (Physics Demos, 2016). The waves will circulate and fill this space, eventually overlapping with each other and combining to form one. This was named after a German physicist and is formerly known as the Schumann resonance (Stolc et al. 2021).

Figure 4

Schumann Resonance Diagram



Note. Diagram of the Schumann resonance mechanism. Image generated using Google Gemini 3 Flash, 2026.

In connection with the magnetic field of Earth, animals also connect with this planetary frequency to better sense the world around them (Buehler et al., 2009). Think of the weird occurrences where animals know something is going to happen before we do. Although we have technological devices that give us more insight into the weather shifts, animals must use their surrounding connections to pick up on these fluctuations. The other day, I had just gotten home from work and was outside with my dogs. I was awestruck by the sounds of hundreds of birds, reflecting almost a war signal. I stood there, staring at the trees in the distance, and watched as hundreds of them signaled and began moving to the other side of the neighborhood. As if they were warning each other, I had seen enough movies to know that animals have a keen sense of if something is going to happen. I got a bit perplexed and

checked my app as I stood outside and continued hearing the screams of so many birds at once. Since my app did not indicate rain, as it is not always reliable, I remained standing there and watching them, utterly amazed and trying to comprehend what they were communicating to one another. Moments after they all fled from the trees in the distance to the ones in the completely opposite direction, they stopped violently chirping. I was not sure what to make of it, so I stood a bit longer as it began to get quiet and redirected my attention to my dogs as they were staring at me in absolute confusion. Right as I went to put them inside, I heard the low rumble of thunder. It was truly astonishing; even such a small glimpse of animals' abilities was a true wonderment to capture. Being able to see the information I had been researching occur right before my eyes was such a beautiful moment. Just exactly how were they able to pick up on these atmospheric shifts? Well, in part, they are able to hear mechanical sounds and infrasound waves far outside of the range in which humans can detect; these sounds were likely emitted from the incoming storm (Buehler et al., 2009). Additionally, it was through their ability to connect with this fundamental electromagnetic frequency of Earth, the Schumann resonance. The behavioral shifts in animals before an earthquake have been studied and recorded, dating back over 2 thousand years, from Greece in 373 BC (Earthquake Hazard Program, n.d.). It is not a far stretch to imagine these species that have existed in the natural world for thousands of years, developing abilities and capabilities to aid in their survival within their environments. However, it is commonly difficult for us to believe things that seem out of the normal realm of our everyday domain, especially as the information and discoveries are quite new and still being further developed. And, in many cases, the Schumann resonance is alongside that hesitancy as well. I truly believe that everything new to us is always met with some level of weariness at first because it challenges our comfort and current

perspective in which we feel rooted and reassured. As this body of work challenges expansive perspectives, the Schumann resonance, although imperceptible to us, is among the most influential connections that we have to this planet.

In the Earth

From the mid-1960s to the early 1970s, over 80 individuals gave up their lives on the surface of the earth for multiple weeks at a time. Leaving the sunlight, normal routine, and schedules their bodies had come accustomed to, they entered into an underground bunker (Wever, 1970). As their new goals for the next few weeks revolved around being test subjects for numerous German scientists, with one by the name of Rütger Wever. Within the span of Wever's life, these were not the only studies he conducted underground; in total, he examined almost 450 individuals amongst over 400 experiments. With the main premise to better understand the influence of external cues on the innate clock that practically all living organisms contain, the circadian rhythm. As these volunteers entered into a completely different environment than they were formerly used to, they were introduced to two distinct rooms. While both were fully furnished and aimed at replicating an apartment-style comfortability with their own shower, kitchen, bed, living space, and bathroom, one of the experimental rooms was entirely shielded from both electric and magnetic fields, while the other was not shielded and allowed both fields to enter naturally (Wever, 1979).

As almost all beings contain their own internal clock that aids in the stability and regulation of critical bodily functions, such as body temperature, sleep, and hormone control. According to the National Institute of General Medical Sciences (NIGMS, 2025), "In humans, nearly every tissue and organ has its own circadian rhythm, and collectively they are tuned to the daily cycle of day

and night" (para. 1). This means that even the smallest changes within certain circadian rhythms of the body can desynchronize, which results in profound effects. Because these volunteers were isolated from social interaction, natural sunlight, and environmental noise for weeks at a time, their clocks often had a hard time maintaining balance. Throughout his studies, it was evident that the individuals in the shielded room (away from all possible cues) began to drift from the regular 24-hr innate clock to their own 25-hr clock. And, although one hour may not seem like a drastic change, it is actually a grave physiological shift. If their internal clocks function on a 25-hr range, then each day that progresses, they shift by one hour. Essentially, this means that by day 12 their bodies' clocks would be completely inverted, releasing hormones in the middle of the night that kept them awake and functioning as if it were 8 in the morning. Not only were these changes made clear, but the researchers also discovered that our bodies have multiple systems that are meant to respond and communicate congruently with each other. As time progressed, these internal systems began to desynchronize (Wever, 1973).

The human body has multiple indicators for day vs. night, one being hormones secreted when waking or sleeping, such as melatonin or cortisol. Secondly, our body temperature is known to drop multiple degrees when shifting to the sleep state. In these studies, they began to desynchronize or stop communication with one another, so while a participant's temperature clock may have been functioning on a 25-hr schedule, their sleep-wake cycle could be set to its own pace up to 30 hr (Martel et al., 2023). If you have ever experienced jet lag or even stayed up all night, then you are likely familiar with the fatigue, brain fog, poor concentration, and overall complete sluggishness these effects bring. The lack of rhythm from these two systems left the participants feeling a permanent state of malaise. To try to "reset" their clocks, Wever tested a number of different things, the most notable being an

extremely low electromagnetic frequency. With attempts to mimic the natural frequency of the Earth, he incorporated a very weak electric field of 10 Hz without their knowledge. They found that it would not only resynchronize the two systems that had begun to function independently of one another, but it also brought their 25-hr rhythms down drastically, functioning closer to the normal 24-hr cycle (Wever, 1979). Below is a graph taken from their results to better display the influence that one small cue had on their entire systems.

Figure 5

Subjects' Circadian Rhythm With and Without Hz Field

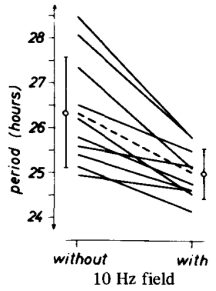


Fig. 6. Period values of 10 human subjects with full internal synchrony, measured in sections without and with an artificial 10-Hz field in operation.

Note. From "The effects of electric fields on circadian rhythmicity in men," by R. Wever, 1970, *Life Sciences and Space Research, p. 182 (https://pubmed.ncbi.nlm.nih.gov/11826883/).* Copyright 2026 by PubMed.

So, What Does This All Mean? —Recap

His extensive research was one of the first to display the true discovery behind our own innate biological clock aside from cues of sunlight and other visible environmental factors. And, even

more so, Wever and his colleagues were able to bring the invisibility out into the physical world by highlighting the profound possible effects of Earth's natural frequencies on our own innate rhythms (Wirz-Justice et al., 2006).

To a greater extent, not only through the innate connection that animals have to this unforeseen energy is animate life vastly regulated through the subtle ways it entwines with them, but there are remarkably strong studies indicating our very own tethers to this "heartbeat" as well. The waves from these resonant frequencies are all-encompassing to the point where researchers must design specific structures that are shielded from them in order to explore the possible impacts that occur without their connection.

In short, we are utterly entangled in electromagnetic fields, whether they are man-made ones or those produced from our own planet, and because every cell in our bodies creates an electromagnetic field, we are beautifully connected to the "invisible" world regardless of if we choose to believe it or not.

How Are We Connected to These Frequencies?

In the beginning of this discussion, I briefly relayed that the fundamental frequencies of Earth vary and that there are 8 distinct ones that have been identified. In later sections I will delve into the power and control that electromagnetic fields have on our hearts and brains, which ultimately guides us to the inquiry that they are among the most influential for understanding our own health and body's overall well-being. Independently from that future exploration, this current one aims at exploring the enmeshed energies of the earth. These 8 distinct varying frequencies are interestingly all within our very own range that can be found within the brain.

Brain waves, measured using an electroencephalogram (EEG), vary vastly and can depict a lot about the state and activity

that the brain is in. Just as the earth's frequencies vary depending on the amount of external energy being supplied and transmitted, our brain waves respond in a comparable manner, highlighting a few different ranges or "bands." The main ones I will touch upon are known as theta, alpha, and beta, depicted from slowest to fastest, and they vary greatly. It is important to note that, just like the fluctuations from lightning, our brain waves do not stay in one fixed frequency. Instead, it may produce multiple at once; however, depending on what we are doing or thinking, one is more dominant than the others (Abhang, 2016).

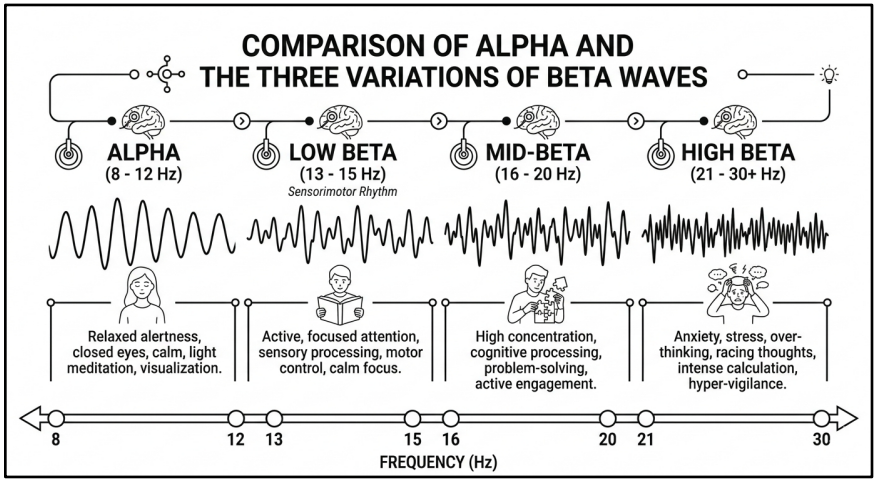
Theta ranges from 4 to 8 Hz and is found in wakefulness and likely appears with the transition from wakefulness to sleep, dreaming, deep meditative or relaxed states, as well as "flow" states. Musicians, artists, writers, and other creative people are familiar with this term and are commonly associated with this state (Abhang, 2016).

Moving up the list, alpha waves are next, ranging from 8 to 12 Hz; think of alpha waves as a period of relaxed wakefulness, moments of quiet downtime, and other states when the brain is peaceful and not intensely focused on something. Our brain is normally in alpha when we are doing activities such as meditation, calm relaxation, and listening to music, depending on the genre and speed.

Lastly, beta waves are found within ranges of 12 to 35 Hz and are often associated with alertness, focus, and more complex states of consciousness. Within this band, there are three variations, essentially lower, medium, and intense mental activity. This is understandable since the other ranges only vary by 4 Hz and this one varies by over 20 Hz.

Figure 6

Comparison of Alpha & Beta Wave Variations



Note. Comparison of Alpha and Three Variations of Beta Waves. Image generated using Google Gemini 3 Flash, 2026.

Just think of the first two letters in the alphabet, and honestly, that is all you need to remember: alpha is the slower wakeful range, and beta is the higher wakeful range. However, if you are unfamiliar with these different frequencies, it may be a bit confusing to visualize something you have never heard of before, so let me try to bring them to life. My grandparents live almost 4 hours away, and although it is not inherently an insanely long distance, I still try to take out some time in the summer to visit them for at least a few days. Since they live quite a ways away from me, I attempt to stop as few times as possible, as I am sure it is likely something we all aim to do on a road trip.

For a large majority of the drive, there are rarely any stoplights or brief pauses throughout the trip. Think of this common "go mode" mentality during my road trip as the beta range that constitutes the common "go mode" lifestyle we have

been obligated to. From the moment we wake up, we are likely filling our minds with information, thoughts, worries, concerns, needs, upcoming reminders, and so on. In the busyness of our daily routines, we are often operating at a much higher amplitude of brain waves as opposed to when we are preparing for bed and drifting off into the realm of our psyche. However, just like on my road trip, although it was not as long as others I have commonly been on, after a while my eyes, brain, legs, and everything else begin to seek out a mini break. Even if it is a small one like being at a stoplight that is just long enough to allow me to grab a snack from the back, change the music, briefly stretch, or ultimately just break up the flow before continuing. Moments like these are essential to regaining the brainpower and momentum to continue the road trip without ultimate fatigue that forces me to stop and take a break. These "stoplight" instances are the momentary alpha breaks within the busyness of our days.

Because beta frequencies are likely ruling the brain when the eyes are open, as our everyday lives rule productivity and achievement to the fastest degree possible, stress is a common ingredient in the mix with beta waves. Whether it pertains to the many things we must remember, the upcoming chat we have to have with someone, running a few minutes late, worrying about our appearance, possible financial stress, or even the smallest things, such as playing a conversation that we had on repeat in our heads. All these small occurrences build in the mind and prevent it from taking a breather. With the brain on high alert during the day and only getting brief periods to slow back down, there is often such a short window for us to leave beta frequency and enter alpha.

Without actively taking time to entrain the brain to enter these states, it continues to function to its own beat and most of the time has trouble with allowing communication to flow easily between various regions of the brain. This is also known as synchrony and is highly beneficial for creating optimal processing

and cognition. When we take time to actively focus our energy and attention on slowing down the rampant movement going on within our brains and pulling away from the loud noise of our daily lives, we allow our brains to process all the previously given information so they can move forward with a clean slate and enhance the moments that lie ahead. Think of sleep. Sleep is the main way our body *slows* down and processes information as we are in some of the least stimulated periods of brainwave activity. When running on faster-paced beta frequencies all day, sleep is the body's mandatory way of slowing our brain down so it can fully recover and rejuvenate itself. Just as sleep is essential for the optimization of our brains, so is a short break in our continuous patterns.

Within my fairly busy schedule, it is quite common for my brain to scream at me to just take a complete pause from everything I am doing and rest for a few minutes. Simply closing my eyes and disconnecting from the "go mode" mentality allows my brain to slow down, enter alpha, and break up the flow. Similar to the moment of relief felt after stretching your body during a brief stop during a long road trip, in a way, the brain is essentially rebuilding its stamina and "recharging." This act of closing your eyes and taking a few moments to escape the constant activation allows the body to switch from absorbing information from our surroundings to processing information we previously received. Although the simple gesture of opening our eyes may not seem like a huge amount of information input for the brain, it most certainly is. Even without our conscious awareness, the brain is programmed to interpret the environment from all of our senses, with the main two being sound and sight. It is always trying to figure out what is going on around you. Even in subtle ways like looking at your pet sleeping, your brain is separating the different textures, shades, shapes, depth, size, and so on, trying to decipher what it is looking at/for. Among many other things, it also draws on details it has already processed to categorically organize the

new information and even fill in the missing gaps that are visible. Just within the normal routines of our day, our brains are processing millions of details. So small moments of escaping the stimuli and shutting your eyes allow the brain to slow down and work at full capacity when it is in “go mode” or beta.

Because we are surrounded by the loud noise of our daily lives, man-made electromagnetic fields, constant tasks, and so on, there is a beautiful frequency waiting for our attention as it quietly hums in the back of the chaos. Just as the macrocosm resembles the microcosm, there are innumerable connections in how the human frequencies overlap with Earth's (Wang et al., 2025; Burnei, 2012). The fundamental frequency, or the “heartbeat” of Earth, operating at 7.83 Hz, falls within the alpha band range. Aside from learning about the impacts that mimicking this low frequency has on the circadian rhythm, scientists have further discovered a pattern that occurs in the brain when examined in a similar setting. And what they found was interesting.

Shielded from possible interferences, volunteers were examined to see the correlation between whether or not this fundamental frequency could be measured within their brain wave activity. By placing something called an “induction coil magnetometer” into the ground, scientists were able to pick up on live frequency fluctuations from the Schumann resonance (Persinger & Saroka, 2015). Through a mathematical process, they essentially aligned the brainwave activity with the Schumann resonance to better see if they reflected any resemblances. About twice per minute, they were able to detect moments of overlapping frequencies, in which the brain redirects its electrical flow, changing from clockwise to counterclockwise. This was fascinating because it suggested that the brain genuinely reoriented its electrical flow to match the earth’s signal right before brief periods of synchronization. These findings were not just coincidental; this coherence indicated that they were repeated

results and could be measured. Along with this, a specific region on the right side of the brain is where the coherence was found. This area of the brain, the parahippocampal gyrus, is a region that governs navigation, memory encoding, and spatial organization (Epstein et al., 1999). What is interesting about this region is that studies have discovered that when they show subjects images of landscapes vs. people, this region activates notably more when viewing scenery than it does for other visual cues (Epstein et al., 1999).

Now, I am no scientist, nor am I a researcher gathering data and conducting my own studies, but as I learn more about this, my curiosity cannot help but decipher meaning from what I have discovered. Especially if the participants in this “coherent frequency study” displayed measurable results in a specific region of their brain that is known for landscape and scenery navigation while being in a room completely away from any visual cues of external surroundings, the Schumann resonance may suggest even further that we innately rely on this frequency. Indicating that it has the potential to naturally synchronize with our own brain waves and can further assist us in entering the alpha band during our fast-moving routines (McCraty et al., 2017).

Bottom Line—Recap & Discussion

Although these were only a few findings from hundreds of studies conducted throughout the years, true evidence of our invisible connection with this frequency is measurable and vastly intriguing. Just like the navigating animals that contain inextricable connections to this planet, we have truly only begun understanding to a greater extent how these connections correspond with our own biology. What I discussed about the magnetic field of earth and the Schumann resonance are solely two components of this

interconnectedness that emanates all around us. Because every electron curates its own "spins," resulting in the constant movement and vibration of atoms, all the wondrous life around us emanates and interconnects with these unforeseeable fields of energy. Through understanding more about the invisible or unforeseen energies that have the ability to impact the lives of many species and our very own, we can begin to see the magnitude of the true complexity that has still yet to be explored and discovered. With the magnetic field of Earth contributing to one of the major reasons why life on this planet is possible and the electromagnetic field of Earth having the potential to synchronize with animals, allowing them to sustain their own innate biological rhythms and pick up on atmospheric shifts and navigate, both of these invisible strings of life can have profound effects on our lives as well. Furthermore, with the influx of man-made EMF radiation emitted from every direction we can imagine, taking moments to disconnect from them, similar to “stoplight” moments, holds the capability of enhancing our everyday lives, mental health, and overall physical health. Because of the rampant beta brainwave lifestyles we are all engrossed in within our modern lives, the earth gently waits for her presence to be noticed, always offering a moment of help, calamity, and peace.

One of the major reasons I was very curious about exploring these possible influences was due to the weird sense of shifts around me that I am able to pick up on. I have always been an observant being, and on top of that, my “why” mentality has led me to digging beyond the surface, hoping to get to the core of the matter (pun intended). As I learn more about the world around me, how the moving parts work, either tangible or intangible, I hope that my exploration of the few intangible influences of Earth has, if anything, left you with your own sense of curiosity when venturing back out into the world. Exploring and becoming more attuned to the components around us that we have once overlooked and seen

as inconsequential can ultimately broaden our perspective or outlook on our unique lens of life. Lastly, my desire for this first section was to explore the potential impacts from uncommonly discussed energies of the earth, both visible and invisible. Because this first portion has primarily touched upon the invisible components, the next portion will delve deeper into the commonly overlooked connections to Mother Nature that we walk past and interact with in a much more direct manner.

SECTION I: EXTERNAL ENERGIES

Part 2: Physical Aid of Earth

Chapter 3

The Wonder of Trees

In nature, there is always something to look at.

—Jane Goodall

Enchanting Explorations

During the summer last year, my brother and I went on a trip into the mountains. He had been talking about going for quite some time and had always been enamored with nature, so I was looking on my phone one morning after I had woken up. Not really planning or thinking anything of it, more so just getting an idea for the future of what we could do, where we could stay, etc. Well, that search ended with me impulsively booking a really tiny cabin surrounded by trees with one of the walls entirely made out of glass. It was something both of us were unfamiliar with, and it is beyond safe to say that my impulsiveness paid off.

After an ordinary morning taking a completely different route, I then began trying to assess what we would need for a trip like this. I had always been in his shoes before, so being the semi-responsible one was foreign territory to me. I had only been to the mountains before when I was much younger, going a handful of times with my cousins, aunt and uncle, and all of their side of the

family. Distinct memories of us huddled together, playing Uno while it poured in the woods, my cousin getting lost (which in hindsight was probably not one of the best distinct memories I have), cooking dinner by the campfire or even walking to a lake and seeing hundreds of butterflies. Each of these and other memories from those moments are some that have left a lasting impression upon me and are those I will certainly cherish forever. So, this time around, I wanted to make sure to leave the same impression on his mind. Although it was just going to be him and me, I was eager to do my best. We packed the car with what I thought was everything we would need for a quick trip in the mountains and headed on our way.

As we made our way there, we talked practically the entire time about so many various things, and that alone was probably one of my favorite things during that trip as well. I am writing this as he is now in his teenage phase and does not care to be bothered by me much anymore, so it is certainly something I am grateful to have had with him. After a while of chatting, he closed his eyes, and I continued driving, eventually entering the winding, steep roads that ascended into the mountains. I wanted to wake him so badly during many moments of us leaving true civilization behind and being greeted with the ever-present beauty of nature. As we got to the Shenandoah Skyline entrance, he awoke, and the true enchantment began. Both of us were awestruck with the views around us. When we began getting closer to the mountaintops, we drove through clouds and watched as the entire view turned into white sheets of fog and then dissipated, allowing us to see the scenery again. Pure wonderment! I had forgotten how beautiful the world we live in is; even with it being such a short trip, sometimes it is hard to grasp true moments of undisturbed nature when surrounded by my habitual routine for so long. Although the trip was barely a day long, it was like being in a completely different world that I never wanted to leave; the void of stress, loudness, and

overwhelming feelings of calm and peace was ever so encompassing. That, in and of itself, made me forget almost instantly what it was like back home.

During that trip he taught me so many things, broadening my perspective on how I viewed nature around me. He had taken a liking to learning about all the different types of plants and their benefits, so actually walking side by side with him and seeing firsthand how much he knew was such a beautiful experience. We stopped at one of the scenic lookout spots and found a small path that led onto a rock-filled cliff. As we ventured down the path, unsure of where it would take us, he kept stopping and pointing at so many plants, in true awe at seeing them in person and exclaiming at their size from growing in the wild. From mullein, yarrow, burdock root, wild grapevines, blackberries, and even ghost pipe mushrooms (if you are unfamiliar with these, give them a search; they are one of the coolest things I have encountered), we both had a wonderful time losing ourselves in the vastness of everything around us.

Once we made it to the cabin, we got settled, took showers, and then went to explore. Coming across a creek and even making our own campfire, where he made s'mores from a kit we found in our cabin, all while we listened to the sounds of animals and calmness around us. The next morning we drove to a waterfall and hiked as it began to pour, for moments making me envision being in a rainforest somewhere in South America. As I could go on about this, it was truly a moment to remember, especially because I got to see such excitement and expression displayed from him. With it being such a short trip, we began our drive home after getting soaked from the hike and left with a sense of wholeness in our hearts.

During the drive back, it was truly like night and day. It is something you are not able to fully grasp until stepping away from it and then returning. From being around almost no indication of

footprints from humans to re-entering the densely populated area, the stress of it all was gravely disheartening. The enchanted world we had just intimately connected with was completely unfamiliar with the real world in which we reside. As we slowly got closer to home, I felt all happiness leave my body and mind, seeing fewer and fewer natural landscapes instead, replaced with more and more sites of construction. From the amount of anger I was able to feel from all of the cars flying past me, I was quickly awakened to the dream I had previously been living in and awakened to the true reality of life. Especially walking back into the house, it felt as if everything were shut off from the world in a completely different way that I could not exactly explain but instead could sense and feel on a deeply profound level. We have been so normalized to the world around us that is greatly disconnected from the creator of our being, the Earth. Although we are still on it, grass is not even native to the natural world. It reminded me of times when walking with my brother through the neighborhood; I see none of the trees and perfectly curated yards reflect the true essence of Earth's potential. How the natural scenery in the mountains, untouched and native to the land, is filled with hundreds, if not thousands, of different plants, all with unique properties that add and create balance to the entire ecosystem as a whole. Never knowing that I could learn so much about a multitude of different plants within a span of a 2-minute walk. At home it is almost impossible to find that same kind of energy. When my brother and I went to forage in the neighborhood, it was clear that not only was it much more difficult but instead the places that displayed the most variety and opportunity for learning new species and plants were in the "weeds." They were in the neglected parts of a yard that had not been cut down or replaced with construction, in which we found so many blackberries and raspberries that naturally grow when they are left to their own devices.

To reflect on those moments while I sit in the seclusion from the true power and connection of the Earth, with a small window positioned in front of me as I am mostly in a reality filled with screens and digital technology, is astonishing to dwell on. It is as if two entirely different worlds reside in the one world we are on while one of them is slowly suffocating and killing the other. The world we all reside in now, within our modern daily lives, is not natural; nothing about bagging up leaves and putting them in landfill is natural. The mindset of appearance has replaced everything natural to the world around us and does not come without a great deal of sacrifice to the true cycle of life. The calamity, peace, and innumerable other feelings that truly have no words to describe how I felt in the mountains reflect the powerful healing benefits that come when being in nature. I do not say all of this as if we have an overarching choice in changing the agricultural landscape of how the modern world has been shaped, but in the hopes of allowing you to see a different perspective on the important and innumerable benefits that all of Earth provides.

As the reflection upon both of the different atmospheres brought immense curiosity as to why such drastic changes occur, it sparked the exploration and discussion within this section. Diving into the physical elements and ways in which earth can aid our mental and physical well-being, this portion traverses a few potential reasons behind those curiosities.

Phytoncides

Through the subtle ways I have shared my captivation with this planet, I am sure it is not difficult to suggest how deeply enamored I am with every aspect and intricacy it consists of. Trees are likely at the top of the list. I truly cannot pinpoint all the exact reasons why I have such a profound fascination and love for them, but I do. The ancientness, interconnectedness, and ultimately just

raw beauty they display while simply being are admirable. As I have explored many different realms of research since taking my brother on the trip to the mountains, I have only gained more love for the world around me. Just as I am likely obsessed with the complexity of animal species, I could do the same with trees, so I will spare you this time. Instead, I want to reflect upon the differences, aside from the obvious ones, in why fleeing to the mountains with my brother brought with it two entirely different atmospheres. Aside from escaping the seemingly inescapable electromagnetic fields that radiate and encapsulate all of our surroundings within our everyday lives, being completely surrounded by nature provides many other advantages to our health.

Within the past 40 years, we have discovered that many plants and trees can detect when and/or what is eating their leaves or causing potential damage to them. They are able to decipher between many different species based on their saliva. Once these plants detect a threat, figuring out whether it is from a caterpillar, beetle, aphid, or so on, the plant will emit chemicals, either released into the air or in the soil depending on if something is underground damaging their root system or above ground; these chemicals will then do a number of different things. One of the most interesting things they discovered is that they curate a unique chemical concoction or blend based on their attacker and will emit it. These are called Herbivore-Induced Plant Volatiles (HIPVs), which further will lure the predators of that threat toward the plant (Turlings & Erb, 2018). In which these predators have acquired a powerful sense to recognize these chemical blends. Essentially, the plant will recruit a hitman to come and take care of the “pest” that is causing harm to them. That in and of itself is astonishing.

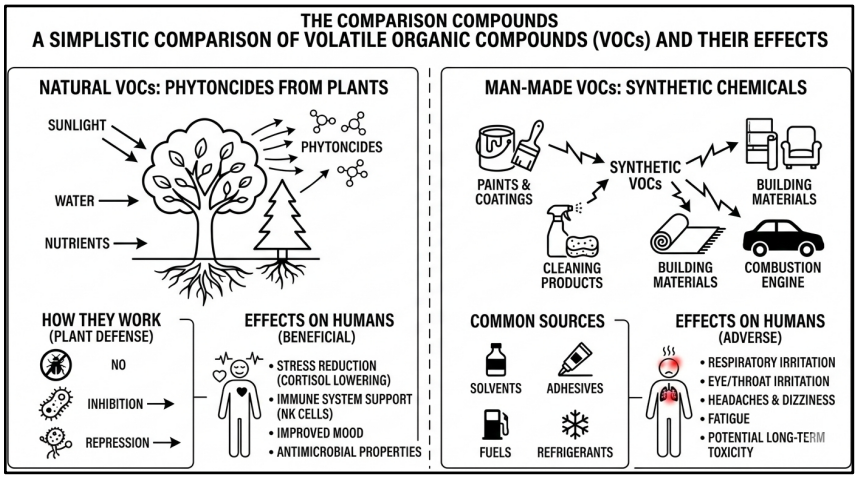
Similar to the chemicals emitted to hire hitmen, trees can also emit chemicals for many other purposes and are given the name “phytoncides.” These phytoncides are chemicals containing

natural antimicrobial and insecticidal compounds that aid in the trees’ protection from parasites and other unwanted bacteria (Thangaleela et al., 2022). When you think about scents such as eucalyptus, lavender, peppermint, lemon, spruce, pine, or even onion, they are the products of phytoncides. These scents are the trees'/plants' natural “body odor” or "repellent" that they emit. So, technically, using diffusing essential oils is *essentially* the artificial way of recreating the naturally occurring process within nature. So many people have raved over essential oils, and I always brushed them off, enjoying their smells but not understanding how the smell of grapefruit could boost your mood or increase your energy. I, never in my life, understood the origin of how that would occur, so its benefits always had a hard time sticking with me.

These essential oils, or phytoncides, emitted by trees are compounds that are easily evaporable and are commonly referred to as “volatile organic compounds” (VOCs). In essence, these mixtures of elements are able to easily diffuse into the air, and if you remember the discussion based on the blood-brain barrier we had, things that can surpass this barrier are water, oxygen, carbon dioxide, and a few other molecules. Now, what can be scary about this is that many everyday encounters emit VOCs as well. To name a few, think of them as our everyday household items, such as paints, cleaning supplies, air fresheners, personal care products, gasoline, permanent markers, smoking, frying food, and burning candles. Envision the smells that come to your mind when reading some of these items and understand that these forms of VOCs are harmful to humans, as they have the ability to surpass this blood-brain barrier and cause either short-term or long-term unwanted health effects (David & Niculescu, 2021; Zhou et al., 2023). Regardless of whether VOCs that enter the body are good or bad, when picked up by our sense of smell and inhalation, they influence a variety of things within our bodies (Thangaleela et al., 2022).

Figure 7

Comparison of Natural and Man-made VOCs



Note: The Comparison Compounds: A Simplistic Comparison of Volatile Organic Compounds (VOCs) and Their Effects. Image generated using Google Gemini 3 Flash, 2026.

Trees and other green plants will emit healthy VOC chemicals into the air to naturally form a field of protection against themselves and obstructive visitors such as bugs, disease, and bacteria. Similar to how bug spray works, plant life curates its own. Unlike many of the everyday VOCs we are exposed to, these tree chemicals encourage the production of a specific type of white blood cell that identifies and removes cancerous and infectious cells around and within the human body (Cleveland Clinic, 2023). These are specifically called “natural killer" (NK) cells and can be thought of as highly skilled bodyguards; they seek and destroy harmful cells before they are able to spread. These bodyguards survey the body, hunting for any harmful cells. If they encounter any, then they will emit destructive chemicals into that cell, rendering its elimination necessary. With a human body aged 20-30 years old containing roughly 1.5 trillion immune cells, only

around 2 billion NK cells are sifting through all of them and seeking out intruders (Sender et al., 2023). This means that they represent 0.13% and are sifting through the other 99.87%. Most of the other immune cells need a specific command to attack something, so they could be waiting for a signal while the NK cells are already eliminating the threats. This is what makes them so valuable within the human body. In contrast to the harmful effects of everyday VOC chemicals, phytoncides from trees and numerous other plants have been studied and are known to benefit humans by aiding in inflammation, lowering stress, enhancing the immune system, reducing cognitive fatigue, and even enhancing our mood (Thangaleela et al., 2022).

In the early 2000s, a researcher by the name of Dr. Qing Li conducted various studies on participants to gain more insight into the role the forest plays in NK production (Li, 2010). Well before this study was even conducted, in the 1980s, Japan had a common understanding, suggested by the Forest Agency of Japan, that regular trips to the forest were a beneficial way to alleviate stress and induce relaxation and should be incorporated into their lifestyles. Within Dr. Li’s first study, 12 participants who were employed in the average business, corporation-style workplace spent 3 days in the forests of Japan. Prior to going on the trip, they had various tests taken on a normal, average day to use as the control when comparing their results. During their trip they walked the amount they would on an average day within their regular routines and had more measurements taken on days 2 and 3. Researchers also evaluated the amount of phytoncides in the forests. After the study concluded and the data had been examined, the results were highly evident and showed visible changes within their NK activity markers. Below is a graph from the results of this first study. Upon completing this study, they were left pondering two things: how would the effects compare to a cityscape? And

how long does the increased NK activity last? So, in the next studies, these two questions were put to the test (Li, 2010).

One year later, following the same procedure, 12 new volunteers that also worked in large corporations within the city ventured into the forest, testing these questions. What varied was that, 4 months earlier, these participants ventured into the city with the same routine but just in a different landscape. Upon completing the forest trip, the results were measured, and as you can likely imagine, their time spent in the city did not increase the NK activity or any of the other measurements tested. The researchers also decided to test the second question by collecting data 7 days and 30 days after their forest trip. These studies reflect true evidence and scientific changes that phytoncides have the potential to contribute greatly to our health.

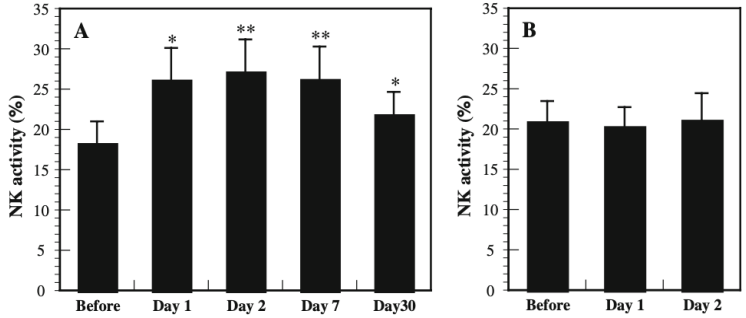
Among testing for NK activity and changes, other markers they also measured for included urine samples. When I was first reading through these studies, I was not sure how urine samples contributed to significant data collection. However, the body actually gets rid of inactive hormones through the urine. So, hormones such as adrenaline and noradrenaline were measured. These specific hormones inhibit NK activity and can be released in the slightest situations of anticipation or worry or moments of unpredictability or uncertainty as well as in other instances of mental alertness. And, before you ask, yes, even thinking about things that carry worry can release these hormones. With such a drastic increase in their NK activity and significantly lower levels of adrenaline, these results also strongly suggest the reduced levels of stress from their time spent in the forest (Li, 2010). Not just through the findings on NK activity, decreased adrenaline, and noradrenaline but also through the discussion of another type of immune cell, T-cells.

T-cells are a wonderful source for aiding the body in recovery and active defense; however, if the body is not experiencing any

particularly threatening situations, this may cause dysregulation within the immune system (Balcerowska & Kwaśnik, 2025). Stress, whether it be short moments or persistent ones, will result in an increase in T-cells (Ronaldson et al., 2016). Stress, or cortisol, is the signal in the body to be on high alert; if someone is constantly in that state of heightened alertness, it can become taxing on their "rest-and-recover" immune state. The results from the participants' T-cell count were also measured and relayed a significant decrease, which was an indication from the researchers that it could potentially reflect their stress levels.

Figure 8

Effect of a forest bathing trip and a city tourist visit on NK activity.



Note. Adapted from "Effect of forest bathing trips on human immune function," by Q. Li, 2009, *Environmental health and preventive medicine*, *15*(1) (https://pmc.ncbi.nlm.nih.gov/articles/PMC2793341/). Copyright © 2009, The Japanese Society for Hygiene.

So, What Does This All Mean? —Recap

These published studies were the first conducted with attempts to understand the role that forests may play in our

immune function. Given the results and data that they recorded and measured for—being in nature is strongly beneficial for our overall health and well-being.

Because these specific “hitman” white blood cells are highly praised, any indication that reflects an increase in them is beyond essential to contributing to our health, whether it be mental or physical. Furthermore, since the increased activity of these NK cells means adrenaline is not particularly active/dominant, increasing them is also said to relieve stress. The same goes for a surplus of T cells; with the results reflecting a lowered T-cell count, the data suggested the body has shifted from a common state of heightened alertness to rest and recovery. And lastly, touching upon the true essence of what phytoncides are—antimicrobial, antifungal, and immune-boosting—the sole act of breathing while surrounded by trees provides numerous benefits, not just for a day or a week but potentially much longer (Li, 2010).

Just learning about these few effects from the VOCs of trees allows me to strongly reflect on the feelings of bliss, peace, and euphoria experienced from my trip to the mountains, or any moment spent in the seclusion of nature, for that matter. I am not forcefully suggesting that you go camp in the woods or drive hours away just to benefit your lifestyle, but taking more time to surround yourself with nature, even for short periods of time, has been shown to have lasting effects up to weeks afterward. Given the few things we have discussed, reflecting on the beta frequency and high-stress modern daily lifestyles we are in, even going to the park once a week (not glued to your phone while doing so) or making more attempts to disconnect from the fast-paced environment has been scientifically proven to lower stress and boost our immune function (Li, 2010).

Chapter 4

The Downpour

Free Radicals–Untrained Dogs

There are typically two types of people in the world: those who love the rain and those who loathe it. The sounds of thunder, the loud drumming as water pours down, or even the dance from the trees as gusts of wind and the music of rain envelop them can be viewed as one of the most magical things by one individual or the most dreadful by another. Since I am a proud extension of earth, I love all of the elements, even snowstorms… especially snowstorms. But I also understand the dread of rain, it being wet, gloomy, cold, and even difficult to drive in; I certainly recognize the potential burden it brings upon the individuals less enthralled by the rain. However, I am sure most of us can agree that rainy days bring with them a sense of calmness. The balance of life, the balance of night and day, cold and warm, happy moments and sad ones are a part of the entire cycle of life. Balance and stability are what many strive for.

Our bodies' sole purpose is to maintain balance or homeostasis. Sweating when we are too hot, shivering when we are too cold, and communicating the needs of each system to another within the body are just a few of the many ways we, as humans, are innately programmed to achieve balance. Jumping back to the beginning of this section with the foundation of atoms, particularly

electrons containing a negative charge. Our body is also handling the omnipresent task of balancing the perfect amount of electrons as well, and when done correctly, it results in a healthy redox reaction.

When we have stable or balanced atoms, the electrons exist in pairs and like to dance together while one spins one way and the other another. However, if one of the electrons is missing a partner, it is given the name "free radical" and is considered highly unstable and reactive (Pham-Huy et al., 2008). We can also visualize this as a wild dog that is missing a companion. Because it is missing a partner, it begins to search for electrons that are occupied by other neighbors such as cells, fats, proteins, and DNA. These free radicals create a chain reaction; when one steals an electron from another party, that party is now out of balance and begins to seek out the same task. As you can see, it is like a never-ending loop of chaos and destruction.

This chain reaction is known as oxidative stress and is essentially an imbalance of those missing an electron partner (think of free radicals) and those with an extra electron partner (think of antioxidants). This imbalance can be detrimental to the body and can result in cell damage, inflammation, or even disease (Pham-Huy et al., 2008). Despite the word “disease” sounding terrifying, it does not always mean that it is intensely life-altering; it can be defined as “a disorder of structure or function in a human, animal, or plant, especially one that has a distinctive group of symptoms, signs, or anatomical changes” (Google, n.d.). Which could indicate an acute illness such as a mild cold or even something as detrimental as heart failure. Honestly, the term "dis-ease" is quite symbolic when you think about it.

Now, what is unfortunate is that innumerable things within our lives carry with them free radicals and can result in reactive effects within our bodies if we do not have access to abundant antioxidants. The short list of VOCs from our daily environment,

which was relayed in our previous discussion, are well-known factors that contain free radicals and can trigger the chain reaction of oxidative stress within the body. That alone is overwhelming to think about because of how unavoidable these emissions are within our atmosphere. From our diet, smoking, air pollutants, pesticides, toxic chemical exposure, man-made EMF exposure, and even psychological stress, all of these are common examples that can contribute to free radicals within our bodies (Thomme, 2024; Pham-Huy, 2008). With our current day and age making it practically impossible to avoid all free radical exposure, it is important to help our healthy cells as much as possible, and even more so due to their profound effects on our cellular structure.

Quick Recap & Importance

I know all of these new possible terms may be very confusing and overwhelming to understand, so I will take a second to better illustrate the information and importance of everything before I keep going further. Essentially, the main goal the body has is to maintain balance and stability within equally paired electrons. However, when we are exposed to unstable electrons or wild dogs seeking a companion, they can create an imbalance. Antioxidants are one great way to introduce and attain balance; this is because they consist of an extra electron and donate their friend to the free radicals that are in need of a partner (National Cancer Institute, 2017). The body commonly creates its own source of free radicals from the natural process of life, so it is not too scary when done in small amounts. The issue is how frequently we are exposed to these free radicals or wild dogs due to the way modern lifestyles and daily routines have become. Just as a little rain pour is natural and beneficial every once in a while, when it begins to flood, issues arise. Those issues come in the form of oxidative stress and are highly damaging to the entire body.

The reason oxidative stress is so harmful, in case damage to the entire body is not impactful enough, is because of the constant depletion and breakdown of vital cells within the body. Instead of focusing on building, repairing, and strengthening the health of the body, it is in a constant loop of components getting stolen and therefore putting more focus on the imbalances it needs to regulate. It also exerts additional energy and makes it more susceptible to contributing to irreversible damage such as neurological, respiratory, and/or cardiovascular degeneration, as well as cancer (Pizzino et al., 2017). So, although it may not seem like a huge deal at first, through persistent imbalances, the issues are more likely to have compounding detrimental effects.

Now, what I introduce next is in no way, shape, or form the end-all, be-all. Well, nothing I discuss is, for the exploration of my curiosity is a way to understand more of the moving puzzle pieces of life. Instead, it is a neat way we can utilize the benefits from the earth in subtle ways we may not have been aware of before with the hopes of enhancing our health.

The Downpour

Alongside antioxidants is another helper, negative air ions. Despite the word "negative," it just means they contain an extra electron. The difference between the two is in the "air"; while antioxidants are normally in food, air is not eaten and instead is breathed in or absorbed through our skin, similar to sunlight. While antioxidants donate their companion to a wild dog or extra electron to a free radical, these atmospheric ions add their charges to the entire balance or sum within the body. Essentially, one works inside out and the other works outside in. Since the main premise of this section orbits around the beautiful planet Earth, it comes as no surprise that I will be touching upon some of the ways in our

daily life we can incorporate the elements of earth into our well-being.

Bringing it back to the late 1800s by discussing yet another German scientist, Philipp Lenard. Now, it is important to note that 1. I am not in the discussion of politics, nor do I ever wish to be. 2. I would also never bring up a Nazi supporter unless it were for a fortunate or not-so-fortunate reason. 3. I am purely highlighting an aspect of his accomplishment, not delving into him as a person (Chomet, 2004). Now that I have gotten that out of the way, Lenard worked very closely with electrons and electromagnetic waves, especially in his years as an assistant to Heinrich Hertz. Yes, the one and only Hertz. Hertz is the one who ushered him to direct his attention towards a specific field of study in which he would later go on to win a Nobel Prize. Other famous individuals such as Einstein branched off of Lenard's work and established many other major discoveries (Hargittai & Hargittai, 2023). I do want to note that it was not until after his discoveries that he took a surprising turn down the dark road of Nazism. Needless to say, in his rational mind he discovered something called the "Lenard effect," or waterfall effect. From here on out, you can likely surmise that I will refer to it as the waterfall effect. Now, before I proceed, I hope discussing a brief background on someone from over 100 years ago has not put you to sleep. Upon learning a little more about his background, I found it quite interesting that he was very involved with *the* Mr. Hertz and aided in furthering *the* Einstein's work.

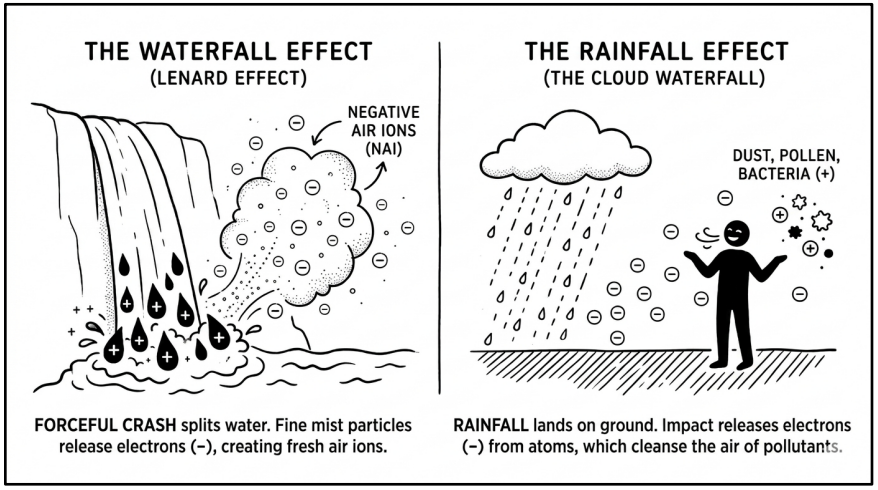
If you have ever been in close proximity to a waterfall, then I am sure you are familiar and likely able to envision the mist that is emitted from the force as it hits the ground below. The small particles of water that splash away from the surface contain extra electrons, while the bigger ones that usually stay within the flow of the waterfall remain positively charged. Because of how tiny these droplets are, seen as almost mist, they mix with the air and oxygen

particles, which results in negative air ions (NAI), and then are easily able to be breathed in by those nearby (Park & Kang, 2011). The unfortunate thing is that many of us do not have frequent access to stand by a waterfall and attain its beneficial misting effects, do we? Broadening the scope a bit, there is, however, another form of a waterfall we are likely to interact with more commonly is the waterfall of the clouds…rain.

When rain falls from the clouds and lands on the ground, atoms that contain extra electrons are released and picked up by the air molecules. As we breathe in the air during or briefly after rainfall, we are introducing our free radicals to an extra partner, an extra electron, which neutralizes their harmful effects and "tames the wild dogs" within our systems (Jiang et al., 2018). These negative ions are not just said to aid with free radicals but have also been commonly studied for contributing to stress reduction, regulating serotonin levels in the brain and even improving our energy levels (Park & Kang, 2011; Perez et al., 2013). With many studies still underway and continuing to test the different variables that may contribute to the aiding of extra electrons provided from the air, it is no question that rainfall gathers a substantial number of free electrons depending on the intensity of the rain.

Figure 9

Comparison of negative ion generation in the Waterfall Effect vs. the Rainfall Effect.



Note. This illustration depicts the Lenard effect and the atmospheric cleansing properties of negative air ions. Image generated using Google Gemini 3 Flash, 2026.

Prior to learning about this, standing outside after fresh rainfall always elicited a sense of rejuvenation and calmness as I breathed in the distinct smell of rain and enjoyed the quietness all around me. I innately knew that rain brought a refreshing feeling, but learning that it genuinely cleanses the air is quite symbolic. These negative air ions that are dispersed from water droplets after interacting with the ground have been shown to attach themselves to dust, bacteria, mold, and other allergens, which essentially suffocates their harmful effects (Zhou et al., 2006). Hence, why the air feels so revitalizing.

The freeing feelings that arise when standing outside after a downpour and the smells of rain or overall rejuvenation and cleanness that arise are all "negative" effects that result in such

wonderful benefits for our bodies' health. So, the next time it is pouring outside, try and enjoy dancing in the rain or, at the very least, open your window so you can receive a few of the wondrous benefits from these electrons that are… *free.* Even for those who despise the cold, wet, rainy gloom, possibly looking at it through a new lens may bring a sense of admiration and appreciation for it next time a storm arises.

Chapter 5

The Surface of Earth

Natural life is the nourishing soil of the soul.

—C.G. Jung

Last year, before I had gotten the chance to take my brother on a short trip out into the mountains, I had been bringing him along on occasional day trips out to some of my favorite nature places nearby to explore and broaden his perspective, as he had only really been to stores and places close to home. He is not one that will willingly take an opportunity to leave the house and seems perfectly fine with being a little hermit in his room, so I took his excitement for the outdoors and nature as an opportunity that may not be around forever, since he often changes his mind in the blink of an eye. I remember taking him to the river downtown for the first time; this was one of his first sights seeing how close nature truly was to home. Walking across the rocks along the water and climbing to the top of a cliff in the forest to overlook a secluded body of water was certainly a moment I will never forget. From then on I began thinking of all of the locations I knew that would be worth showing him, and we began going on nature trips to places I had not even been to myself. I spent more time with him

than I ever had before, and since we are 7 years apart, it felt like one of the first moments where we were able to connect on a "sibling" level that did not just entail tolerating each other like the years growing up did.

On one of our ventures, we stayed within the neighborhood range (well, at least we thought we did) and explored a few different places. Behind our neighbor's house there are acres and acres of woods; I am not entirely sure where they lead, but I remember walking through certain trails with friends when I was in middle school. I honestly had not revisited them since then; nearly a decade later, one day he and I went to explore them. The walk began with us searching the neighborhood for blackberries that grew in the thick mess of neglected land that sat in between people's yards. After finding a few handfuls of them, which seemed like buried treasure, we decided to enter the woods. I had faintly remembered certain cut-throughs I used to venture through when I was younger, and upon telling him about them, he was eager to explore as well. These cut-throughs led to all sorts of places, from entirely different sides of our neighborhood to even a path leading to a park. When we entered the woods, it was as if we were leaving one aspect of us behind and returning back to the free-spirited nature of ourselves that yearns to escape in our everyday lives.

No matter what type of weather it may be, the forest will always be magnificent with endless captivating wonders to catch your eye. Needless to say, it was enamoring seeing old echoes of how it used to look in my fleeting mind while faintly recognizing the almost invisible path that had not been loved and run on by excited children in ages. We walked and talked on the trail, gazing in awe as each of us periodically pointed out something mesmerizing. As we walked through the path, memories began flooding into my mind as I saw a younger version of myself and the various neighborhood kids running, hiding, and chasing one

another. Climbing trees and playing hide-and-seek while it was pitch black outside, the younger version of me kept darting past my present self as I stood there reminiscing. Encountering a path that used to be flooded by a creek on the back of my neighbor's four-wheeler, I remember always getting splashed; it was now completely dry and easily traversable. My brother had a blast as I recounted my memories, and we continued displaying our enamoring admiration for the earth.

Of course, until we decided to leave the path and venture into the woods, thinking that we would remember how to get back. As you can likely guess, that did not turn out the way we envisioned, and instead it rapidly evolved into the resemblance of a sort of survivor moment that people in those shows have, racing the sun and desperately trying to find our way back.

I thought it was hilarious and was truly unconcerned with the fact that we were lost, delirious to what would occur if the sun did manage to say goodnight as we were entangled in the leaves, branches, and vines of the forest. He was luckily way more scared than I was, which I did not know at the time; we eventually found a huge stream and decided to walk in it. With the hopes of it leading us closer to a way out of the dense foliage. At first the thought made me wince due to the image of my wet feet in my socks and shoes stomping around in the water as the clay and sand slowly sank beneath my feet. Although when I did manage to push past that mindset, it was as if I felt a new sense of connection with the earth; everything felt so calm and freeing in a way I had almost forgotten was possible. With our shoes and socks on, we walked in this clouded, muddy water that came up almost a foot; meanwhile, I was aloof and in utter enjoyment while my brother was pooling with anxiety. The sun was setting, but the woods took it much faster due to the denseness of the trees, so it was nearly dark, and his stress was finally beginning to emanate onto mine. After following the icon on the map on my phone that would not give us

much detail on our whereabouts, with little connection and it almost dying, we finally saw houses, and he ran. Seeing the house in the distance brought more relief than we knew, and I just remember thinking how insane we would have looked if these people with this really nice house had seen two kids covered in leaves and sweat with muddy shoes while racing through their yard. Luckily that did not happen, but since we were now on a street, I could see where we actually were and how long it would take to get home…. We ended up being 3 miles from home. We crossed the river in the woods and were now not on the side that our neighborhood resided on but were about a 9-minute drive from where we lived. Needless to say, the call to my mom to have her pick us up was quite interesting, and that day is one I will never forget. Within that story and many of the other adventures we had, like foraging for blackberries in the neighborhood or building a snowman in a state park or even driving to an abandoned house and chopping down bamboo over 20 feet long and then tying it to the roof of my car as fast as possible as we began getting eaten alive by mosquitos, all for the hope of building a bamboo fence for the garden, many beautiful memories were created, and I will be forever grateful that I was able to be a part of them.

In moments now of recounting these memories during the exploration that has occurred throughout the writing of this body of work, many instances of reflection and curiosity arise in my mind. It may seem as if the recounting of these moments holds very little value within the work that I discuss, but they hold much importance through my own lens of life. My adventures with my brother within the intricacies of Earth are very special to me. Being able to curate such weird memories and discover many different parts of nature while showing him some of my favorite places brings with it much more than I could ever put into words. Just as I reflected upon the venture of ours in the mountains, diving into a few curiosities, I carry some with me for this story as well. The

main curiosity is the connection shift when I put my feet into the creek; it is indescribable and likely nonsensical to others when looking at how I connected with it. However, I could not help but try to dig a bit deeper into why/what was taking place behind the scenes. Similar to how healing the ocean can be without understanding the why behind it, what about connecting with the elements, particularly soil, elicits these feelings and/or health benefits?

Surface & Seclusion

Because the earth is supplied with a constant influx of electrons via incoming solar particles emitted through the ionosphere as well as the immense amount of energy generated from the core of the earth *and* the millions of lightning strikes occurring daily, there is such a bountiful amount of electron supply on earth's surface. As our daily lives become more disconnected from the true contact with this planet, surrounded by human-caused EMFs, constantly inside of a building or structure, residing in a high beta range frequency, moving from task to task, and always on the go, we have a much harder time receiving all of the plentiful energy that the earth has in store for us (Koniver, 2023). Taking a moment out of our day to disconnect and get back into connection with the surface of the earth is not only proven to reduce inflammation (Oschman et al., 2015), but it also aids in the overall well-being of every single cell in the human body.

The familiar houseplant, named the Monstera deliciosa, is one of my very favorite plants; this is primarily due to its rapid growth as well as its beautifully symmetrical leaves, sometimes referred to as the "Swiss cheese" or "split-leaf" plant. The beauty in the leaves of a monstera plant is formed from an adaptation they have developed in their natural habitat, which aids in allowing rainwater to reach their roots as well as absorb more light and offer

wind protection. In the summer, we normally put our Monstera plants outside, keeping them in their pot and letting nature provide all the nutrients and resources they may need, and every year we end up propagating them due to their rapid, massive growth. Although this plant can grow quite big in an enclosed environment, it naturally thrives in the tropical rainforests of Central and South America, often reaching sizes anywhere from 30 to 70 feet. With many Monsteras living inside the homes of plant parents, their true potential is only met with a maximum average height of 8 feet. These enormous plants commonly flower and produce fruit; however, it is very rare for a houseplant to do just that (University of Connecticut, 2020). The wonder and complexity of these beautiful plants are something that are admired amongst many houseplant lovers, but it is truly captivating to compare their capabilities when they can thrive in natural environments with the aid of earth's elements. Now, you could say that it is due to the limited amount of sunlight they receive, and I would certainly agree with you, which is a main reason why we bought artificial lights for when they are kept indoors. However, a rainforest is often under a canopy of leaves and only allows for limited sunlight, so you would think it is not solely due to that. I mean, of course it is not. How do you suppose a 5-gallon-sized potted plant can reach its full potential inside, surrounded by exposure to things that can contribute to free radicals while under artificial lighting? It is nonsensical to even compare the two truly, and I completely agree. So, why even bring it up?

Well, what does their disconnection from the true elements of the earth suggest about us? Bear with me. I am not saying we are plants and need to dig a hole so we can sit in it while absorbing the light, but in this country alone, the average amount of our time spent indoors is not 50, 60, or even 70 percent. We spend 90 percent of our time on this planet inside and in enclosed environments (US EPA, 2021). Not to help the situation, but it is

also often met with 2 to 5 times more polluted air than the environment outside. This planet is a battery with more charge than our own bodies could even fathom if we ever gave them the chance to truly connect with it. I am sure it is safe to say that two hours out of our day can seem like a lot given the busyness and restricted time we have, right? Well, say someone spent 2 hours each day outside (not counting possible full days spent outdoors and so on); at the end of the year that same person would have only spent a little over 8 percent of their entire year outside… Factoring out the required amount of sleep we should all aim to achieve each night (8 hr), that number would only go up to 12.5 percent. I think it is valid to claim the immense amount of disconnection we have with our true creator. Being the monstrous battery that she is, she is also brimming with extra electrons. So even if these Monstera plants are put outside during the summer but are still contained within their plastic pots, they are devoid of the bountiful source of healing potential that emanates from the surface of the earth. Essentially, just as plants are being domesticated and grown indoors, we, just like them, cannot reach our full potential and maximum amount of growth.

Prison Cell?

The basis of all life revolves around a multitude of things.
However,
the basis of one thing revolves around life.

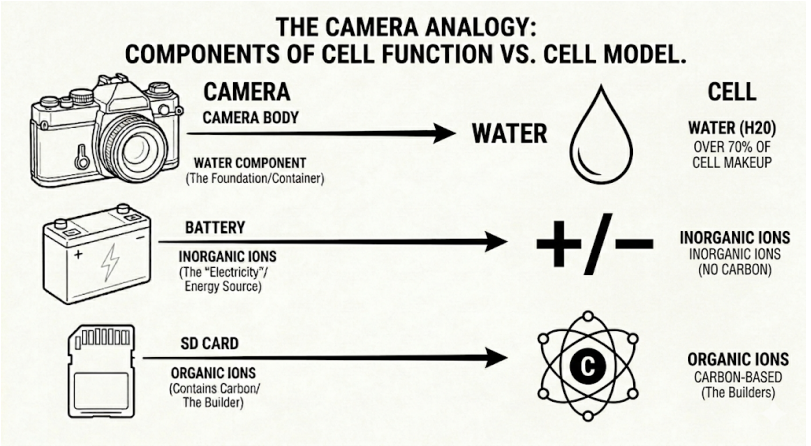
Cells, which are composed of 3 major components, are the foundation for our bodies to optimally function. The first is water; cells are over 70% water, and since we consist of cells, water is the most abundant compound in the overall making of our being. The second major component that cells contain is inorganic ions, which, in short, means that these atoms or particles carry either a

positive or negative electrical charge and are often referred to as electrolytes, hence their symbolism. Inorganic ions do not contain carbon and are primarily useful in providing minerals and nutrients to our bodies; they are the "electricity" that keeps everything flowing. Organic ions, the third major part in cell creation, contain carbon and carry out greater roles by creating proteins, fats, and carbohydrates. The carbon essentially allows them to build.

When I was trying to think of a good way to describe this concept to someone who may not fully comprehend or visualize its meaning, I was sitting and tossing around a few different analogies. As I kept discarding the ideas, I was blankly staring in the distance, not realizing I was directly looking at the camera on my shelf. It was just waiting to be acknowledged. Needless to say, think of a camera being the water component; it is the surface that allows for creation to occur. The battery inside of the camera is what keeps it on, but I still do not have the ability to take and keep images if there is not an SD card inside. The battery is the inorganic component, and the SD card is the organic component that contains carbon; it enables me to build from that element, so to speak. Without any one of these pieces, the camera would not be very useful if I were aiming to create and capture many moments. And, without water, nutrients, and carbon, the makeup of cells would not be what it is today (Doheny-Adams, n.d.). Because these 3 components contain and sustain life, each one of them carries such a vital role in the most optimal functioning of our beings. When we put all of these pieces together, with the water housed within each cell, the inorganic ions supplying the minerals and conductivity to the water, and carbon-based ions, or organic ions, binding to other molecules, we harness the perfect formula for not only electricity to pass and communicate with one another but also life itself. When we take away one of the major components, it is much harder for the conductivity and capability of those cells to function in a substantial way.

Figure 10

The Camera & Cell Analogy



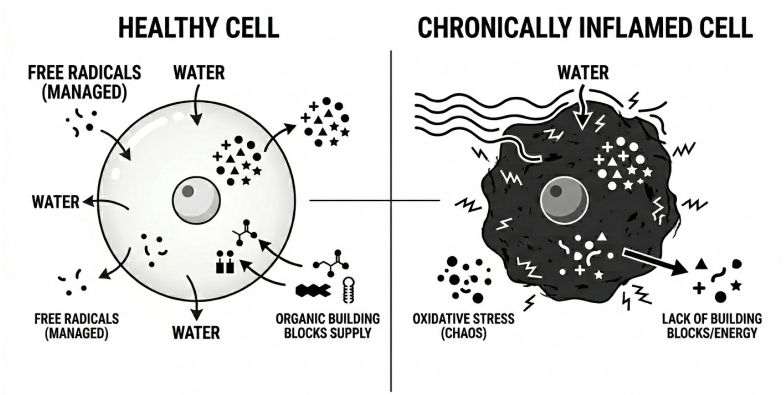
Note. Image generated using Google Gemini 3 Flash, 2026.

Stress is not something I experience very frequently, but it can be a concurrent subject in my daily life depending on the situation at hand. From stressing about my future goals, money, appearance, running late, those close to me, school, and the earth crumbling—you name it, and I will claim it. Because of being in this constant heightened period, my body is always in an active defensive mode. Stress is a signal that lets the body know something is off and to stay in a protective, alert mentality; think back to the T cells we discussed. In a further section I will dive into the process and harm of prolonged stress. In my attempt to bring science to life, the story will end with me painting a picture of this ever-present mentality of stress causing an excess amount of free radicals to be produced in the body. With more free radicals or wild dogs than my body is able to tame, they begin to run amok and steal from very vital cells. As they periodically bump into me while I am about to capture a beautiful image, maybe drop the camera altogether, spam my SD card with hundreds of random

images, or even waste my battery, they begin damaging the intricate process of the body's cells and overall health. Just think of the combination between a camera and a gremlin child that is covered in syrup. By blocking fresh water from flowing in and out, burning through the cell's energy reserves, taking up storage space, and damaging the overall process, many things begin to function incorrectly.

Figure 11

Comparison of Healthy & Inflamed Cell



Note. Image generated using Google Gemini 3 Flash, 2026.

This may or may not be an exaggeration of what they look like; I suppose I will never truly know since I cannot directly look at my cells when they are experiencing solely free radical damage, but we can still use this depiction to get at least a rough idea of what may be occurring from within. At its core, or *cellular* level, inflammation is an imbalance of each component that hinders the cells' ability to function, build, repair, and remove toxic substances. Over persistent time, these free radicals begin contributing to inflammation within the body and essentially limit the amount of information and electricity needed to keep these

cells healthy. On top of my internal world or body attempting to combat this imbalance, the external world in which I revolve myself around is also surrounded by sources of free radicals, so it can be even more harmful if I am not eating foods rich in antioxidants, prioritizing sleep, or disconnecting from that fast-paced environment.

Now, if you remember me briefly discussing the ways in which negative air ions can be absorbed, I mentioned both inhalation and the skin. Interestingly, it has been studied and revealed that only about 20 percent of the negative air ions we are exposed to enter through the respiratory system, leaving the other 80 percent of them to enter through the skin (Wan et al., 2024). The same can unfortunately be said for man-made EMF radiation, since the skin is the biggest organ in the human body; it is essentially our shield and also one of the most important protectors we contain. Think of the surface of the earth as the skin on your body; it is not only the biggest organ, but it is also a key participant in emitting energy. When we are hot, we radiate excess energy outward to regulate our temperature and sustain a healthy balance within the inner workings of our systems. The skin permeates conduction and convection currents by creating a regulated movement of blood, which heats up the fluid and transfers the energy from the body's core to the surface of the skin and then out into the environment. It will also emit energy through evaporation, such as when we sweat, to regulate homeostasis (Yousef et al., 2023; Oscilla et al., 2023). And, lastly, since it is the main barrier between the external environment and our internal one, it is a key gateway in allowing external energy to be readily available to the organisms and cells within our systems.

Because our skin generates and regulates various forms of energy, it also contains its own voltage that is a product of the inorganic or electrolyte minerals getting passed throughout the cell layers (Catterall, 2011). The movement of these electrolyte

minerals along the cell layers within our skin has to pass through little "gates," like checkpoints, from one country's border to the next. These gates essentially control the amount of ions or electrically charged particles entering and leaving. Now, if I have not lost you, the millions of small open pores all throughout our skin are like tiny magnets for charged particles we encounter throughout our day. If you have caught onto what I am about to say, you can likely see where this is going. Ions, such as free radicals/wild dogs (or gremlin children) and negative air ions (or companions) from our external environment, can essentially access the keycard to these gates by getting absorbed through these tiny pores. And, because it is practically impossible to avoid all free radical exposure (think of the long list of everyday VOCs we interact with) and we spend 90 percent of our time indoors, surrounded by more potential stressors on our bodies, there are simply not enough antioxidant-rich blueberries we can eat in a day to mediate these effects.

Hence, I have put so much emphasis on spending time in nature, even in subtle ways. Coming in contact with natural parts of the earth more frequently can aid in boosting the never-ending imbalanced cycle within our bodies. Not just through dancing in the rain, entering alpha states, going to the forest, spending multiple hours a day outside, or any drastic measures. But by simply just spending a little more time away from the enclosed spaces of our environment and immersing ourselves in the natural external ones. Even if we are not directly coming in contact with the surface by either running around barefoot or digging up weeds in the soil, these electrons have the capacity to be dispersed upward, interacting with the air molecules and then having the potential to interact with us.

Closing Thoughts on Section I

Hopefully I have not begun to sound like a broken record by discussing electrons and their potentially beneficial or harmful effects. It is certainly a very neat thing to explore and dive into further. Since practically all systems within our bodies function solely because of electrical signaling, learning more about the ways in which our external environment can influence our bodies' behavior is important but also fascinating. We are electric beings, and just because we cannot see the electrons or other realms of energy dispersed all around us, they are still able to show themselves in physical ways. Subtle symptoms, changes in our mood, or even much more impactful ways, such as those relating to degenerative diseases, are vastly different effects and often quite difficult to understand. Although I am no scientist or licensed clinician and cannot give rise to the exact reasons we experience imbalance, I can, however, relay what I have learned and offer possible insight through the information and knowledge I have gained. My curiosity for this first section began as an inkling of knowledge and resulted in an eagerness to learn more about how the energy of the earth affects our own lives. I could have never imagined delving into such intricacies and scientific mechanisms behind how these things work, only leaving me with more questions as to what else in the environment may also influence our well-being. From electromagnetic fields, the importance of frequencies, magnetic fields, learning about magnetite in our bodies, the influence of rain, trees, and so many other intricacies, I hope bringing you along on my first journey of curiosity has allowed you to ponder and discover new things to look at as you peer through your own lens at this beautiful world. The next expedition of wonderment will explore transitions from the external influences of Earth to the influences we ingest and how the mechanisms from within are just as prominent. Why a lack of balance can affect practically all aspects of the human body and

how the chain reaction of free radical damage and oxidative stress can be especially detrimental to the brain.

SECTION II: INGESTED ENERGIES

Part 3: Brain & Bacteria's Bond

Chapter 6

Gut-Brain Axis

Meeting Your Microbes

In exploring more about the wonders of life and different things that have the ability to impact us as human beings, whether they are mental or physical influences, the unique connection between the gut and the brain seems to intertwine the two. As I am sure you have heard dozens of times in your life, the things we put in our bodies affect our health and have measurable impacts on us as human beings. But what is it about the influence of organisms from within that have such profound effects? You know, the ones that are so microscopic we cannot even see them with our own eyes? What makes these *invisible* energies so special?

Although, on the surface, earthworms are practically never seen, they hold such important roles within the entire ecosystem on our planet. Yes, we can begin to see their mastery once we break up the soil and look beyond the surface; however, solely looking at it from an outside perspective, they could almost be disregarded for their drastic influence on the cycle of life. If they magically went extinct, it would be devastating to this world. They break down and reuse the "waste" of leaves, dead plants, compost, and so on, as they get rid of these materials by also turning them into nutrient-dense products that give back to the ecosystem. Think of the microbes in your body as little earthworms; on the surface, they are invisible to us and could be written off as insignificant, but

they hold great power once you begin to understand their many roles.

These microbes that reside within us account for the same number of cells that make up the human body but are practically all housed within the gut. This means there is roughly a 1:1 ratio of human cells and microbe cells, each consisting of over thirty trillion (Sender, 2016; Williams, 2024).

The microbiota, or the microbiome, resembles a small ecosystem and is derived from the Greek roots of "mikros" (μικρός), meaning "small," and "bíos" (βιος), meaning "life" (Goins, 2019). The ending of this word is "-ome" and is used to perfectly reflect "community." Putting all of these together, we get the “small community of life.” Because it consists of trillions of cells, it is meant to consist of an immense amount of diversity and can often determine whether the health of the body is balanced and stable or imbalanced and indicating issues. Some types of organisms within the microbial community commonly consist of viruses, bacteria, and fungi (Films Media Group, 2018). Some of these may harbor unwanted effects, while others optimally thrive and help to keep the body as healthy as possible. When we hear the words "viruses" and even “bacteria,” we often immediately associate them with negative connotations; however, many of them actually help your own body fight against the “harmful bacteria.” For instance, one of the most common types of virus in the microbiome is vital for limiting the growth of specific unwanted bacteria. Their main job is to target these bacteria so they do not begin to overrun the microbiome (Williams, 2013). Just as we mentioned NK cells in section one, whose primary function is to seek and destroy any harmful cells that are causing harm to the body, think of these phages in a similar manner, just in a different environment.

Dysbiosis & Mail

Similar to the role of worms in the earth, each type of microorganism in our microbiome plays a special role in the health of the human body, all with their own specific tasks. Earthworms are not the only types of species within the ecosystem that contribute to breaking down soil and so on; there are many different kinds of decomposing organisms. The issue arises if we cause certain microbes to go “extinct.” Taking away an entire species or type of organism may not seem like a huge deal in the grand scheme of things. However, if too many begin to disappear, it can lead to an imbalance in the microbial community and ultimately give rise to the more harmful bacteria taking over. This is known as dysbiosis and impacts more than just the tiny microbiome (Leonard & Toro, 2023).

For example, instead of using the earthworm comparison, we can compare this to the real world in the sense that everyone has a job and an important role in society. In March of 1970, over 200,000 postal workers went on strike in advocacy of unlivable wages. Many postal workers worked relentlessly, and most had second or even third jobs just to make ends meet. After finally having enough of it, they went on strike, which lasted for 8 days and resulted in an immense disruption of mail delivery occurring all across the country. “At the time,” notes the National Postal Museum, “letter carriers handled 270 million pieces of mail a day. With no one to deliver them, documents critical to government, finance, and other industries sat unprocessed in postal department handling facilities” (Zinn Education Project, n.d.). Welfare benefits, draft notices pertaining to the Vietnam War, airlines responsible for mail carrying, medicine deliveries, undelivered paychecks, bills, and many other things were disrupted. Although the strike was a little over a week-long, it created a major ripple effect and took weeks to see reversal effects within the nation. The impact of one moving part within the entirety of the system had

major repercussions on the system as a whole, just as can be reflected in the gut microbiota when dysbiosis begins to take place.

With insufficient jobs for each of these microbial metabolites, certain processes such as breaking down a specific protein begin to fall behind and pile up. After occurring for a prolonged period of time, these disruptions are not isolated to the microbiome but, instead, impact all systems of the body. Without the proper “mail carriers” able to take and deliver important messages to other areas of the body, communication begins to fall into congruence with the pile of “mail” that has been left in the post offices. As dysbiosis is caused by an imbalance and disruption in the healthy diversity of the microbiome, when so much “mail” or food enters the gastrointestinal tract and it is not well equipped to break down and process it, it begins to degrade the lining of the intestinal wall. Through time if this imbalance persists, it can create a buildup of effects and begin breaking down the protective barrier or intestinal wall that keeps these organisms and other waste contained within the gut. When this wall begins to break down, the unwanted bacteria or antigens are able to enter the bloodstream and bodily systems. Antigens are toxins, chemicals, bacteria, viruses, or other outside substances that trigger an immune response within the body (National Cancer Institute, 2011). When an immune response is elicited, the problem is that it will not stop until the breached issue has been resolved. Such as when you are sick or have a cut on your body, that response persists until it has cleared up the problem. However, when dysbiosis triggers an immune response and is not acknowledged, these antigens continue to seep into the body and result in numerous pathogenic effects

Because there are many disruptions occurring all over, the body is not able to defend against inflammation as easily, especially with the continued antigens that are seeping into the body’s systems via the intestinal wall. These continued alarm

signals can also further dampen the immune response by affecting certain receptors that were formerly meant to respond to problems and then stop when the issue has cleared. However, because of the repetitive signaling, they are no longer able to work or function effectively. Over time this persistent response breaks down the body’s ability to maintain balance and ultimately leads to oxidative stress. As we discussed in section one, oxidative stress is primarily caused through a chain reaction from an imbalance of free radicals and antioxidants. Among oxidative stress, this continued cycle from antigens entering the body can also lead to inflammation, which is triggered by the constant immune response signaling (Institute for Quality and Efficiency in Health Care, 2025). As well as neurodegeneration and inflammation within the brain, it is also caused by the persistent immune response activation. Over time it can begin breaking down the protective barrier around the brain, which we have learned about and is known as the "blood-brain barrier" (Tang et al., 2020). Since the immune activation or alarm signaling causes the body to be in more of a protective state or defensive mode, the body is not in the same environment that will allow rejuvenation, healing, rebuilding, and so on because it is using that energy to find/fight the invader. However, as I mentioned before, the immune response is quite persistent if dysbiosis is continually allowing antigens to enter the body. Due to this, the protective cells around the brain begin to break down, which allows for those antigens and other harmful substances to enter the brain's safe haven.

These little imbalances may seem manageable at first, such as eating fried food or a sugary dessert every once in a while, but if they begin to occur too frequently, they kill and prevent healthy microbial cells from thriving, which can lead to their elimination without the ability to regain their strength. Through time, if these types of foods begin to enter the body more frequently, it decreases the diversity of the microbiome. Now, food does play such an

important role in the regulation of the microbiome, but it is not the only one; medications, sleep, stress, and our environment do as well. In all, these small habits that build up over time may not seem like they contribute to much change or harm on the surface, but once we begin to look deeper, we can see how each domino begins to knock the others over as well.

Recap

I am sure that was a lot of information and may have been hard to fully comprehend, but I hope you have understood the process of how these small triggers begin to account for much larger changes. Although these microbes, or "earthworms," seem invisible on the surface, once we begin to dive a bit deeper, their utter complexity is revealed. Because they account for trillions of cells, they are also designed to account for an immense amount of diversity, which aids in the mini ecosystem that keeps everything running smoothly inside of our bodies. The presence of “good” and “bad” bacteria is not a threat when balance and diversity are in order; however, if an imbalance begins to take place and is persistent, it can get rid of the “good” bacteria and give rise to the more harmful ones. This imbalance is known as "dysbiosis" and can affect many things within our bodies if we are not careful and adamant about fixing it. Furthermore, it prevents certain tasks or food from getting completed and broken down into essential nutrients for the body. Over time if certain microbial cells have been killed off, the bad bacteria take over and begin to break down the intestinal wall; this is known as “leaky gut." If antigens or harmful organisms begin to enter into the bloodstream, they cause alarm bells to go off. This alarm signal is known as triggering the immune response and is normal in times of injury or sickness because it is temporary. The issue is that these alarm signals cannot stop the breached issue since it is ongoing; this keeps these signals

on and, over time, begins to lead to oxidative stress. Among many other things, this persistent response triggers a cascade of events. In the next chapters we will discuss a few of the common things that have the ability to interfere with the microbial community. But before that I want to lay out the ways in which these microscopic organisms interact and communicate with the brain.

Communication & Modes of Transportation

Due to the massive amount of cells the microbiome accounts for, it contains a highly complex system alongside all of the others working symbiotically inside our bodies. This system or microbial community has designated pathways to communicate back and forth with the brain. Which is commonly called the “gut-brain axis” and allows for the microorganisms to effectively signal certain updates or commands to the brain and vice versa. Throughout this section, I will often use the comparison between the gut-brain axis and that of a ship.

With the brain being the captain and the microbiome resembling the crew. Both the gut and the brain are meant to communicate clearly with one another to ensure that everything runs smoothly. I will quickly display the communication modes they use to help illustrate their importance and better understand the impacts that dysbiosis can have on the “ships” entirely. If the captain is the brain and the ship’s crew is the microbiome, the crew may signal their updates or needs to the captain on the deck. The same goes the other way around: the captain will message the crew if they are seeking help or have any other important tasks in need of completion. Both cannot optimally complete their jobs if they do not work together to do so. In this, they are able to send messages via three major pathways: the first is through the neural pathway.

The Neural Pathway

The neural pathway is like a direct intercom system between the captain and the crew; when a message is to be sent and received through fast travel, they are likely to use the neural pathway. This method primarily uses the vagus nerve, which is the longest cranial nerve that runs from the brain all the way down to the gut. Along with it being connected to the gut, this vagus nerve also runs through many crucial organs such as the heart, lungs, liver, spleen, kidneys, stomach, and other areas of the body (Breit, 2018). With it branching off into different parts of the body, it is vital in monitoring and regulating many of the functions within these organs. As the neural pathway is the fastest form of communication, it is essential to keep a close eye on all the major organs, relaying anything irregular back to the brain as quickly as possible.

These bidirectional messages between the brain and the gut can occur in milliseconds through electrical signals, and what is interesting is that roughly 80% of messages are sent through this pathway from the body to the brain (Wang et al., 2021). Which leaves roughly only 20% of messages going from the brain to the body. Thinking about this more closely challenges the comment about the brain controlling the body; if around 80 percent of neural messages are afferent (carried toward the brain), that means that they control many signals on how the ship shall be steered (Bonaz et al., 2021).

Some of the messages that may be sent and perceived via this neural pathway relate to nutrient/satiety levels, mood/stress levels, and updates on the stability of the gut, such as stress in the digestive system and/or gut wall damage. Signals from the gut via the vagus nerve may also impact serotonin levels and mood, with a large portion of the gut responsible for supplying around 95% of serotonin in the human body (Appleton, 2018).

The Neuroendocrine Pathway

The second mode of transportation that may be used to send messages is via the neuroendocrine pathway. This pathway can commonly overlap with some of the neural functions because it is called the *neuro*endocrine pathway; sometimes these messages can enter the vagus nerve and travel via that modality. In contrast to the neural pathway, which uses electrical impulses, the neuroendocrine pathway primarily uses the bloodstream.

As mentioned before, the neural pathway is the fastest method of transportation of the three methods and is most commonly used; therefore, when using the neuroendocrine system, these messages vary in speed and may take anywhere from a few minutes to a few hours to be received by each other. When any hormones are released, they will use the bloodstream as their preferred method of transportation. Just like its name suggests, it is kind of a combination between the endocrine system and the nervous system. For example, certain hormones can use two different modes of transportation by beginning their travel via the bloodstream and then binding to receptors within the vagus nerve that alter their method of travel (Cussotto et al., 2018). Since the intercom can be depicted for the neural pathway, as crew members and the captain can use it and communicate rapidly, the neuroendocrine can be depicted as sending an email or letter, which can also be read by a recipient and then further sent via the intercom to deliver the message more rapidly.

This method is responsible for things that help in maintaining homeostasis, such as metabolism, blood pressure, mood, and so on. Because it helps in regulating mood, it is responsible for releasing hormones, such as the stress hormone cortisol, into the bloodstream when dysbiosis or inflammation is apparent. Yes, these hormones can signal that something is off, but they also carry with them alterations to mood, cognition, and behavior. Stress is a huge detriment to the microbiome, as it can be

triggered by either the brain or the gut, and since they contain bidirectional communication, both largely affect each other.

Immune Signaling

The third pathway that is commonly used to signal and relay messages between the brain and gut is the use of immune signaling. As we have already touched a little bit about the power of this modality, we can think of this pathway in regard to the captain and ship analogy as alarm signals sent out into the entire ship that do not stop until the issue is acknowledged and solved. Because this pathway involves the immune system, it is interesting to learn that roughly 70% of the immune system resides within the gut lining, monitoring and defending against toxins, microbes, pathogens, and gut lining damage (Macpherson & Harris, 2004). Through immune signaling, the microbes can contact the immune cells and trigger an activated immune response, which in turn can be released throughout the entire body. Or, looking at a breach in the intestinal wall, this immune response can be activated if the body finds any antigens where they are not meant to be.

Quick Recap & Importance

Again, that may have been a lot of information, so I will quickly recap and explain the importance of discussing it. The gut and the brain communicate through 3 primary ways to ensure that each is well-informed and aware of any important changes. The first way is through the neural pathway; this is the fastest and most common way they communicate, and it primarily uses a very long nerve that connects the two. This vagus nerve connects the brain to many vital organs and is very important to make sure each is running smoothly. Roughly 80 percent of the signals are coming from the gut to the brain, which means they keep the brain, or "captain," well informed on their status. In my comparison

between the captain and crew, this is seen like the intercom system.

The second is the neuroendocrine pathway, which uses a mixed pathway between the nervous system and the endocrine system or bloodstream. This pathway is for more steady and slow signals that correspond with mood, metabolism, and other forms of maintaining homeostasis. In my comparison, this was referred to as sending an email or letter that could be picked up and sent through the intercom if need be.

Lastly, immunological signaling keeps the immune system and the microbes well informed with each other, since the immune system is the first line of defense; this is especially important. If something occurs that triggers the immune response to be activated, then this can be thought of as the alarm bells going off on the ship. Not just the captain and crew are aware, but the entire ship is as well.

So, Why is This Relevant?

Although it may not have been the most mind-blowing information, understanding how some of these processes work and the ways in which the gut-brain axis functions are important foundational pieces for the following chapters within this section. As I begin to bring the everyday external realm into the microscopic realm from within, we can begin to see how some of these vital communication paths are affected. And, in return, can affect many other moving parts in the body as well.

Within the next few chapters I will discuss some of the ways in which our microbial community is shaped and influenced by a few of the most common factors we may experience in our daily lives. Before I jump straight into it, I want to further explain the reason why I chose to explore this discussion in the first place. Health is something that many of us strive for whether we are

aware of it or not. Our internal systems are programmed to keep us as healthy as humanely possible, doing their very best to keep us alive and well. Although sometimes, the choices we make harm us more than we truly realize and defy that very desire to be healthy. For instance, I know that sugar is unhealthy for my body; drinking caffeine at 5pm to stay up and get work done, staying on my phone when my body is begging for sleep, getting a tattoo, or even purposefully putting holes in my body, and so on are all not things that contribute to my health, yet I do them anyway. The curious "why" came knocking on my door yet again. The obvious ones are apparent, but how exactly do such subtle things truly affect my health? Why is sugar bad for you if it is made from the earth and put in practically everything we consume? Why is stress so detrimental to our health? What exactly goes on internally? And how do these small ripples expand out into such huge problems?

In truly seeing the ways in which seemingly subtle things affect the mechanisms deep within my body, it helps me understand the aspect of health on a greater level. So, in this part of my work, I explored the most influential things that have the ability to affect our microbiomes, and upon learning about dysbiosis, the things we ingest quite literally have the ability to affect every aspect of our overall health. In doing this I had to first learn about how our microbiome is ultimately shaped and curated into the complex ecosystem that it is.

Part 4: Factors at Play

Chapter 7

The First Factor

Before Day One

Just like everything else that begins to grow and shape us into the beings that we are, the microbiome begins to establish itself before we are even born. Their close entanglement with the immune system is actually what helps it develop, grow, strengthen, and prepare us for the encounters that lie ahead on our journey. With the microbiome developing just as every other organ and cell in your body does when first entering the world, the major influences of their health are determined in the beginning stages of life.

The diversity of our microbiome, consisting of trillions of cells, is practically fully developed by the time we are 4 and stays with us for the entirety of our lives. Things such as the method of delivery, ways in which we obtain food, and even the people we encounter as babies have vast impacts on our mini-ecosystem (Patangia et al., 2022). What is even more interesting is that antibiotic use by our mother can largely shape it as well. When I first introduced the main types of organisms within the microbiome, I mentioned bacteria, viruses, and even fungi, all of which brought me uneasy feelings upon first learning about them. Personally, I believe that those beliefs are likely engraved from the way our society influences us. We learn that germs are bad and constantly associate negative connotations with them. Because of

this, we are more likely to view all germs as harmful and do not see many repercussions when eliminating them. Antibiotics are something I was surprised to learn about when understanding the main things that have the ability to shape our microbial communities.

In discussing antibiotics and their impacts on the microbiome, it is in no way my intention to deter anyone from the use of them, nor do I wish to input any medical advice. In reality, I was surprised to learn about their effects on the “good guys” and instead insist on bringing some awareness to anyone who may have been unaware of them. In learning about some of the things that influence their diversity, we can help our mini community as much as possible, giving it the best chance to thrive.

The First Factor

Aside from the early establishment of the microbial community when we are young, one major determinant that can influence the connection between the gut-brain axis and also contribute to dysbiosis is the use of pharmaceuticals and antibiotics. These have the potential to alter the natural process of the body’s ability to self-regulate and openly communicate with one another. Antibiotics are strong medications created to stop the growth of bacteria and other microorganisms. What can be harmful about certain pharmaceuticals and antibiotics is that their strength does not just target and get rid of the harmful bacteria but also the microbes that aid in keeping the body healthy and stable as well. Even in small courses, these effects can last for years. From just a one-week dose of the common antibiotic clindamycin, researchers found that it resulted in a major disturbance within the microbiome, which remained for up to two years after treatment (Jernberg et al., 2007). A more recent study, published in 2024, was conducted to understand if the effects from antibiotics could

be lessened on the microbiome’s diversity. By instructing certain volunteers to take a postbiotic supplement alongside their antibiotic dose, they could compare drastic changes in each group (Schluter et al., 2024).

While many are probably familiar with the term “probiotics” and understand that they are good for the gut, they differ from postbiotics. I always knew that the words “probiotics,” "prebiotics," and so on were good, but I never understood the differences between them. Probiotics are the healthy live bacteria, or "earthworms"; prebiotics are food, or “dead leaves," for the healthy live bacteria; and postbiotics are what the healthy bacteria produce, such as the nutrient-dense byproducts of composition (Ji et al., 2023). Specifically focusing on postbiotics, they are able to prevent the growth of harmful bacteria, which in turn assists the healthy ones. These postbiotics are also able to strengthen the gut barrier function and are also able to demonstrate antioxidant and anti-inflammatory properties that help alter the immune response.

Essentially, the researchers wanted to see if adding in postbiotics could help in protecting the gut microbiome during and after an antibiotic course. To do this, they split 32 participants into two groups; all received an antibiotic course for 7 to 10 days regardless of which group they were in. However, half of the participants received a postbiotic, and the other half received a placebo. After the 7- to 10-day study was complete, the results reflected that the group receiving the postbiotics showed over a 40 percent increase in microbial diversity as opposed to the group that received a placebo. On top of that, the postbiotics also helped reduce the harmful bacteria while promoting the growth of the beneficial ones. Such a small addition to their administered treatments reflected that postbiotics do indeed have the potential to help prevent negative impacts on microbial diversity (Schluter et al., 2024).

Interestingly, other things we are commonly administered can leave lasting impacts on our microbial diversity as well. Many have been examined and displayed drastic changes in our microbiome with continued use, and it is known that roughly 1 in 4 of our medications can inhibit the growth of our gut microbiome (Minichino et al., 2023). Some include the use of antidepressants, antipsychotic medications, antacids, and nonsteroidal anti-inflammatory drugs (NSAIDs) like ibuprofen and aspirin, among many others (Ferretti, 2025). I certainly will not get into the logistics of each medication and its effects, nor am I here to cause any apprehension about prescription drugs or medications someone may be on; however, one out of two Americans in this country takes at least one or more medications on a regular basis. I am sure we are all aware of the miniature textbook attached to each bottle or the sped-up list of side effects that reigns over the TV screen in a voice we have almost all become accustomed to. All of this is to say that these orally taken medications directly come in contact with our gut microbiome and have the potential to greatly alter its diversity and health.

Although this may not seem as intriguing as the next two factors I will touch upon, it is very important to understand the influence that certain things we ingest regularly have on the intricacies of our systems. It was certainly something I had not thought of previously and am now able to take a new piece of information with me along my journey as I continue to learn more about health and all of the things that may contribute to or influence it. While antibiotics can help to eliminate the problem of certain illnesses, whether it be a rough cold that has become bothersome or even a urinary tract infection, many people are unaware of the long-term effects that may come alongside these medications. In briefly touching upon antibiotic use and finding yourself prescribed or instructed to take any sort of medication, may this bring you some insight into what can help your healthy

bacteria thrive alongside your immune system. Whether it means you seek out more foods that contain postbiotics, prebiotics, or even probiotics, they have the potential to drastically reduce the elimination of good bacteria, which are essential for protecting the gut barrier function, strengthening immune health, protecting against harmful microbes, reducing inflammation, and helping the body absorb vital nutrients (Cleveland Clinic, 2023). As they are commonly found in fermented foods such as yogurt, kefir, kimchi, sauerkraut, other pickled vegetables, and even kombucha. It is certainly worth a try next time you find yourself in need of antibiotics to combat a yucky infection or just something to incorporate within your already prescribed medications.

And, to reiterate this again, although I am providing facts that are meant to bring awareness to the modern-day changes that have been implemented throughout the past century, I do not say this to go against medical advice. I am merely just examining the major contributors that have been researched and are outspoken pertaining to the gut microbiome. There is no denying that certain medications play a drastic role in the limited diversity of our microbiomes, and if there are any measures we can take to combat these findings, I am more than willing to share possible advantages and disadvantages that affect our gut health. As I will soon discuss, the gut is perhaps one of the most crucial factors that contribute to the overall health of our bodies, and it is beyond dire to be aware of this. Just as the famous Hippocrates suggested well over two thousand years ago, “All disease begins in the gut”; therefore, bringing more awareness to the tiny ecosystem that cohabitates with the other cells that reside within our bodies can help all of them work in congruence with one another (Lyon, 2018).

Chapter 8

The Second Factor

Let food be thy medicine and medicine be thy food.

—Hippocrates

Processed Foods

What is in our control and what may be one of the most important factors that tie into our overall health and immune longevity is what we ingest. Through the aid of food, we, as the captain, are able to fight alongside our bodies instead of working against them.

As to be expected, many of the man-made, genetically engineered foods that are not derived from whole, natural ingredients do not offer much benefit to the diversity of the gut microbiota. Because many of these foods lack ingredients that contain essential nutrients that the body needs to convert into useful energy in order to function optimally, they have major adverse effects on the health of not only the gut microbiome but also all aspects of the body. With shocking database statistics from 2022 covering over 50,000 food items sold in the highest-ranked grocery stores across the country, they indicated that “73% of the US food supply is ultra-processed, and on average ultra-processed

foods are 52% cheaper than minimally processed alternatives" (Ravandi et al., 2022). What makes these ultra-processed foods so unhealthy is certainly the process that goes into creating such highly palatable foods that disconnect the mind and body, overriding the desire to feel satiated and seek out nutrients that our bodies need, but also the chemicals and unnatural ingredients bombarding our systems.

With these processed foods causing a major influx of inflammation, dysbiosis, lower memory, cognitive function, and many other things, they also result in bringing unwanted harm to the body. As heart disease and cancer contribute to the most common causes of death in the United States, it is truly a wonderment to see the reflection of ultra-processed foods occupying roughly three-fourths of the "food" inside grocery stores that are most commonly shopped in (Centers for Disease Control and Prevention [CDC], 2025). The major issue that comes along with ultra-processed foods (UPFs) is not solely the fact that they contain little to no nutritional value, aside from the common supplements that are added to them through fortification, but also, more importantly, the saturated fats, high levels of sodium and sugar, and the mix of unnecessary chemicals that were never meant to enter our systems. Even food marketed for babies and young infants reflected that around 70 percent of products are ultra-processed foods, containing additives, unnecessary preservatives, and other enhancers (Dunford et al., 2026).

With a disheartening majority of Americans consuming processed foods, it has become a necessity to reach the daily nutritional value through fortification, the process of adding powdered nutrients to ensure that there are no nutritional deficiencies in the country. This is not just a common occurrence in America but is also implemented in most parts of the world.

The true shift in fortifying foods occurred around the time of the Great Depression in the 1930s and 1940s, when the main

foods consumed consisted of high-yield crops such as potatoes, beans, and corn, as well as bread and flour (Lin, 2024; Institute of Medicine, 2003). These high-yield crops meant many farmers focused on one single crop harvest instead of a diversity of crops. When the mass production of food and farming began to take place, the soil's richness and nutritional content rapidly began to diminish. As chemical farming began to take the place of natural farming, artificial fertilizers, chemical pesticides, and genetically modified seeds were aimed at resulting in more money and more product, all of which are harmful to the environment and human health (Bhardwaj et al., 2024). Because of this, a lot of the nutrients that used to be supplied via our foods slowly started to decline in congruence with the rise of mass-produced processed food, which loses its nutritional content during *processing*. Thus, it became essential to combat nutrient deficiencies across the population in the form of fortification. Since that major shift, with high-yield crops feeding the country and the implementation of vitamins and minerals in food, the dependency on nutrients and vitamins has become more inclined to be obtained via processed foods. Slowly, preservatives were incorporated to create a longer shelf life and chemicals to enhance flavors and make the food more enticing, which allowed a faster production of food and ultimately led to more economic profit. The shift from eating processed foods, due to the lack of accessibility for other foods, such as in times in the 1930s, has become more geared towards profit and palatability as time has progressed (Ravandi et al., 2022). All of these changes have contributed to the rapid decline of the quality of the American diet and overall shifts within our eating habits.

Although all of these changes have led to more food production and accessibility around the world, the quality of how we think about food has declined. Instead of focusing on feeding our systems so they are able to optimally function, many have

opted for the faster, cheaper, and more indulgent route. As more and more of our time pertains to working and daily necessities, we have begun to rely on quick meals without putting in further thought on how they nourish our cells and other internal states. In reality, food may be the most important thing that we can control to optimize our longevity and the well-being of our bodies. With so many more options and choices on the shelves, it should not be nearly as hard as it has become to find food that is truly natural. It is now engraved in my soul to search and scour every single thing when I am in the grocery store, down to each can of beans I am looking for just to find the only option that does not contain some sort of chemical additive. We are bombarded with flavors, varieties, new items, and hundreds of choices to the point where it has become beyond excessive. Along with that, it has become difficult to find actual food that does not hide something harmful in its ingredient labels that are advertised in a deceptive way. Even fruit and vegetables have become altered in major ways that have only given my trust issues more reasons to thrive. With everything ingested into our system, it either aids in fighting unwanted antigens and reducing inflammation or helps it.

One very interesting study, conducted in 2021, examined the detrimental effects on the gut microbiome caused by a common food additive within an 11-day span. In which half of the participants consumed diets that were free of the additive, and the other half consumed a diet enriched with 15 grams of carboxymethylcellulose (CMC). CMC is a widely used food additive that acts as an emulsifier or polymer to thicken/stabilize things. It is found in many things, ranging from food products, eye drops, and pharmaceuticals to industrial and oil drilling uses (Sidley Chemical Co., 2013). Three days before the inpatient study began, each participant was given additive-free meals to take home to ensure the results did not correlate to their previous diet and so on. After the study had been completed, the results were measured

and revealed that subjects that were fed CMC showed much greater changes in their microbiota composition than those that did not. The microbial metabolites meant to break down and produce essential nutrients largely changed and displayed great disruptions. These metabolites influence neurotransmitter production and immune regulation, which can have a direct correlation to the brain and communication signals. Because of the things we eat, the microbes in our bodies can genuinely begin to crave those things and signal to the brain since 80 percent of the messages sent in the gut-brain axis come from the gut. Researchers also found that alongside the reduction in microbial diversity, they also showed loss of a key anti-inflammatory bacterial species that helps to protect gut lining and calms the immune system. This finding is especially scary, as the tests from 2 out of the 7 participants who received CMS displayed markers of bacteria that were found beyond the gut's protective mucus barrier, indicating an early marker of "leaky gut" and immune activation. Within the span of less than two weeks, this small, 15-gram dose of a specific food additive was able to significantly affect the gut microbiota and already implement major disruptions (Chassaing et al., 2022). Think about how that one emulsifier in this study affected these participants and then compare that with the estimated 10,000 or more food additives that are used in the United States (U.S. Food & Drug Administration, 2025).

Sugar & The Microbiome

Understanding that food additives are only one small aspect of the disruption that can be caused within the well-being of our health is astronomical. Foods high in saturated fats, sugars, additives, preservatives, pesticides, stabilizers, and even microplastics from packaging—the list is endless and can all contribute to one domino tipping over another. Sugar is another

major deterrent from the diversity that takes place within our microbiome. An intriguing article published in 2016 extensively surveyed the packaged food and drinks sold in grocery stores and found that anywhere between 70 and 80% contained some form of added sugar, even when it was not marketed as sweet. With food labels disguising sugar with more than 200 alternative names (Ugarte, 2025). Over half of all added sugar consumption in American diets comes from these hidden sources rather than obvious dessert options (Popkin, 2016; University of California, San Francisco, 2013). If these findings were from nearly ten years ago, imagine how much change has occurred within our eating patterns and sugar consumption since then. The issue with sugar consumption is that it activates the brain's reward system, triggering you to continue seeking that same pleasurable feeling from it. Continuous exposure to sugar can result in dependency on what those chemical pleasures provide; when overconsumption of sugar occurs, it begins to disrupt the neural pathways that regulate appetite, leading to excessive sugar intake and impulsivity (Qin et al., 2025). Because sugar is hidden in many more commonly eaten foods than once previously imagined and is practically inescapable, the brain begins to fixate on the chemical rush and satisfaction that it is anticipating. Sugar disrupts the microbiome and contributes to dysbiosis, which feeds the harmful or unwanted bacteria and eventually leads to inflammation and diminished gut function (Kawano et al., 2022).

Briefly, I want to discuss another study that was conducted in an effort to test the impacts certain things we ingest have on our microbiomes. I found that understanding and diving into studies were better ways for me to visualize and really realize the impacts such small things have on us. Although I may hear it affects us over and over and over, I have a hard time putting the information into perspective and find myself drawn and intrigued by studies. So, by no means do I mean to sound like a broken record as I bring

up yet another study to relate the information I am reiterating; it is just one of the main ways I learned to integrate the newly found knowledge into my own life. To comprehend how the different sugars affect our microbiomes, researchers had volunteers follow 4 different diets over the course of 4 weeks. In total there were 12 healthy participants, 6 of whom were lean and 6 of whom were obese but all in good health. During the first week they followed a low-fructose diet, ingesting less than 10 grams of fructose per day, which acted as the control diet. Upon the second week they entered the first real *phase*, shifting to a high-fructose fruit and vegetable diet. As they were required to hit 100 grams of fructose per day, and for reference, the average apple contains roughly 6 grams of fructose. So as you can imagine, many ate copious amounts of fruit during that week. The third week consisted of another low-fructose diet, aimed at resetting the body in order for the final test. So, on the last and final week of the experiment, volunteers were asked to once again eat 100 grams of fructose, but this time, instead of the source deriving from fruits and vegetables, it was through high fructose syrup. As opposed to an apple or a banana, which contains very low amounts of fructose, the average 12-ounce can of soda contains over 20 grams of processed, refined fructose (Beisner et al., 2020).

During this last week their caloric intake was 50% higher than normal, meaning that they consumed way more energy even though it was much easier to hit their daily fructose intake. Because many of these foods contain no real nutritional value, they are often characterized as "empty calories," so although they easily hit the daily calorie requirements, they leave the individual empty of actual energy that fuels the body for optimal performance. With the flavor enhancements on many of these products, it is much easier to continue eating, hoping to reach that satiated feeling but never achieving it, resulting in feeling empty and full at the same time.

As you can likely guess, at the end of the study, not only did the high-fructose syrup diet display overall negative effects on the gut microbiome, but it also reduced key microbial metabolites that are essential to the protection and defense against inflammation and disease. Specifically displaying the reduction of microbes pertaining to butyrate, which is essential for gut health and contains anti-inflammatory properties, heals and protects the intestinal barrier and displays antimicrobial properties that may aid in the body's overall protection against several diseases (Beisner et al., 2020). Because there was a major change within the production of these metabolites, the harmful bacteria that increase inflammation and contribute to the intestinal barrier breakdown were more present.

Even though they also underwent a period of high fructose consumption through fruits and vegetables, because these sugars also carry vastly different digestion and absorption processes, they do not produce the same results. Sugar or fructose from whole-food fruits and vegetables also carries essential vitamins, minerals, and nutrients that are being broken down and processed by the body in conjunction with fructose. It also is a much slower digestion process because the body has to account for the amount of water and fiber also ingested alongside the fructose from fruit. These essential foods feed the good bacteria in the microbiome and help the body protect against inflammation. As shown in the study results, the high fructose consumption through whole fruits and vegetables showed an increase in beneficial bacteria that produced butyrate, which are the short-chain fatty acids that strengthen the gut barrier and reduce inflammation. The analysis also displayed that the beneficial bacteria may help the heart and metabolic function by resulting in lower cholesterol and triglyceride levels (Beisner et al., 2020). Although this is such a short glimpse of the wonders our bodies process through the eyes of one study, understanding that such small imbalances and shifts in the

microbial composition can result in grave effects is one of the most important things to grasp when making choices to either heal or harm our bodies.

Sugar not only has a massive impact on the gut microbiome but also, because the gut is in constant communication with the brain, the brain is gravely affected as well. With over hundreds of millions of neurons in the digestive system, also known as the enteric nervous system, it is an integral part of making sure the ship and captain are on the right track. As briefly discussed earlier, neurotransmitters, such as dopamine and serotonin, are significantly affected by the intake of sugar (Qin et al., 2025). The balance of neurotransmitters in the nervous system greatly shapes our ability to think, feel, move, perceive, act, and react, influencing many factors. Dopamine is a key puppet master in the influence and impact of sugar on the brain. Dopamine has a main function in the brain, controlling pleasure and reward, and the excessive intake of fructose or glucose (different forms of sugar) in humans is known to literally change the activity of different brain regions that are associated with eating habits and rewards (Qin et al., 2025). After sugar consumption, dopamine is released, which activates feelings of pleasure and reward, and therefore the brain aims to seek these same pleasurable responses again, which reinforces further consumption of sugar. Leading to a vicious cycle and can be compared to the effects of nicotine usage (yes, it may seem like a drastic comparison, but bear with me).

Similar to the effects sugar has on dopamine, nicotine consumption binds to certain receptors in the brain that trigger the release of dopamine; along with feelings of pleasure, it contributes to reuse. Although it is hard to see the comparison between a drug like nicotine and sugar consumption that is given to children as a sweet treat or *reward*, there are undeniable similarities among them that cannot be overlooked (Valentine & Sofuoglu, 2018). One striking finding is discussed in a 2022 study, stating, "Long-

term consumption of sucrose altered nicotinic acetylcholine receptor (nAChR) expression in the NAc" (Witek et al., 2022). In short, there is actually a receptor in our brain, nAChR, with the same *nicotinic* name that is involved in numerous brain functions and is distributed throughout the brain and body. Its main functions pertain to regulating the release of neurotransmitters as well as engaging in things such as memory, learning, reward, and mood (Abbondanza et al., 2024). When we do something pleasurable, our brain will remember that due to the release of neurotransmitters that cause a feeling of "good" to occur and thus help us learn and grow. In essence, nicotine usage binds to these receptors and triggers more dopamine to be released; sugar consumption has been shown to interact with these receptors in a similar manner.

After understanding that sugar can genuinely affect the same receptor in our brain as nicotine, it is much more surprising and understandable to see the similarities between the two. Not to drill in the impacts of sugar on the body even more, it is shown to have possible detrimental effects on a region of the brain that is responsible for memory and learning. These impacts demonstrate that overconsumption of sugar can actually harm the brain by inhibiting neural connections. Furthermore, it has reflected high inflammation markers, which showed signs of neuroinflammation and even spiked the chain reaction of oxidative stress. When studying the impacts of what sugar can do long-term to the body aside from what I have discussed previously, even after stopping sugar consumption, researchers have reflected that the cells could heal but would still genuinely remember the effects it caused. Meaning that a sign of deep cellular stress was still apparent, as well as some lasting effects from residual inflammation, i.e., the brain was still aware of the stress from the high-fructose diet (Mazzoli et al., 2021).

Although I have been well equipped with the knowledge and understanding of the detrimental impacts that these highly palatable foods have on the microbiome and brain and, in turn, on my entire body, it does not take away from the fact that they are in every direction I look, in every store I shop in, and, at times, the only option I have in my surroundings. Knowing what I have learned, I am certainly not a perfect human being attaining to be the most restrictive in a world that praises indulgence, but instead it has allowed me to find balance in the choices I make and become more aware of the impacts certain things can have on me as a whole. I hope with the little bit of information I have shared about the importance of nutrient-derived foods and those formulated from processing, enhancers, and chemicals, we are all able to make healthier decisions that result in nourishing both our bodies and minds, so they are able to work with rather than against one another.

Chapter 9

The Third Factor

Stress & The Vagus Nerve

As I had briefly discussed earlier, inducing deep cellular stress damage is not the only kind of stress that can be prolonged by constant sugar consumption; rather, sugar affects certain systems that aid in the coping and management of stress. When we are experiencing stress, certain hormones are released and sent through the bloodstream. Because sugar can affect these signals and lead to an oversensitivity of the stress response, it can further impact all aspects of our body. Prolonged stress, also known as chronic stress, occurs when our bodies have experienced continued stress for an extended period of time. Whether it is mild stress, such as running late, being preoccupied with upcoming bills and your financial situation, or even little things like not getting a text message back from someone you have been busy thinking about, all of these little moments of stress accumulate over time. Throughout the moments of our lives in the fast-paced routine of life, stress and worry are constantly surrounding us. Along with stress itself triggering an unwanted response within the body, the anticipation of stress can actually do the same thing. They all elicit the same responses by releasing cortisol, which is the hormone commonly associated with a stress response. Over time, these small, inconspicuous moments that may seem like nothing at the time begin to pile up and strain our body's functioning if we are

not able to maneuver through them well (Greater Good Science Center, 2012). Any minor day-to-day occurrence can trigger stress, even if it is for a short amount of time, and the issue with these different layers of stress is that they can promote inflammation.

Think about the signal of stress as the body switching from an "everything is fine, healing running smoothly" mode, often governed by the parasympathetic nervous system, to a state of worry, preparation for an issue, or overall defensive mode, which is governed by the sympathetic nervous system. With even the smallest moments of stress, the body is taken out of the calamity by the parasympathetic nervous system (which is strongly associated with the vagus nerve). Due to this, the body switches to the sympathetic nervous system and prepares for "fight or flight," shutting off all of the nonessential functions of the body that lower the chances of survival in the enhancing situation.

Because stress has previously been associated with life or death, as we are mammals and used to rely on these functions in order to survive, our bodies are not aware of the different layers of everyday stress and stress that is detrimental to our livelihood. Therefore, when the stress response is activated throughout the brain and body, certain functions temporarily stop in order to direct all of the extra energy to survival. As well as other responsibilities, it will also stop our digestive system for a short period of time and, in turn, temporarily suppress some immune system functions. All of these functions may only last for a short duration depending on the length of stress stimulation; however, when prolonged stress is triggered, these responses and hormones become disrupted over time and cause dysregulation within the functioning of the body's signals. Certain receptors begin to lose their sensitivity to stress responses when prolonged stress or chronic stress is apparent in the body for an extended period of time. When they stop responding sufficiently, the area in the brain that responds to stress and calls to other areas to release cortisol does not know when to shut off.

Understanding that even small everyday moments of stress can impede the performance and communication of the brain and body is detrimental to gut-brain axis function. Similar to dopamine being released when we consume or even anticipate eating something sweet, the body has a similar mechanism for stress. Constant cortisol being released into the bloodstream is shown to genuinely sever the communication pathway between the gut and the brain via the vagus nerve. The vagus nerve, which is the longest cranial nerve that connects and passes through many vital organs within the body, also controls many crucial functions. Ranging from controlled breathing to our heart rate and many other automatic functions. Some of these pertain to gut function, such as regulating the digestive enzymes, gastric acid, and bile and the contracting of the stomach and intestines (Keer, 2024). Because the status of the vagus nerve is largely associated with periods of rest and regulation, make sure all autonomic functions are properly balanced to achieve a beautiful state of homeostasis; when stress enters the equation, it immediately disrupts the communication between the gut and brain via this bidirectional highway.

The vagus nerve achieves this through hundreds of thousands of nerve fibers that are contained within this intricate network of communication (Northwell Health, 2025). These nerve fibers aid in something called the "cholinergic anti-inflammatory pathway," which is considered a mechanism or reflex that assists in controlling the inflammatory responses. Essentially, because this vagus nerve is connected to such vital areas of the body, these nerve fibers are crucial in detecting anything that seems out of the ordinary. These fibers within the vagus nerve will essentially detect inflammation and then send that information to the brain. Then the brain's job is to process this information and then send out a signal back to the vagus nerve, which then releases a chemical called acetylcholine. The vagus nerve fibers will release this chemical, and surprisingly, it will bind to a similar receptor

that was found to be altered through the overconsumption of dopamine, the α7-nicotinic acetylcholine receptor (α7 nAChR) (Bonaz et al., 2021). To make it a bit less technical, think of it this way: Have you ever seen something out of place, let your higher-up (boss) know, and then had to wait for them to evaluate it and ultimately give you an order? That is practically what occurs here: the vagus nerve fibers detect inflammation, tell the boss or brain, the brain evaluates it, and sends a signal back down to the vagus nerve, and in turn these nerve fibers release a chemical or solution (acetylcholine) to mediate the inflammation signaling. After they sufficiently bind to the α7 nAChR in immune cells, they succeed in suppressing immune cells. This inhibits macrophages from producing and sending out (alarm signals) properly, known as cytokines that are pro-inflammatory. Cytokines can be viewed as the messengers that send out these alarm signals (Bonaz et al., 2021).

In the beginning of this chapter, I discussed some of the benefits that phages provide to the human body. Just like NK killer cells, these phages aim to identify and destroy any harmful pathogens. But because innumerable factors like stress or unhealthy food can continuously trigger the stress response within the body, the vagus nerve fibers are essential for suppressing the immune response. Think of it this way: Imagine kindergarten students that are on the playground and see one student trying to hurt another student because they will not share their toy or for any other reason children may be arguing. With other students seeing this, they will run to the teacher and "tattle" on them, and then the teacher (the brain) will assess the information and try to provide a solution. Whether it is by sending that student to play with another kid or providing discipline, which may teach them why sharing is important. Either way, the action is resolved, and the students do not continue running to the teacher every 5 seconds to *tattle* on that student. These cytokines (or students in the analogy) are essentially

triggered to let the body know that there is inflammation and that they must direct the immune cells and tell them where to go/who to target. However, the issue is when constant signaling takes place, whether it is from poor diet, prolonged stress, or a number of other factors (inhaling constant VOCs from harmful substances, for instance), the communication link that inhibits these signals from continuously being sent out into the body is breached. Because being in a constant stress response can shut off many functions, it is also known to suppress the vagus nerve.

Remembering that over 70% of immune cells reside in the gut makes this communication pathway a key contributor to helping combat chronic inflammation. Without the communication and detection from the vast array of nerve fibers within the vagus nerve, detecting inflammation and assessing the situation when communication is cut off from this nerve, the brain has no idea that certain cells in the gut are spewing out more and more pro-inflammatory cytokines (messengers holding alarm bells). As stated in a study on the effects of stress and diet on the gut-brain pathways, "Chronic stress is known to inhibit the anti-inflammatory potential of the vagus nerve as well as increase circulating proinflammatory cytokines, which can reach the brain, therefore increasing gut inflammation and motility" (Herselman et al., 2022). When we begin to understand that the vagus nerve plays a huge role in the body's ability to rest and rejuvenate, chronic stress essentially battles it, and in return the body is functioning through a different system. Since the parasympathetic and sympathetic nervous systems are polar opposites, similar to a light switch, only one can be on at any given time. Because both cannot be present at once, the body is not able to communicate as easily through the relaxed method of transportation supplied by the vagus nerve when chronic stress is present. Shutting off this communication method to the brain results in a greater release of pro-inflammatory cytokines in the gut, i.e., the alarm bells are

ringing over and over in the ship as the captain is in the control tower, not able to effectively resolve the continuous issues. Because the release of these markers disrupts the receptors' ability to regulate correctly, the body is now beginning to operate on more levels of cortisol that are not only affecting the gut-brain axis but also all regions of the brain and body in different ways.

Stress & The Blood-Brain Barrier

Interestingly, the high levels of pro-inflammatory cytokines (messengers holding alarm bells) that are being released can also signal to certain cells within the blood-brain barrier. The blood-brain barrier is so crucial to the protection of the brain, preventing any harmful antigens from invading the neural stability of the brain and affecting the processing of it. This barrier is also vital to preventing devastating fluctuations from the rest of the body. If the captain is bombarded every two seconds, they cannot effectively do their job and control or focus on the regulation of the ship. Due to this, they may end up steering into rocky waters or miss a crucial signal because of their distraction, leading to further problems.

If proinflammatory cytokines are able to signal to specific cells that reside within the blood-brain barrier, they are able to actively remove these cells from the physical seal that forms the blood-brain barrier. Not only that but these cytokines are also able to "convince" these cells and surrounding cells to produce enzymes that further break down the structure of the blood-brain barrier. To further use the captain-ship analogy, imagine this is a cruise ship, where there are always guards outside of the captain's command center to prevent everyday passengers from walking in. One day during a boring, monotonous shift, a guard engages with one of the passengers and is convinced that they should join them in the dining room. From that point on, they do not return to their

job as a guard and are able to persuade other guards to join them, pulling away from the protective duty they were assigned to complete. The disruption of this tight junction (protective layer) creates holes within the lining of the blood-brain barrier, which allows for antigens like inflammatory cells and molecules to enter more easily. As you can suspect, this is not a good thing for the brain's health (Pan et al., 2011).

Since the blood-brain barrier is breached, there is a vicious cycle that occurs with inflammation. After disruption in the tight junction of the brain, these pro-inflammatory cytokines cause hypersensitivity and activation of the brain's immune cells, which are essential to maintaining the brain's health and activating when it encounters injury or disease (Colonna & Butovsky, 2017). Not only can these cytokines trigger the "bodyguards" to shift, but they can also turn these brain's immune cells into inflammatory producers as well. By undergoing a gene expression change, they are much more susceptible to making pro-inflammatory responses. As a result, the brain's hijacking is now more detrimental to the entirety of the body than just affecting the gut microbiota.

Quick Recap

Yes, that was likely a lot of new information for your brain to digest; hopefully, you were able to follow the various medical terms and scientific names. If not, that is completely okay; I will briefly recap because it gets crazier.

Stress switches the body from a calm, relaxed state (parasympathetic nervous system), which allows for healing and ordinary function, to a defensive state (sympathetic nervous system), which stops many functions and instead prepares for an incoming issue. In this the vagus nerve is affected. Because of the crucial role within the vagus nerve, connecting to many vital organs, it can detect inflammation and immediately send that

information to the brain. The brain then evaluates it and responds with another signal back to the vagus nerve. Once the vagus nerve receives its order, it will release a chemical called acetylcholine, which essentially shushes the alarm signaling from pro-inflammatory cytokines or messengers with megaphones. This calms inflammation within the body; however, stress inhibits this communication pathway from working properly.

What is bad about so many cytokines with megaphones is that they are able to "dismantle" the protective layer of the brain, the blood-brain barrier. Allowing antigens and other harmful substances to enter the brain. These cytokines are also able to turn the brain's immune cells into inflammatory producers as well. All of these issues largely impact the entire "ship."

Continuation

Alongside the monstrosity already occurring, other findings discuss that stress genuinely hijacks the "ingredients" that are necessary for producing serotonin in the body. Similar to how the bodyguards became distracted and overturned the brain's immune cells, stress is displayed to take essential amino acids and divert their destination from making serotonin to a different pathway. Prolonged stimulation of this pathway, the kynurenine pathway, is reported to show negative effects on the body because it produces certain neurotoxins and actually aids in the inflammation already taking place (Herselman et al., 2022). In short, the ingredients that were meant to aid in serotonin production are redirected under chronic stress, leading to the enhancement of oxidative stress and other harmful effects on the brain. This is another main indicator as to why stress can be strongly correlated with an increased risk of stress-related mental health issues.

Prolonged stress also harms the gut lining by weakening the protection that short-chain fatty acids, such as butyrate, are

meant to provide defense against harmful antigens from seeping into the body's systems. When they are under chronic stress, they are not as strong; therefore, stress is seen to weaken this protection and lead to even more vulnerability within the gut (Herselman et al., 2022).

Within all of these different mechanisms that are altered due to stress, the innerworkings of our overall health are determined by so many intricate factors, and it is truly astonishing to discover. Thinking about how one small change in the diversity of the microbial community can have a ripple effect on a vast array of internal systems and, in some cases, can determine the health of our bodies is crucial to understand. When leaving the world of words and returning into the world of wonder, bring with you the curiosity that arises when moving through your daily life. Understanding that small changes, whether it is the stress you experience every day because you do not give yourself enough time to get ready in the morning, how you may be perceived by others, a preoccupied feeling of not completing something the way you expected, or the millions of other scenarios of small stressors in daily life, bring the wonder of the microscopic ecosystem with you when you are in the midst of these macroscopic moments. The mini world within you is responding to these subtle movements and can be vastly affected by these changes. With most of the foundation of health residing within the gut lining, little shifts from the captain can create a massive effect on not only the rest of the ship but the overall destination as well.

Chapter 10

Facing the Factors

As I have reiterated many times already, I am a “must see it to believe it person” for a lot of things in life. And although the process may be completely explained to me, sometimes seeing exactly how this works and applying it to an everyday scenario close to my daily life allows me to fully grasp and integrate the knowledge into my brain. Just like in my introduction, discussing that the things I ate were a clear indication of how my acne reflected the ingested inflammation, I could see how food affected one aspect of my body, but understanding all of the moving parts was visualized a bit differently. If I may jump ship for a bit while I take a pause from the science and processes within, I want to briefly relay a few moments from my life that gave me much greater insight into the world of microorganisms.

Years back my family and I used to foster dogs, and one strong soul by the name of Pinky came into our lives and was welcomed with as much love and help as we could extend. Pinky was quite different and lacked almost all of the hair on her body. We did not know much about her story other than her being in a shelter for a few months and, as you can imagine, not getting the help she needed. She had methicillin-resistant Staphylococcus aureus, or MRSA, which is a bacterial infection. It is unfortunately resistant to many commonly known antibiotics; therefore, it makes

it much more difficult to treat. Since it can spread rapidly, it is also very life-threatening if not treated quickly enough. Because she had already been battling the infection for who knows how long, when we got her, it was already intertwined within her system. Upon picking her up and meeting her for the first time, she smelled of rotten cheese and had massive boils on her skin that resembled mini craters of ooze and infection. I understand this may be gross to envision, and I certainly am with you on that, but the severity of her situation was unfortunately just her everyday reality. Because we were fostering her through an organization, we went to a specific veterinarian that they advised us to go to, and for the next several months, we did everything in our power to beat this infection. With the intensity of her infection, we frequently switched course and tried many different medications, food alternatives, steroids, and so on. At times, even when we saw signs of progression, the infection was embedded into her body, and the excitement did not seem to last very long. The medications and the MRSA itself began to slowly and then rapidly take over until she passed away as it took over her respiratory system. Her story was hard, and although I only got to be a part of it for a short period of time, I felt every ounce of strength and fight that she had given during the entirety of her battle with MRSA.

When diving into the exploration behind this section, her story revisited me many times. Looking back now, as I have discussed, how antibiotic use, medications, food, and the overexerting stress she experienced from dealing with her infection all played a role in the continuous battle she vicariously lived through. Her story had previously always remained an unanswered question in my mind. How? How did she seemingly get worse throughout the almost 4 months she was in our lives? How come we tried innumerable different medications and possible pharmaceuticals to help, yet we never saw clear progress?

Many questions still surface frequently in my head despite it being over 5 years. What my curiosity did get potential answers to came in the form of this section. Understanding, on a deeper scale, the intricate and vastly influential role the microbiome plays in the entire body's health allowed me to revisit her story with a slightly different approach. Although we did the best we could with all we were capable of doing during that time, we did not have all the answers, and I suppose no one ever truly does.

However, I feel that she seemed healthier upon leaving the shelter and meeting us for the first time because she had not been switching medications and antibiotics practically every few weeks. Her microbiome and immune system could build tolerance based upon the medications she was on during that time; however, when the vet began incorporating new things into her body, the resilience she gained had declined. In also wiping out many good bacteria that offer protection, the harmful bacteria, which were already attempting to take over, gained an advantage. Also changing her food due to her appetite loss, which later on we found out she was allergic to, likely increased inflammation in her body without us knowing. Among the dozens of reasons that likely contributed to her health story, many things were in the mix. Just like I have said, not one perpetrator is to blame; all of the moving parts around us are able to influence our health whether we are aware of them or not. Although this is a rather sad story, it was important for me to discuss, as it allowed me to put the information I learned from researching this section into a situation within my life. In seeing these scientific mechanisms in action, I am able to visualize and fully grasp the power and influence they hold, and I hope that has allowed you, the reader, to do the same.

A few years after Pinky passed, I met someone who had caught MRSA at a very young age, which majorly affected her health and was a battle she fought for over 3 years. I had not heard of MRSA until Pinky came into my life, and understanding the severity of her situation gave me a closer perspective on the hardships that my friend Iris encountered. I will not go into the details she recounted of what horrors were endured during that time, but I will say that I am forever grateful she is here. Because she was very young when she had gotten it, it utterly destroyed her body and the systems that were meant to grow and develop. This led her to many years of treatment, and after she had medically fought it, just like it had done with Pinky, it weakened Iris' immune system, which made her more susceptible to other diseases. In this, she got Crohn's disease, which is a lifelong autoimmune disease that inflames the digestive tract. Because over 70 percent of the immune system resides in the digestive tract, this disease causes the immune system to attack its own healthy cells. Needless to say, after overcoming the various hardships she faced growing up, Iris still carried them with her through her current reality.

Because her family had a history of autoimmune diseases, they had made numerous changes to change their health. One of the most important lifestyle changes that occurred was food, in which her mom even studied plant-based nutrition to better understand the important role that each thing we consume within our body plays on our health. Although Iris had been in remission for many years, something occurred within her life that brought an immense amount of stress. Upon experiencing these heightened and prolonged periods of stress, she had a bad flare-up of her autoimmune disease that would ultimately take months to regulate. When she was experiencing this flare-up, I was unsure why she mentioned that stress caused it. At that time, I was so clueless as to the strength and vigor of our mental and emotional states on the

entire body. However, upon learning more about the inner workings behind our bodies and their various systems, I can now see clearly how and why she mentioned this and, furthermore, why she was absolutely right.

Since her body was in high levels of stress for a prolonged period of time, her brain sent out signals of stress, which then trickled down and told the body that it must remain in fight-or-flight mode. In moments of short, small bursts of stress, the immune system actually signals to stop inflammation; the issue arises when prolonged stress enters the equation. However, these heightened stress signals are not natural to our bodies, as they are not built to endure extended levels of this much cortisol and stress. This chronic stress caused her immune system to stop properly regulating itself, which led to the persistent upregulation of pro-inflammatory cytokines (alarm signal messengers) that essentially flooded the whole body. Over time this prolonged inflammatory response began to break down the body's rest and regeneration mode, which led to a buildup of inflammation in the entire body and disrupted many major responses. Thankfully the flare-up she was experiencing has since calmed down, and her body was and is able to heal once more; however, it took quite a while for those changes to take place.

Through the things we experience and endure throughout our lives and the influences of our mental and emotional states, they leave lasting imprints on how our present reality is shaped. Although things we have experienced may have occurred well over 10 or 20 years ago and even much longer than that, they leave lasting impressions on how our body adapts, shapes, and continues throughout our current reality. Even moments or experiences not necessarily physical but mental or emotional can also have deep impacts on us. In learning more about how the gut-brain axis works and its true importance, I have begun to truly see the impacts on not only my life but also those close to me. Although

recounting my time with both my dog and my best friend were rather extreme scenarios of how food, health, bacteria, and our mental state can affect us entirely; their journeys have stuck with me forever. Making themselves more prominent as I journey myself through this section and relay the importance of our gut health.

As displayed in Pinky's story, the constant antibiotics and various changes made in efforts to help combat the bad bacteria also made it difficult for the helpful bacteria to flourish and likely weakened her immune system as well. From this we can see the drastic reflection of how antibiotics can shape our health. Through the story of my close friend, a few factors we touched upon, such as dietary changes and the impacts of stress, had a lasting effect on her health as well. If it were not for her family's adamant change on their lifestyles and food that they put into their bodies, it is beyond likely that many things may have contributed to her battle with these diseases as well. In understanding more about those around me, the internal mechanisms within my body, and my own lived experiences, I am able to continuously learn more about the ever-present influences that impact our lives.

SECTION III: INTERNAL ENERGIES

Chapter 11

Fascination of Fascia

Each grain of sand, brick on a house, leaf of a tree, tree in a forest, and so on can be individualized,
yet they all combine with such harmony to create one formation.

—The Author

Another realm of wonder lies in the normalcy of body pain and stiffness. Even within myself, it has become an increasing issue that I am challenged with. With my body feeling more rigid, tight, and constrained in a manner that seems almost inescapable, I long for the moments where I have forgotten about these issues in their absence. It is interesting, isn't it, the way that something could be banging on my door seeking my attention for days or even weeks at a time, but as soon as they stop, it is as if I forgot they ever existed? The aches or tightness in my body are certainly knocking excessively. On days they are not present, I feel liberated in a way I cannot fully explain. Sure, it is more than likely dozens of different things that accumulate and put an extended amount of stress on me until it finally makes itself known in the form of constant aching. In experiencing this frequent dilemma and further hearing those near to me express similar counts of discomfort or

tightness within their bodies, it is certainly something that I know many struggle with. To the point where it is almost normal amongst those we interact with but most certainly should not be the case. In giving greater thought to this confliction, this section was born. As it tries to understand how our everyday actions, movements, mindsets, and previous encounters have the potential to shape our health alongside our external environment. What about the repetitive actions in our lives that can create certain responses? How do past experiences shape those in our present moment? How does the brain's interpretation of the world around us either directly or indirectly create a ripple of effects that can be seen, felt, or lived through our day-to-day lives?

In the first section, we explored some of the unique ways in which the external environment, mainly via the Earth, can influence our well-being. Whether it be our mental or physical health, the first portion of this project laid out a handful of puzzle pieces in attempts to fit into the entire picture as a whole. Within the second section we transitioned from the external, earthly energies to the ingested energies, incorporating a few more puzzle pieces. While exploring the mechanism and connection via the tiny microbes and our brain or body as a whole, we examined a few of the most common ingested influences that have the ability to impact the diversity of our microbiome. We also largely touched on stress, which ultimately is not something we ingest, but it was a tangent that displayed how influential our internal status is on all parts of us. Through the ending of stress, it began to weave in slight hints about this section, which will further explore the impact that our internal state has on our health and well-being.

Furthermore, we will also explore some of the ways in which our responses to previous encounters have the ability to shape our present reality and leave a lasting impression on the way we interpret and interact with the world around us. This section is primarily focused on understanding how the things around us can

affect our own health based upon the way our internal systems have been shaped throughout time. So, diving deeper into topics that seem rather dispersed, such as connective tissue in our bodies, the heart, and even external EMFs, are certainly different from one another but display the body's ability to adapt and shape via the things around us. Instead of looking into the immunal triggers that can create persistent inflammation in the body, I examined certain processes to better understand how they may fit into this picture of wonder.

While many everyday experiences can trigger and elicit emotions such as stress or anxiety, understanding our body's responses to those factors is not solely based upon the brain's perception of them. As we saw through the gut-brain connection, the gut is what sends around 80 percent of messages to the brain, which in turn can shift our response to that encounter. The brain may be the captain, but it is not the only mastermind behind all of the moving parts that make up who we are as individuals. Most will commonly agree that information and memory are found within the brain; however, many may tilt their head and question if the second statement is true. Information and memory are also commonly found throughout the body. Unfortunately, if the term "muscle memory" arose within your mind, you would be a bit upset to hear that the muscle does not retain the memory; rather, it resides within specific regions of the brain. Nonetheless, at a first glance, thinking about information or memory being held within areas outside of the brain may sound out of the ordinary. That is, until we begin to think about the term "building your immune system." If the body has already encountered and overcome a certain illness or virus in the past, then those immune cells preserve the knowledge of what to do if they ever come across it again. Hence, this type of immunological information is not stored

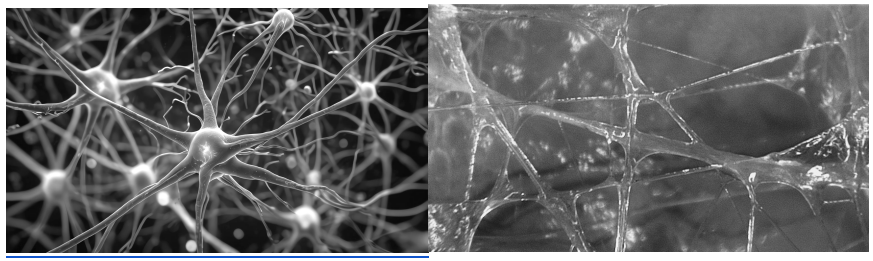
within the brain but held within various cells all throughout the body (Janeway et al., 2001).

Realizing that the body holds various types of intellectual responses, which each play an integral role in the function of the body as a whole is an eye-opening thing to learn. If we look a bit further into the way the brain houses memory, we can see that it is not fixed to one spot but is actually dispersed throughout the entire brain (Queensland Brain Institute, 2016). When we learn new information, synapses, or new neural connections, are formed, which are connecting points between neurons. The brain alone holds roughly 86 billion neurons and an astounding number of synapses that range anywhere from 100 trillion to 150 trillion (Herculano-Houzel, 2009; Tang et al., 2001). I understand that these numbers seem so large they almost hold no visual representation, so to further illustrate, I will use the example of people in daily life. Imagine you are at a live event that can hold around 75,000 people, and it is at full capacity. In comparison to such a huge number of people in the audience, there are only 43 people performing. Now fit all of that inside the human brain, and I am sure you can imagine how crowded and inextricably linked neurons and synapses are to one another. Using this perspective, there are roughly 1700 neural connections, or synapses, for every one neuron within the brain. Needless to say, these synaptic connections within the brain are very interconnected and close to one another, aiding in delivering much faster communication and memory recall. They create an intricate web-like structure within the brain. But how does all of this contribute to information held within the body?

Meet Fascia

Figure 12

Depiction of Neural Connection



Note. (A) Abstract colorful microscopic structure of cells [Photograph], by N. Uengbunchoo, n.d., *Vecteezy* (https://www.vecteezy.com/photo/46254678-abstract-colorful-microscopic-structure-of-cells-neurons-veins-splash-circulation-lines-microorganisms-micro-dimensions). Vecteezy Free License. (B) Extracellular matrix fibers [Photograph], by J. C. Guimberteau, n.d., *Endovivo* (https://vod.endovivo.com/en/photos/). Copyright by Endovivo.

As we begin to take a closer look at how messages are sent and received throughout the brain, we begin to see various communication similarities among the different functions of the body. The image on the left is a depiction of the neural connection within the brain, displaying the vast, interconnected, web-like formation. The image on the right, however, is an actual image of the fascial structure that is found throughout the entire human body. As you can likely perceive, they are quite reminiscent of one another and actually share some similar traits. Just as information is held and spread all throughout the brain, fascia is able to distribute information in a similar manner as well. Because both are intricate and complex compositions, they each have their own

unique mechanism for sending and receiving messages (Tozzi, 2014). They are not solely limited to communicating within their own individual networks, but they are able to spread and send their messages all throughout the body.

Fascia consists of connective tissue that encompasses and is spread throughout all parts of the body; it holds various functions. Just as a spider places every thread of silk onto its web independently, each separate placement adds and interweaves within the entirety of the structure as a whole. Through the complexity of such an intricate design, these single threads eventually come together and act as one. Similar to how each grain of sand, brick on a house, leaf of a tree, tree in a forest, and so on can be individualized, they all combine with such harmony to create one formation. In such a way as a spider's web, fascia and all of its connective tissue that entwine within the human body are quite similar. Because there has not been one concrete, agreed-upon definition that encompasses the true complexity of this system, one quote taken from a research study by Bordoni et al. captured what I think is a beautiful representation of this intricate network:

Our definition hypothesis is thus: The fascia is any tissue that contains features capable of responding to mechanical stimuli. The fascial continuum is the result of the evolution of the perfect synergy among different tissues, capable of supporting, dividing, penetrating, and connecting all the districts of the body, from the epidermis to the bone, involving all the functions and organic structures. The continuum constantly transmits and receives mechano-metabolic information that can influence the shape and function of the entire body… (Bordoni et al., 2018a)

Fascia is considered both a solid and a liquid-gel like substance; the solid state of fascial tissue is responsible for protecting and supporting every organ, muscle, and bone within the body (George & De Jesus, 2023; Slater et al., 2024). It consists primarily of collagen, which is the body's main ingredient in building connective tissue, muscles, tendons, and many other things. The solid structure of fascia also consists of elastin, which allows for elasticity within the body. These two major properties are produced by fibroblasts, which are the main cells found in the connective tissue. These fibroblasts are the primary "workers" of the fascia and ensure that everything is supporting and building smoothly (FibroBiologics, n.d.). Essentially, within the solid fascia, the workers, or fibroblasts, create elastin or collagen, which enables the building of connective tissue muscles, tendons, etc. By combining these two major components, collagen and elastin, this state of fascia is able to separate, connect, protect, and maintain the shape of many different parts of the body (Bordoni et al., 2018b).

Think of this fascia as the fibrous material that can be found within vibrant and acidic citrus fruits. These stringy yet connective parts within the inside of an orange slice are pertinent to maintaining the order and stability of the fruit itself; without this fibrous material, the inside of citrus fruits would lack structure (Films Media Group, 2017). Just like citrus fruits, other highly fibrous vegetables will begin to lose their form or sturdiness when they are cooked or heated. As they begin to warm up, the fibers of these vegetables will soften, in return leaving the vegetables in a much softer condition. Think of the fascia in our bodies in a similar way to these fibers; when they are well-hydrated, they are sturdy and maintain a very important role in protecting and supporting the surrounding muscles and organs. Without it, our structural state would not be well supported, nor would it hold form very well.

Similar to this depiction, the liquid- or gel-like composition of fascia refers to what is commonly called the ground substance or "sol." It resides within and between the solid fascial fibers and layers of muscle (Guimberteau et al., 2025). Its main and most crucial function in providing the body with movement is done through lubrication by allowing these layers to glide past one another without causing friction. Without this crucial mechanism, tissues would begin to stick to one another (Bordoni & Simonelli, 2018). This ground substance or liquid/gel-like substance is also responsible for the nutrient supply within the connective tissue. Because the solid state of fascia lacks a strong blood supply, this liquid/gel-like fascia acts as a medium to aid in delivering blood and oxygen to those areas (Bordoni et al., 2018b). It also helps to flush out and remove the unwanted matter, such as dead cells, a buildup of lactic acid that is produced from intense muscle activity, and even cytokines (the alarm bell messengers or immune cells). Think of it this way: Just as things get dirty from being used, such as your car, they need to release the “waste” some way or another, and if they do not, then they could cause a major blockage within the entire mechanism. The liquid/sol fascia allows for the disposal of not only waste and unwanted particles that are no longer benefiting the body to be disposed of properly, but it is also the main transporter in rejuvenating and delivering new, fresh nutrients to those areas.

The key molecule in this liquid-gel-like structure is hyaluronic acid, which is a sugar molecule that attracts water. This allows for it to change its form depending on the energy and movement at hand and ranges anywhere from a thick gel-like substance to a very thin liquid (Slater et al., 2024). To put this into a visual perspective, imagine how stiff your body feels when it is very cold outside as opposed to on a nice, warm summer day. Similar to how water begins to harden when it is cold, this gel-like substance has a comparable effect and will stiffen up due to the

process of vasoconstriction (Osmosis, 2025). As your blood vessels constrict in order to preserve core body heat, the flow of warm blood to the fascia is reduced and can cause it to transition from a more liquid state to a thicker gel-like state (Stecco et al., 2023). These two different categories of fascia, solid and liquid/gel-like, combine to beautifully help the body.

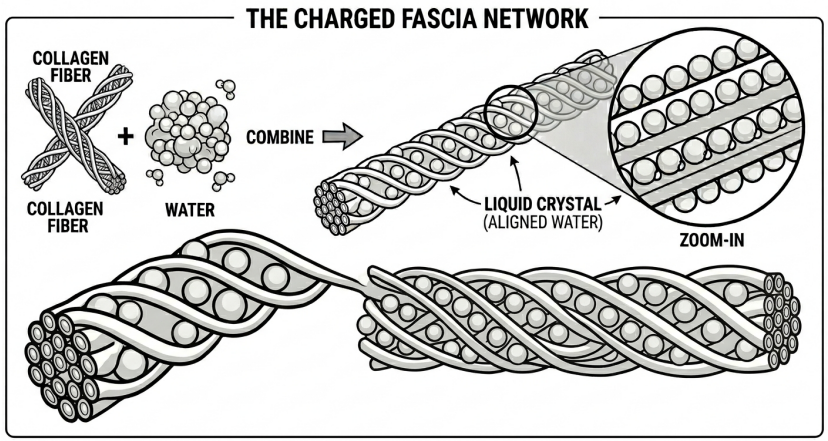
How does Fascia Work?

Together, both the solid and liquid/gel-like fascia unite to create a liquid crystalline structure. Meaning that when the collagen fibers from the solid structural state of the fascia and the water molecules from the liquid/gel-like state of the fascia intersect, they result in a highly organized formation that is not considered fully solid or liquid (Pollack, 2013; Bordoni & Zanier, 2015). These collagen fibers found within the fascia are arranged in such a precise manner, a repeating triple helix pattern, that they are symbolic of geometric patterns found in quartz crystals (Silva et al., 2001). Thus, the result of the precise collagen fibers in the solid fascia and the water molecules found in the liquid/gel-like substance of fascia is displayed as a liquid crystalline structure (Ho, 2012; Ho & Knight, 2012).

Because collagen is highly ordered and precise, the action of moving or stretching results in a small electrical charge, also called piezoelectricity. This occurs when water molecules stick to the collagen fibers, such a combination acts as a semiconductor within the body. Through the electrically charged collagen fibers, they attract the water molecules in the ground substance or liquid state, which ultimately lines these water molecules up in perfect rows along the collagen fibers. This bioelectrical charge that is produced from these highly ordered or crystalline structures is what turns movement into information (Oschman, 2012).

Figure 13

The Charged Fascia Network



Note: Depiction of the Piezoelectric Mechanism Within Fascia. Image generated using Google Gemini 3 Flash, 2026.

Although they do not contain neurons that can encode complex data, movement is a form of information, as it directs the fascial cells, telling them where to build, support, and grow. Recall back to the vast array of neurons and synapses that reside within the brain, whose primary mode of transportation is through the use of electrical and chemical signaling. Because of this, they are able to travel at very rapid speeds, with the fastest neuron signals traveling up to 268 miles per hour. In contrast to the communication signals of neurons, the fascial structure using this process operates through a different type of signaling. By involving the mechanical vibrations of sound, these messages from movement travel through the water and the connective tissue at approximately 3,300 miles per hour (Grogan, 2023). As this interconnected crystalline structure is found all throughout the body, the vibration is similar to that of a perfectly woven spider web when the smallest movement occurs on it. Because a spider is

on the web, it can feel the vibrations of anything that gets caught on it almost instantaneously without needing to be directly near that interference. The action of movement generated from stepping creates a mechanical vibration that is meant to ripple along the entire web of the connective tissue, meaning it should be instantly felt within areas of the body much further than the initiated movement. Think about the common arm injury, tennis elbow. Movement that began within the wrist or hand will manifest and appear as pain in the elbow, which, in hindsight, is not where it formerly began.

For quite some time, I have been using a pair of boots for work that provide very little arch support. I did not notice that this pain was caused by the improper shoe support for at least a few weeks and instead questioned why there was so much tightness in my calves, hips, and even back after a long day at work. Once I began to dig a little bit deeper, after thinking it may have been due to sleeping funny or possibly not stretching enough while still not seeing any relief, I then realized it stemmed from my shoe support. I was so curious about how a slight change of arch in my foot could result in calf tightness, hip pain, and even lower back pain that began working its way up to my neck. Upon discovering the intricate web of connective tissue within my body, everything began to make sense. One major line of connection within the fascial web is called the superficial back line. From the toes to the head, this line connects from the soles of the feet, calves, hamstrings, spine, neck, over the head, and to the eyebrows, aiding in posture, stability, and movement (Zahran, 2024). The repeated use of improper footwear over time began to send the message to my fascia to build/repair based on the signals and information it received. Because it is piezoelectric and collagen-based, each act of movement sent information throughout the web and told it where to repair and build. Through constant improper footwear, my fascia began to adapt accordingly, building and getting stronger

(tighter), based on my posture and daily movements. Over time this fascia built up and shaped around my foot balance and arch support, causing tightness in areas that were not moving due to the fixed arch position.

Similarly, the movement from my foot generated a mechanical vibration that was sent throughout the fascial web. However, with the improper arch support, certain muscles and areas of my body stopped engaging the way they were meant to. Through time, this lack of movement in areas causes the body to build around that lack of engagement, in turn hardening the liquid/gel-like fascia. When certain areas of the body's fascia have hardened up and become a thick, glue-like texture, losing their hydration and causing certain areas of the fascial structure to stick to one another, messages are not able to pass as effectively. Thus, this hardened state results in the lack of the small electrical charge, piezoelectricity, that is generated through movement, and since that part of the body is not properly engaging, it cannot pass on mechanical vibrations to other areas within the fascial web. All of these responses affect one another.

After the fascia has hardened in areas that do not get movement, it does not send messages to other parts of the body, and as a result, the brain loses signal from the mechanoreceptors in the fascia. These mechanoreceptors tell the brain that movement is occurring, and when the brain begins to lose touch with that region of the body, it chooses to make a decision to send out messages to tighten the muscles in connection with that area as a protective mechanism; this is known as protective guarding (Gromakovskis, 2025). As you can see, all of these individual responses overlap and begin to affect the other moving parts within the structural composition of the body. Even after changing the shoes I wore, it did not immediately resolve the buildup of tightness; it was a process. Just as it was a process for the tightness to slowly

enhance, to undo the false signaling that my foot arch sent all throughout my body, it took time.

Hopefully this depiction of how intricate and interconnected the fascial web has been able to display how such small, minute changes can appear in much greater ways. Through a small imbalance that was not even half of an inch large, it resulted in a domino effect, displaying issues that I would have never thought possible. When movement or piezoelectricity is not generated and sent throughout the fascial web, hardened fascia is like a traffic jam that prevents signals from flowing efficiently. Not only can hardened fascia within the body constrict muscle movement, trap nerves, and result in a lack of blood flow, but it may also store the responses from previous stressful encounters.

How Fascia & Stress Mix

When your body experiences a traumatic event or highly stressful encounter, it will induce a major stress response, which switches from the calm and regular processing mode of the parasympathetic nervous system to the sympathetic nervous system, governing the fight-or-flight response. As mentioned in earlier sections, stress and the sympathetic response will cause the body to shut down certain functions in preparation for an intense state of survival; in doing this, the body will also tense up, proceeding in a dehydrated, hardened state of the fascial structure. This results because of a defense mechanism in order to protect certain areas of the body; without the fluid movement of liquid/gel-like fascia, blood, oxygen, nutrients, and messages are not as readily available to the solid parts of connective tissue. With the fight-or-flight response, blood is redirected and prioritized to areas of the body that are deemed more important in a situation of survival.

Through both the lack of oxygen and blood passing through these areas as well as the hardened/dehydrated state of this liquid/gel-like substance, this can freeze certain parts of the body and prevent them from receiving messages. Especially if this response persists, these hardened states that were once temporary turn to a tacky, glue-like material that further disrupts the flow of nutrients and messages to be sent and received. Taking the visualization from the first section of my hypothetical stressors in modern daily life and discussing the impact of minute, small everyday stressors; once again, imagine that someone (me in this scenario) is experiencing mental stress or anxiety due to an argument with a loved one, running late, worrying about an upcoming meeting or presentation, all of the deadlines coming up, and so on. These mental stresses are perceived in certain areas of the brain as a threat and release stress responses, such as cortisol and adrenaline, into the body. Furthermore, if this individual is waking up and experiencing numerous or continuous stress response states daily, they can develop allostatic load (Rodriquez et al., 2019). This allostatic load, which is caused by a constant buildup of repeated stress, is beyond detrimental to the body and impacts the function of numerous vital systems, such as the nervous/endocrine system, the immune system, the metabolic system, and even the cardiovascular system (Guidi et al., 2021). Over time the dysregulation of excess hormones can contribute to lower cognition in brain function, cause immune issues, and damage the heart's health (Seeman et al., 1997). Due to the persistent stress responses, the body adapts and begins to function in an "on guard" or hypervigilant state. This hypervigilant state keeps the brain in preparation mode and is much more susceptible to triggering stress responses (Blumenfeld et al., 2021). These anxious reactions hinder the body by causing muscle tightness and contribute to a protective, hardened state of the fascial web. The resulting stress response affects the fascia in a number of ways.

Fibroblasts, which are the main cells found in the solid fascia and are responsible for building and maintaining the structure and stability of the body, move rather slowly. They are quite laid-back and complete their job when the body is in a resting state. Needless to say, these fibroblasts depend on special reinforcements when necessary, which are myofibroblasts. When there is an increased need for work at a faster rate and/or with more enhancement, in times such as injury, these specialized cells are essential (Schuster et al., 2023). In times of wound injury and tissue tears, these myofibroblasts are only meant to stay present until the job is finished. However, if we are constantly sending a stress response throughout our body, we already know the inflammatory impact that can occur. As we previously discovered in the last section, chronic stress is known to release certain cytokines. One cytokine that particularly impacts fascia is TGF-beta1, which is crucial for regulating cell growth, tissue repair, and the immune response and is very beneficial when it is truly needed. However, chronic stress can trigger this cytokine to be released as well. When it is released into the body, it can cause myofibroblasts to contract, independently of your muscles, which leads to the compression and tightness in the surrounding areas such as nerves and muscles (Nicola et al., 2021). Because this emotional response can tighten the fascia, prolonged periods of stress begin to harden and dehydrate this once-elastic tissue.

What is even more interesting is that fascia holds more sensory nerve endings than skin, with skin containing roughly 200 million nerve endings and the fascial structure containing around 250 million (Slater et al., 2024). After a prolonged period of stress, lack of hydration within the fascia, and constriction within the myofibroblasts, it creates a dangerous loop. As the tightness within the fascia triggers these nerve endings to emit signals of distress and pain, the brain then creates more concern and in turn leads to more of these cytokines being released. The inverse may also be

true; due to the prolonged and hardened state of fascia, these nerve endings may ultimately adapt and stop firing, which not only prevents messages from being sent but also can lead to cellular silence. Through time, the lack of mechanical vibration able to pass through cells and nerves from hardened states of fascia has also recently shown that they may actually forget their memory of how to execute healthy functions due to insufficient surrounding signaling (Song et al., 2024; Plaut, 2025; Blanc et al., 2025).

Depending on how our bodies and brains respond to previous stress responses, they can alter the sensitivity of cortisol released and the ability to tolerate stress. Based on a person's previous encounters with a deeply distressing or shocking experience, this can cause certain parts of the brain to change. Whether it is the overactivation of fear and anxiety, hyperarousal and constant states of survival mode even when safe, or cognitive alterations—all of these shifts in correlation to trauma impact each individual and manifest differently (Bremner, 2006; Substance Abuse and Mental Health Services Administration, 2014). Over time, as well as understanding the mechanisms behind the highly fascinating web of fascia within the human body, we can begin to see how some of our daily responses and habits can contribute to the hardened and rigid state that once was able to beautifully move in coherence with the entirety of the fascial web.

Closing Thoughts & Personal Speculations

Although this complex and intricate network of fibers is commonly overlooked, it is truly a highly intelligent mechanism, using piezoelectric signaling to relay information and supplying parts of the body with nutrients, elasticity, strength, and support; without this beautiful band of information working and effectively doing its job, many things begin to display a ripple effect of issues. Just like I did not notice that an imbalance in the arch of my foot

caused a chain reaction of unwanted problems. From the lack of movement preventing the piezoelectric signals from being received in other parts of the body to ultimately hardening and inhibiting the action of movement to generate an electrical charge. This lack of piezoelectric signaling can contribute to a hindered flow of blood supply, slowing healing, affecting bone health, and even impacting the body at a cellular level. Thinking about this in a broader perspective, imagine the body is not able to generate as much flow or current throughout itself, either from the effects that have piled up due to constant signaling of low chronic stress or from physical stress that has overloaded the body and begun to impede the true function of all systems. Without information or piezoelectric signaling being able to effectively communicate with all areas of the body, it poses the thought of how this may influence us more than we realize.

In all, I was intrigued by the process of this connective tissue for a multitude of reasons. One, due to my own lived experience, I am in my early twenties and feel immense stiffness or pain on a regular basis. Whether it is due to the cold environment in which I work, repetitive movement, how I sleep, or just the lack of full-body movement in general, I wanted to explore how this fascial web truly works and a few of the things that can influence its health. Learning that stress plays a large role in this system and even how the lack of movement from one small area of the body can impact the entire mechanism as a whole reflected a lot of insight into my daily life. At work I am commonly only using my dominant hand, and after months of continuously doing the same movements, the piezoelectric information is displayed to my connective tissue to mold and shape based upon that movement. Flash forward to months later; now, I feel constant pain or tightness in my back that almost feels like it is fused together in some areas. It then made me recollect on the innumerous occasions that individuals close to my age or even under 40 relay the constant

stiffness or pain their bodies are in. As if it has become normalized that we should be feeling this stiff and writing it off as “getting older"; personally, I do not think that should be the case. The lack of true full-body movement, sedentary lifestyles, accumulation of stress, and many other factors can all result in this hardened state of fascia. As we discussed, this prevents dead, yucky cells from being flushed out; it prevents new nutrients and water from revitalizing and hydrating those areas of the body; and over time, through the continuous actions in our daily lives, this begins to degrade the body's ability to truly heal and remove toxins/waste the way it is meant to. In this, I do not think it is so far stretched to correlate this to an increase of inflammation within the body, on top of the handful of things we have discussed that create oxidative stress. Just like a car that does not have a way to remove the waste, the hardened fascia within our bodies could make it much more difficult to remove the free radicals and toxins and ultimately cause the body, or "car," to break down or mess up more frequently.

As I sit here and edit the final touches before completing this project, I reflect upon the information I learned in a very interesting way. Similar yet different to the scenario from improper foot support, this highlights a different part of a common encounter of mine. Most people, regardless of whether you experience a menstrual cycle or not, are likely aware of the aches and cramping that this lovely visitation brings. Mostly stemming from the lower back, hips, legs, and abdomen, these feelings can vary drastically from person to person but overall bring discomfort and soreness. Again, this is only my speculation as I draw from my own personal experiences, but I believe fascia plays a huge role in this discomfort. Because the uterus becomes inflamed during a person's cycle, as it releases the lining and drops key hormones, pain is usually in the mix as well. As we have learned, the fascia aids in transporting the blood, oxygen, and nutrient supply as it removes cells and other things no longer benefiting the body. When certain

areas of the fascial system become constrained or tight, oxygen supply and the cleansing of new nutrients are not able to leave and enter. Such as areas in and around the uterus that are currently prioritizing the continuous flow of this process.

At times I feel my legs, lower back, and thighs almost going to swell with a similar feeling as if I had a brutal leg day at the gym. Furthermore, since I am a reluctant person to take medications, wanting to solve the problem by listening rather than shutting out, I have innately learned that when I stretch those specific areas, I experience immediate relief as if I had deflated a balloon. Certainly fascia is not the end all and be all, as there are many other biological processes that take place in the body during this time. However, this act of stretching allows the blood, oxygen, and nutrient supply to flow in a less constrained manner. It opens up certain areas of the body that have become rigid, stiff, and inflamed. As we stretch or exercise, endorphins are released within the body, which serve as the body’s own pain reliever. These endorphins also elicit a reduction in stress hormones, which further allows the body to relax, contributing to a more fluid and less rigid state within the fascial structure. This in connection with the increased blood circulation can help to revitalize all aspects of the body, not just in a menstrual cycle scenario (Saleh et al., 2016).

Now, what I am not saying is that all menstrual pain is caused by fascia; that is absolutely not the case, and there are many other biological processes that take place in the body during this time. No single solution is ever the be-all and end-all, as that is the whole reasoning behind this project. However, this act of stretching allows the blood, oxygen, and nutrient supply to flow much easier rather than pushing through inflamed cells. As we can apply to all areas of our body regardless of whether we experience these menstrual gifts or not, there is no denying that movement from stretching or fully engaging the body allows for vital cells within the fascial network to transport more easily.

Chapter 12

Heart Madness

Heart-Brain Axis, Heart Fields & Heart Rate Variability

As I discussed in the very beginning, every electron creates an electromagnetic field due to the constant movement and charge that it contains. Because of this, humans generate something called a biofield. We run on electricity, from movement turned into piezoelectric signaling throughout our fascial structure to the nerves, cells, heart, brain, and many more areas of the body; they all generate electricity through the use of charged particles. Looking at how doctors use all types of various machines to measure the health of that certain body part or organ, each machine targets a different area or mechanism and often aims to measure the amount of electricity in that specific part of the body (Institute for Quality and Efficiency in Health Care, 2023). We can think of this again in terms of how each grain of sand, brick on a house, leaf of a tree, tree in a forest, and so on can be individualized but ultimately can also combine to create one. How each cell, organ, system, and part can be viewed as separate but unite to form the body as a whole. Each carries with them their own biofield. As you can imagine, a single cell generates a much smaller field, but when combined with billions to form the heart, the resulting effect is quite vigorous.

In music, there is something called sympathetic resonance, in which one vibrating object causes another with the same frequency potential that is nearby to vibrate as well. For instance, if you have two tuning forks or tuned guitars and play one of them, the other that is nearby will vibrate at the same time (McPeck, 2014). The same is true for biophysics but is given a different name: entrainment. In the heart, there is a small group of highly specialized cells that form the sinoatrial node (SA node). They generate electrical impulses that force all cells nearby to fire in sync with them; the SA node is responsible for the heart's rhythm and resembles the beginning of a large ripple (Basit et al., 2022). Because the nearby cells begin to fire in the same rhythm with them, their individualized fields synchronize and begin to resonate at one standard frequency, or beat per minute (Klabunde, 2023).

Since the heart's magnetic field is up to 5,000 times stronger than the brain's, and its electrical field is 60 to 100 times stronger, it can be detected several feet away from the body using specialized machines (Koch, 2001; McCraty, 2016). Thus, its strength and intensity can *entrain* other organs to resonate in congruence. So, when the heart is in a calm state of relaxation, it can cause the brain to ripple in effect with it as well and synchronize with that rhythm. This form of heart-brain coherence is more expected to occur when someone is in a much slower and calmer state rather than an anxious, fast-paced state. As a result, it is likely due to the amount of time it takes for steady rhythms to make their way to other parts of the body; if someone is in a much more alert and anxiety-induced state, their waves are going a lot faster, causing physical and neural constraints on the body and ultimately preventing the perfect alignment of this synchronized rhythm from taking place. The amount of information the brain is processing and receiving can also affect this coherence; someone preoccupied with stress or constant busyness has a harder time experiencing this calm, heart-brain-coherent state of being.

Heart rate variability is an important player in displaying if someone has better heart-brain coherence as well as communication between these two vital organs. When measuring the heart rate variability in an individual, scientists or doctors are focusing on the variation in time between each heartbeat. The importance of this is that it displays the variation in the fight-or-flight response with the rest-and-digest response, or the parasympathetic nervous response and the sympathetic nervous response (Shaffer & Ginsberg, 2017). Because these two branches of the nervous system are constantly relaying information to the heart and the brain, this form of measurement can indicate the overall health of the body. It shows the body's ability to adapt and respond effectively to certain situations and surroundings. Think of it this way: if you are in a much more stressed response state and/or in a heightened state of alertness, your heart rate is likely beating faster. In which case, this does not allow for much variation or time between each beat and, in return, can signal that it is facing difficulty adapting to or mediating the different physiological and physical challenges within its systems. On the contrary, someone who is not as easily anxious or distressed due to physical and physiological situations may have a slower response state within their heart, which allows them to experience much more variability between the different heartbeats and indicates that their body is more well equipped to adapt and handle changing situations.

As touched upon previously, the current modern-day lifestyle of many individuals revolves around constant preoccupation with some form of physical or psychological response within their lives. This means they are likely worried or experiencing a heightened response due to an occurrence within their mental state and/or their physical state, and when this occurs, it keeps the brain operating separately and more focused on the "noise," inhibiting it from being entrained by the heart's rhythm.

Jumping back to the importance of slowing down to give ourselves a calm break within the fast pace and busyness of our daily lives, this not only allows the brain to calm down and connect with all rhythms of the body but also can help the brain in adapting to challenging situations.

In the last section, I spoke about something called the gut-brain axis, which involved numerous modes of communication that helped the gut and the brain communicate with one another. Similarly, the heart and the brain share their own unique forms of interacting via the heart-brain axis. By using various different modes of communication, they are able to influence one another. The four major pathways they communicate through are neural, biochemical, biophysical, and immunal (Fahim et al., 2025). Just as the neural pathway within the gut-brain axis primarily uses the vagus nerve, so does the heart-brain axis (Fang & Zhang, 2024). As we touched upon in the last section, the vagus nerve is connected to and runs through a plethora of different vital organs and systems to ensure that this bidirectional communication highway maintains homeostasis within the body. Such involuntary movements, like heart rate, breathing, and immune response, are controlled via this pathway. By sending signals from the brain to the heart's SA node, it is able to modulate and slow down the heart's rhythm as well as speed it up. As you can likely suggest, the state of the brain is quite pertinent to the rhythm of the heart; someone in a state of sympathetic hypervigilance, either from chronic mild stress or previous trauma, is constantly sending haywire signals to the SA node and affecting the heart rate variability.

If someone is experiencing a great enough disruption in their physiological state of mind, it can truly damage their heart's function. For example, through the use of biochemical pathways such as hormones and neurotransmitters, severe emotional or physical stress can result in something that mimics a heart attack

(Virani et al., 2007). Broken heart syndrome, or Takotsubo cardiomyopathy, is a genuine and temporary heart condition that is caused by the massive surge of stress hormones overwhelming the heart and ultimately resulting in temporary dysfunction (Jeon et al., 2018). This overload of stress hormones signaled from the brain causes the heart to actually weaken and leads to ballooning of the left ventricle. Essentially, due to the brain's perception and response state to a stress-induced event, it can cause genuine damage to the heart.

Another interesting way that the vagus nerve can be affected is through the fascial web and piezoelectric signaling. Because the fascial web runs throughout the entire body, the vagus nerve is known to travel through the fascial layers as well (Slater et al., 2024). If the fascial layers are hardened due to various responses previously touched upon, the fascia can physically hinder the vagus nerve from signaling to the brain and body. This can effectively impact the stress response and inhibit the vagus nerve from communicating the calm, rest, and digest response with the body (Davis et al., 2024). If this reaction does not get resolved, the brain's and body's main communication responses are hindered, and they begin to work separately from one another. With the heart functioning at its own pace and not being able to entrain the brain, and the brain running at its own pace and not being able to hear or send certain messages to various parts of the body. This lack of coherence between the brain and heart can be detrimental to the health and longevity of an individual. Not to mention that if the vagus nerve communication is disrupted by constant stress, trauma, toxins, poor diet, hardened fascia, or so many other factors, the response in calming down the body is hindered and can add even more damage to it.

Now, if we dive a little bit deeper into the impending effects of stress or high-anxiety situations, we can see how all of these responses do not just impact the physical and physiological

health of the body but can also impact interactions in our daily lives. Thinking back to sympathetic resonance in music, since our heart's electromagnetic field can be detected several feet from the body, when we are around other people, they have the capability to sense our field as well. And, if their heart's field is vibrating at a similar frequency potential, they can reflect synchrony with one another. Yes, this sounds insane, but it is something that has been studied and is proven to be measurable across countless studies during nearly three decades. It has even been coined as "interbrain synchrony" or "neural coupling" (Azhari et al., 2025).

For instance, have you ever been around someone and, upon being within their presence, felt so calm and at peace? Or the opposite: maybe you were perfectly fine until you got close to someone and began to feel either overwhelmed or slightly anxious, even if nothing in your surroundings indicated a high-anxiety situation. This may have been partially due to the intense ripple of their electromagnetic field intersecting with yours. With chaotic heart waves as well as chaotic brain waves, their biofield is not as coherent and likely reflects their internal state of mind and/or current state of being. Interestingly, this has been a topic of discussion for quite some time. In 1998, researchers conducted multiple experiments to identify the effect that an exchange of heart fields had when people touched or were in close proximity to one another. Among other studies, these researchers have come to understand that not only does the person's inner emotional state have a direct effect on the coherence of their electromagnetic field (EMF), but they have also found that emotions like love, appreciation, care, and other feelings of sincerity produce increased heart coherence within their fields (McCraty et al., 2018). Because those findings had already been discovered in other studies, they aimed to explore how touch and proximity affected the coherence of human heart fields. Over the course of several years and with the help of many different individuals, this small

sampling of results gathered its data in a few different ways. By first having the participants sit in either a comfortable position or lie down and then using an electrocardiogram (ECG) machine to measure their heart's electrical activity as well as an electroencephalogram (EEG) to measure their brain's electrical activity. In total, there were 6 different variations and tests conducted to measure the strength and connection between the heart fields of another individual. In one of the experiments, they first placed the electrodes on each participant and then monitored their activity, insisting that they not abruptly move or communicate but only follow the instructions for holding hands. During a 10-minute period, the first 5 minutes of the experiments were spent recording a baseline of their electrical activity without interacting with the other participants. After the 5-minute period, they then moved within proximity of each other and were instructed to hold hands for the remainder of the time without communicating or attentively seeking to alter their electrical activity. Other experiments followed the same timeline as the baseline period and tested the effectiveness of their hypotheses. Throughout all of their experiments, they displayed clear detectability of the ECG signal on the other's EEG signal depending on the proximity and physical touch they displayed. Meaning, the heart waves of one individual have a lasting and detectable impact on the brainwaves of another person nearby, displaying that they are most prominent when the individuals are touching or positioned within 18 inches of each other (Tiwari et al., 2021).

Even more recently, a systematic review of interbrain synchrony was published in 2025, which aimed at exploring interbrain synchronization between individuals as well as how psychological states influence this coherence. In exploring 30 studies consisting of thousands of participants, the data indicated repeatable patterns of interbrain synchrony, but intriguingly, it also showed that different regions of the brain were active. This is very

important because it can further reflect someone's psychological or internal state of being and was discussed to be a potential consideration for mental health biomarkers. For example, certain areas of the brain pertaining to memory, cognition, reflective thinking, and even threat or fear showed greater areas of activity depending on the individual's psychological response (Azhari et al., 2025).

If our brain activity is able to have a measurable and observable effect on the people we are surrounded by, just think about how many instances in our daily lives can be impacted by this. Essentially, the measure of your internal state and the health of your anatomy as a whole can be gauged through your heartbeat. As it indicates, if you are in a state of overall balance or imbalance, you are interestingly able to be interpreted by those you come in close contact with, even if you are not consciously aware of it.

Furthermore, think back to the countless factors that we have explored within this reading, and it is no wonder that if someone is experiencing a few of these imbalances, it could result in lower heart rate variability and, in turn, affect their heart's electrical activity (Tiwari et al., 2021).

In learning more about the importance behind the variation of our heartbeat, I stumbled across a chart within a study displaying different factors that heavily influence it. Physiological, pathological, environmental, lifestyle, and psychological were the main five explored and discussed.

The major variables within the physiological category included the influence of age, the circadian rhythm, physical activity, and the vagus nerve. More importantly, if you remember the cholinergic anti-inflammatory response discussed in the last section, it heavily relies on the vagus nerve. With these findings further displaying that a lack of these cholinergic reflexes results in a longer duration of pro-inflammatory cytokines and ultimately reduces heart rate variability (HRV).

In this study, the main factors within the pathological category further involve inflammatory and infectious conditions. As well as a prolonged increase in heart rate, which can impact the blood vessel's elasticity and/or decrease the heart's contractibility. Just as prolonged stress can cause fascia to harden, it may be linked to issues within this pathological category, over time causing strain on the heart and inhibiting its true health potential.

As you can likely guess, alcohol consumption, smoking, what kind of food you consume, and poor sleep all impact the body's heart rate variability.

And lastly, to hammer in the word "stress" even more… psychological factors play a huge role as well; mental stress, depressive disorders, and anxiety disorders all, yes, affect and lower heart rate variability but have also been shown to influence the anatomy of the heart and the endocrine, neurological, and even muscular systems through their lack of betterment and recovery.

Essentially every small choice or action can contribute to the heart's adaptability, further showing how well the body is at handling all of the repercussions from those accumulated choices. With the strength and influence the heart's rhythm has, displaying

the health of all systems within the body in congruence with the brain's control from its perception to mediate and adapt to physical and psychological circumstances, their entwinement is more deeply influential and impactful on our lives than many realize. Through our very own perception of how we encounter and view the external world, our physiological or mental state interprets that perspective and relays it involuntarily to the heart. As the heart is the strongest, most vigorous, certain pacemaker cells take the information from the brain and put it on the *loudspeaker,* which ripples out further. In this we are able to be affected and affect others depending on our psychological state. With this constant echo of heart rate variability, it can be thought of as reflecting our entire state of being, not just our mental state but ultimately how well our body is adapting and shaping to the world around us. How well it is functioning in terms of health, stress, immune responses, sleep, physical activity, and the daily choices that directly either help or hinder our variability. In essence this "ripple" of our brain's interpretation can largely affect our hearts and, in turn, our entire well-being.

By bringing together the impact that not only fascia has on the body but also the tenacity of the heart's electromagnetic field, I yearn for all to learn more about the internal influence our bodies have on our everyday and overall health and lives. In combining the internal influence of the biofield or human electromagnetic field with the external, constant contact of man-made EMFs, we will now dive into the effect these may have on us when they are thrown into the mix.

Chapter 13

Internal Influence of EMF's

Due to the intense strength of the human heart field, as it has been measured with machines such as magnetometers, it is not as easily affected by external stimuli. However, unlike the heart, the brain is very, very vulnerable to frequencies, as we have seen. Even if someone is in close proximity to another person, not talking or touching, their brain waves begin to reflect the other person's heart waves. This further displays how intricately susceptible the brain is to electromagnetic fields, especially due to the fact that they can directly affect the variation of the heart. Better yet, now surrounding us in all directions, there is an inconsiderable amount of EMF radiation emitted into the air, which can offset the natural body's electromagnetic vibrations, further inhibiting the perfect coherence within the entire body from taking place. From cell towers, phones, televisions, Wi-Fi routers, radios, wireless devices, microwaves, power lines, smartwatches, and even the electrical wiring behind your walls, the list is endless and seemingly inescapable within our modern lifestyles.

Hence, I was interested in understanding how the little accumulations from surrounding ourselves with numerous wireless devices and other sources of man-made electromagnetic fields impact our brain activity. However, many of the studies only aimed at understanding the possible effects of electromagnetic radiation from mobile phones, and although there have been

countless studies with a wide variety of conclusions, it is clear that some alterations occur from man-made EMF exposure (Kivrak et al., 2017). Although I began this exploration with brain activity in mind, like many things in life, the road led me on a different route. When diving into my research about the possible implications of man-made electromagnetic fields, I discovered a few things that may seem subtle within the grand scheme of things. Yet throughout my discussion, as you are likely aware, my aim was to bring these so-called *subtle* influences to life by truly understanding them on a larger scale.

Looking back on the discussion and importance of the different frequency bands within brain activity, we discussed beta and alpha. To recap some of the previously mentioned information, beta waves range from 12 to 35 Hz and are likely present when we are in states of alertness, high focus, problem-solving, anxiety, and other states of attentive mental activity. Alpha waves commonly range from 8 to 12 Hz and are present when the brain is in a state of relaxed alertness, such as calm relaxation, moments of quiet downtime, and other states when the brain is quiet and not intensely focused on something (Abhang, 2016). In the first section, I also used the analogy of our brain activity throughout our day being compared to a person who has not stopped once on a road trip with the displayed importance of a "stoplight" moment after driving for hours on end without a quick break. It posed the thought of allowing the driver to break up the intensely focused flow and give their brain a moment of rest. Because our days are filled with the constant influx of mental activity and stimulation, we spend most of our time operating in the beta brain state. When we have moments to stop, close our eyes, and experience some quiet downtime, it not only gives the brain a microbreak, but it also aids in replenishing our brain's endurance, processing information, and even lowering stress hormones (Immordino-Yang et al., 2012). These moments of entering the alpha state during the day may

seem like small moments, but they are more powerful than we realize.

What is interesting is that, although many of the studies on environmental/man-made EMFs luckily do not show drastic effects on brain activity, many of them do reflect the changes that these EMFs have on the alpha band. For instance, they reflect the disturbance of the alpha band, which can inhibit full relaxation and higher states of arousal, even when closing your eyes and aiming to slow down (Ghosn et al., 2015; van der Meer et al., 2023). Because many of these studies are solely focused on how mobile phones and wireless telecommunication systems affect our brain activity, it was much harder to understand the possible impacts of brain activity that stemmed from other types of frequency bands such as extremely low frequencies. For example, the frequencies of the brain range from 0.5 Hz (occurring during sleep) to 40 Hz (found during intense focus or learning), whereas the common range of Bluetooth is around 2.4 GHz, which is 2,400,000,000 Hz. Such high ranges reflect little to no constant effect on brain activity, and it has been implied that these high frequencies are actually absorbed by the skin; thus, this can explain the lack of constant changes within the brain's activity (Gallucci et al., 2025). Later on, this is something we will explore further. Again, given that many of the studies do indicate slight differences in the alpha band, especially within a specific stage of the sleep cycle, I was intent on looking into how much lower frequency ranges may interact with us.

Interestingly, in doing this, I discovered that a large portion of the studies' findings indicate a mixed bag of either good or bad effects. From results exclaiming that exposure to extremely low frequencies less than 300 Hz is able to influence gene expression and other cellular processes, as well as its recognition as being a hopeful medical tool due to its slowing effects on cancer cells, many positive conclusions have been drawn throughout the various

studies (Cios et al., 2024). Studies concluding quite the opposite, which suggest that they may induce constant changes in the brain's ability to shape, mold, or form based on our environment and the things around us (Sakhaie et al., 2017). Above all, each study suggests a slightly different finding, which has made it difficult to truly understand the impact that these very low frequencies have on the human anatomy. Even the smallest changes in experimental methods can affect certain cells one way, but a slightly different frequency may impact completely different ones. Overall, I have found one theory that has been understood and hypothesized amongst the countless studies. Which is that exposure to these man-made electromagnetic frequencies acts as a mild biological stressor on the body (Panagopoulos, 2022, pp. 99–136).

Reactive Oxygen Species

Regardless of whether they are extremely low frequencies, such as power lines, wiring behind and within homes, and even common appliances, or extremely high frequencies, such as mobile phones, Bluetooth, Wi-Fi, etc., they all have been known to induce fluctuations within human cells (Thoradit et al., 2024). In other words, they are able to trigger something called "reactive oxygen species" (ROS) and induce a cellular stress response, "oxidative stress" (Cios et al., 2024; Wang & Zhang, 2017). Taken from a 2024 research study by Thoradit et al., which examined the body's immunological response to man-made EMFs, the researchers stated that

> Recently, there has been a breakthrough in our understanding of the fundamental mechanisms by which human cells respond to EMFs. In particular, many labs have now shown that EMFs induce a rapid increase in cell-free radicals and reactive oxygen species (ROS) and

> thereby enhance cellular oxidative stress. This has been demonstrated in human cell cultures as a response to low-frequency ELF-MF...as well as to high-frequency RF exposure in the MHz and GHz range…(Thoradit et al., 2024).

They then went on to express that rapid increase of ROS occurs rather quickly and is not directly harmful to human health due to the safety guidelines. Now, what I was interested in was how this occurs and, further, how it can affect each individual in such varying ways.

ROS are unstable and easily reactive oxygen molecules, and most are commonly called… you guessed it, free radicals (Panagopoulos et al., 2025). ROS can also include non-radical species that are more stable than free radicals but are easily able to initiate reactions that generate free radicals (Martemucci et al., 2022). Just as most things can be considered safe in small amounts, ROS signaling is a process that healthy cells produce in order to regulate physiological processes, such as increasing antioxidant defenses, aiding in cell growth, regulating nerve functions, and controlling immune responses (Tavassolifar et al., 2020; Shields et al., 2021).

However, the issues arise when there is an overwhelming amount of ROS signaling, which can lead to an imbalanced redox reaction. A healthy redox reaction is when the body is able to maintain a state of equilibrium by controlling the ratio between antioxidants (those with extra electrons) and oxidants (those that steal electrons, the wild dogs) (Di Meo et al., 2022). When an imbalance occurs, it can result in oxidative stress, damaging cellular makeup such as DNA, and be able to trigger inflammation. Within this chain reaction of effects, it creates stress within the cells, leading to this mild biological stressor (Berg et al., 2004).

Understanding this makes more sense as to why some researchers show a positive correlation while others indicate a negative correlation; depending on the body's cellular defense mechanisms, this exposure can either aid in cellular strength or overwhelm and destroy it. Because this exposure is mild, it is not able to truly kill the cell, yet it can "teach" it to build up certain antioxidant defenses and is likely why some results have shown that the use of low-level EMFs poses a promising medical tool. However, if the body is already continuously overloaded with oxidative stress and free radical damage, indicating that it is not effectively fixing the imbalance of unpaired electrons, seemingly small and insignificant exposure to these very low frequencies can result in even more overload on the body's ability to obtain balance (Panagopoulos et al., 2025; Barati et al., 2021).

Researchers tested this theory by adding another stressor in the mix alongside extremely low-frequency electromagnetic fields (ELF-EMFs). They were curious about seeing the vulnerability and adaptation process that these cells went through when they were faced with multiple stressors at once. In this study there was a control group that only encountered the stress from the extremely low-frequency electromagnetic fields, whereas the other group experienced the second stressor as well as these frequencies. Comparing the results to the control group, vast differences were present.

By using a frequency response of 50 Hz (think household appliances such as refrigerators, chargers, air conditioners, the power coming from outlets, and so on), they found that when these cells had already experienced oxidative stress from another source, they had a much harder time maintaining homeostasis. In essence, the cells were working harder to find balance within one stressor, and because their defenses were heightened, encountering another stressor caused the antioxidant response to struggle (Reale et al.,

2014). What the results from this study proved was a closer look into how hard the systems were working to maintain this balance.

If we begin to put some of these separate pieces together, it may help to paint a better picture of the potential effects that occur within the entirety of our bodies from constant EMF exposure. Firstly, we must remember that ROS signaling via EMFs has continuously been studied to display initial elevations, but after a continued amount of time, a majority of these studies indicate adaptations and do not further increase ROS signaling. Meaning that after a prolonged period of exposure, the body shows that it is quite adaptable, and if it is capable, it will "overcome" this conflict. It is not always the case, but it is likely and is a possible reason these impacts do not pose a large risk within the safety guidelines. That being said, adaptation does not mean that the impact is no longer an issue; it just means that the body has begun to work harder to neutralize this constant interference/threat within the stability of the body's systems (Reale et al., 2014). Because there is a greater energy focus on upregulating antioxidants/neutralizing the response from this increased ROS signaling, it appears that after time, when the body has begun to overcome this spike, there is no longer a visible impact on the body. However, this does not mean that the body is exempt from experiencing effects from elevated ROS signaling levels, especially if they are already combating an ongoing chain reaction of oxidative stress.

Now, taking this puzzle piece and adding the plethora of different effects from daily factors discussed throughout the entire duration of this reading, most individuals in daily life are juggling the implications from numerous combined stressors. I barely touched on the insanity of how such little things we encounter can accumulate within our bodies and build to result in such a huge ripple of side effects. From internal stress, lack of quality sleep, microplastics housed all throughout the human body, any one of

the ten thousand food additives in the food we consume, inhaling harmful VOCs from hundreds of things we encounter each day, hardened fascia, constant EMF exposure, and, overall, just an innumerable amount of other factors, the body is, without a doubt, upregulating and continuously neutralizing effects from multiple stressors every second of the day. There is no question in my mind that our bodies have certainly gotten stronger and built resistance/immunity to these daily encounters, but there is also no question in my mind that a majority of individuals experience some resulting effect from these stressors. Even in the most subtle ways, the impacts are present.

How Do These Frequencies Cause Reactive Oxygen Species?

This interaction between the body and these extremely low frequencies occurs through a very interesting process that we have previously discussed. In cell membranes that have the potential to generate electrical impulses, there are things called voltage-gated ion channels (Pall, 2022). Maybe this is coming back to you. From the very beginning, when we discussed magnetic minerals and how electrically charged particles we encounter throughout our day can interact with these voltage-gated ion channels through our skin. These gates allow the movement of electrolyte minerals needed for cells to pass along the cell layers. They control the flow of how much can enter and leave at any given time to maintain a healthy balance within the body. These voltage-gated ion channels (VGCCs) help to regulate electrical signaling in neurons, muscle cells, and hormone secretion for hormone regulation, and among many other functions, they also affect neurotransmitters.

What we also discussed were the harmful things we encounter daily that produce free radicals within the body, such as VOCs in common household items or emissions from pollution.

On the other hand, I had introduced the benefits and importance of certain elements from Earth and how they contain extra electrons or negative air ions that help to combat that imbalance. Both categories I spoke on are electrically charged particles that we discovered can “access the keycard” to these voltage-gated channels and affect the balance within cells.

However, since these voltage-gated channels are very sensitive to electrical forces, this means that even extremely weak frequencies caused by man-made EMFs can produce significant and measurable effects within cells (Thoradit et al., 2024). These electrical impulses from environmental electrical fields trigger these voltage-gated sensors to oscillate irregularly. By causing disruption within the ion movement, these EMFs have also been studied to deteriorate these voltage-gated ion channels (Georgiou & Margaritis, 2021). Through the irregular oscillations of these ions, it exerts pressure or force on the gated channels, which results in their dysregulation and improper function of opening and closing. After a time of constant interference within the voltage sensor, as if someone had hijacked its control tower, it allows ions to enter into the perfect electrochemical balance of the cells.

Honorable Mention—Effects on the Fascial Web

In comparison to other systems and mechanisms within the body, the nervous system has been considered more vulnerable to these EMFs than other systems due to its heavy reliance on electrical signaling. If you also recall me mentioning that the skin has been shown to absorb these much higher electromagnetic waves or radiofrequency electromagnetic fields (RF-EMFs), such as those in congruence with 5G communications, as well as taking into account that both the skin and fascial web are filled with millions and millions of sensory nerve endings crucial to the nervous system, it is no wonder that the nervous system is

especially vulnerable to these man-made EMFs (Gallucci et al., 2025; Schuermann & Mevissen, 2021).

Because man-made frequencies that are first encountered via the skin of the body are closely associated with the piezoelectric fascial network, whose entire premise is composed of electrical charges through movement. Bringing this full circle, the same EMFs that impact the flow of electrical charges by triggering a mild biological stressor on the body are likely first met with this fascial web (Soda et al., 2008). Just as we discussed the potential for certain frequencies to be used as an aid in the medical field due to their positive effects, multiple studies have displayed similar results in the realm of fascia. As it has been shown to promote collagen growth, enhance building, and stimulate wound-healing responses, these processes can be very beneficial when aiming to generate these results. However, most of the results from these studies use pulsed EMFs instead of a continuous frequency; by using pulsed/interval amounts of frequencies, the cells are not able to adapt as easily to these incoming vibrations, and the results are more powerful (Costantini et al., 2019).

Now, focusing on the effects that continuous wave frequencies such as alternating currents (AC) or other extremely low frequencies have, the inverse is apparent. Within the span of ten days, researchers used a frequency band of 60 Hz on collagen to further investigate the changes endured in its expression. What they discovered was that not only did it decrease cell growth, reduce collagen production, and increase specific cytokine expressions, but it also enhanced a specific enzyme that degrades collagen (Wang et al., 2013). Meaning that while pulse EMFs are known for upregulating and enhancing growth, this constant frequency displayed suppression of collagen production *and* further amplified a specific enzyme (MMP-2) that is known to break down tissues and other extracellular proteins that provide structural support and guide cell functions such as growth and

movement (Wolosowicz et al., 2024; Frantz et al., 2010). The effects of this may manifest in the form of premature aging, a display of loose skin in specific areas of the body that have lost their tensegrity or tightness, and the activation of multiple inflammatory stress response signaling pathways that these EMFs stimulate. This domino effect could cause the fascia to experience chronic low-grade inflammation, which ultimately would appear as widespread body pain such as stiffness, aching, or soreness throughout the body (Wang et al., 2013).

Closing Thoughts

The effects of man-made EMFs on the fascial web are not something that are as largely explored as the implications of phones and our brains. However, given that these electrical frequencies are practically all-encompassing within our current lifestyles, they do have a great potential to influence our health in ways we likely are not even aware of. Learning about the effects that can occur from the voltage-gated ion channels and EMFs broadened my curiosity as I turned the puzzle piece upside down and examined it in a way that may make sense to the entire puzzle. Stiffness, pain, body aches, and weaker joints are things we hear of on a daily basis, either from those close to us, ourselves, or those online. It is almost normal in our current lifestyles to accept these sensations and essentially deal with them without any guaranteed resolution for our future. Because of how normal it has become; it is much harder to pinpoint the root cause of how it manifests itself in the body. At its root, stiffness is commonly a sign of inflammation within the body, which then allows us to dig deeper into what in our life specifically causes inflammation. As this work has explored, so many things have the ability to create an imbalance within our livelihood and cause a ricochet of issues.

One sole perpetrator can never be fully to blame given the extensive things we encounter on a regular basis. From food, sleep, breathing in harmful compounds, our sedentary lifestyle, the habitual way we complete tasks, EMFs, and, not to mention, the internal stress we combat daily within our minds, I barely grazed the surface.

However, given all of the things around us that have the ability to influence our health and well-being, there is no question in my mind that our bodies have certainly gotten stronger and built resistance/immunity to these daily encounters. That being said, there is also no question in my mind that a majority of individuals experience some resulting effect from these stressors. Even in the most subtle ways, the impacts are present. There are infinite possibilities as to why the body may be reflecting symptoms of slight imbalances within its structural composition, and many are commonly overlooked and/or seen as "normal." Imbalances within the body that display signals of heightened stress responses should not be considered normal; it should not be normal for everyone you talk to in daily life to experience some amount of stress, either physically or psychologically. It is almost impossible to solely understand how one of the possible factors is affecting our health and mental state when it is constantly encompassed in a combination of them every second of every day. Although things like heart rate variability and other clinical biomarkers display the body's ability to mediate these potential stressors, the cells within your own unique anatomy are the only ones that truly understand the complexity of maintaining this equilibrium.

Throughout this reading, I have touched on several factors, both internal and external, that are able to influence that beautiful balance in hopes of shedding light on possible encounters throughout our days. From the influence of fascia to the vigor of the heart to the impacts of electromagnetic frequencies, let this

reading bring a new perspective on the little cells within your body working together to produce a harmonious balance of health.

Conclusion

Main Purpose/Goal

As we now wrap up and integrate all of the different ways and forms in which some of these discrete energies can influence our overall well-being, my hope is to have provided you, the reader, with a better understanding as to how some of these different forms, shapes, and manifestations of energy interact and affect one another. Using, yet again, the beautiful display of how each grain of sand, brick on a house, leaf on a tree, tree in a forest, and so on can stand on their own yet can also stand together as a whole, this reading has hopefully provided a broader perspective as to how intricate each layer within and around our own bodies is as well as the profound impacts that they have on us. Energy is not just a scientific thing that correlates to atomic structure, the movement that occurs from the realm of electricity or, better yet, the "energy" or calories that each bite of food contains; it encompasses everything around us. Yes, using the basic building blocks, atoms, to curate and create the world we live in and are granted the pleasure of being a part of, we are able to fully extend from something intangible to the visible eye to something with true enchantment, such as Earth, with its enormous complexity. It corresponds to such a beautiful and expansive wonder of terms and definitions, which is exactly why I was drawn to shaping and molding it in this reading.

Curiosity has always rattled around in my head, playing ever so quietly like a broken record. Over time it only began to make itself more known as I learned about little things in passing and in conversations with people in daily encounters. I could not

help but begin to itch, yearning to explore the possibilities of who the perpetrator may be as if I were a detective scanning and plotting from every clue my subconscious collects through the lived experiences of those around me. Upon relaying my exploration and findings to the reader, not only have I learned on a much deeper level why certain symptoms and issues arise within us, but I have also aspired to share and teach others about the root causes as well. As we have all experienced in one way or another, whether it was through our own lived experience or through experiencing another near us, imbalances within our mental and/or physical health have become ever so present. I assure you that I have barely grazed the surface of such wonder and curiosity rattling around in my head at any given moment of the day, but hopefully, through time, these tiny puzzle pieces will be able to add to the huge array of others patiently waiting to build and construct a gargantuan jigsaw puzzle. And maybe none of the truth of the matter has been fully answered during my exploration and investigation. For all I know, the true intricacies of human anatomy will likely always be a wonderment filled with question marks and answers we may not get in this lifetime. Although what I will say is that being granted the opportunity to finally step up to the "investigation board" and create this piece of work—researching, learning, and curating possible answers to those questions—has brought me an immense amount of excitement for not only this current body of exploration but also the adventures ahead of me. Throughout this reading, I have aimed to explore the curiosity as to how some of the uncommonly spoken about "energies" or aspects of our lifestyles play a greater role in the imbalance within our health and experiences.

Summary of Information Discussed

Bringing back the beauty of what I hoped to expand upon, I sought to gain a better understanding of how energies or factors from our environmental life had the capability of influencing our physical and mental well-being. Of the innumerable possibilities out there in the limitless layers of life, I was first curious to explore a handful of factors that the Earth itself could have on our overall health. By exploring some of the intangible examples, such as the natural vibrational frequency of our planet, the Schumann resonance, and how it has the potential to impact our own frequency, I also discussed the importance of frequency waves, especially within our modern-day lifestyles. As the first section then incorporated physical ways we can benefit from the Earth and natural world, I focused on exploring and providing a broader perspective on how we are truly connected to our mother Earth. By opening up the discussion and exploration of frequencies, it warmly lays a foundation in which to build upon for the latter portion of the work. By closing off the handful of examples used to broadcast the physical demonstration and "tools" available to help all around us, it heavily focused on the balance of electrons within the body, better yet between free radicals and negative air ions or extra electrons.

The second section, *Ingested Energies,* began with the discussion of bacteria and the fundamental connection bacteria have to our livelihood, as they are something I deeply underestimated prior to my research. In delving into the unity our own separate systems have within the connection of bacteria and the other trillions of little microbial cells, my goal in the second section was to further explore the grave importance external energies (in this case mostly consumed, caloric energies) have on us on an internal level. Moreover, I was interested in seeking out how the few examples I explored began to impact us on a deeper level than just at the surface. By exploring the mechanisms and

true inner workings of what goes on in the deep depths of specific areas of the human anatomy, it has not only allowed me to paint a better picture in my own mind but also to aim at doing the same for the reader. As I mentioned in the introduction, my curiosity of "why" has always followed me, not allowing me to truly grasp the full concept, as if I were blindly putting a puzzle together without any prior knowledge of what it is I am constructing. That same "why" and eagerness to learn from the very first building block or origin have allowed me to get down to the root and true essence of how certain intricacies within our bodies fully work. Thus, I went a bit scientific and not only learned plenty of new scientific words and concepts but also aimed to understand them as best I could to relay that same picture to the reader, allowing them to see why the things I spoke about are so important in our everyday lives. Within the last section of this reading, I first aimed to build upon the information and concepts I had previously discussed while introducing a few new examples and lastly used some of my personal experiences to integrate the newly learned information.

The third section was positioned to now see how the interpretation our mind makes from our own unique perspective of this world is able to entirely shape the way our body reacts and responds to it. By diving deeper into what else this may mean, I aspired to explore how our bodies handle and read responses from the external environment. Concepts such as fascia, heart rate variability, and uniquely bringing the reader back to the first things explored by further investigating the implications of electromagnetic fields may, on the surface, seem like vastly different core concepts. However, they hold with them the glue of interpretation via our own bodies' and brains' responses and further display the separate yet underlying importance each of them carries. Depending on how well our brain is at interpreting and handling certain things around us, it can largely determine what signals it will relay to the rest of the body. As each of us is

our own unique creation of life, we all experience and adapt in vastly different ways from one person to the next. In this, the goal of this last section was to, one, explore my own curiosity, but secondly, to understand how our responses to previous encounters have the potential to carry over into the present moment.

Only Looking Through One Lens Prevents Us From Seeing The Full Picture

As I stated in the very beginning, there is no definitive way to encapsulate the expansiveness of "energy" in its entirety, as it is malleable and able to shape itself to the interpreter's own perspective. Taking that into vast consideration, throughout this journey, I have used my own experiences and perspective on how I decipher the wonders of what energy can entail. By displaying in this work that it is defined as the fundamental force that animates, connects, and influences all forms of life, it has allowed me to string together separate branches of a tree with the intention of illustrating how they all bridge the beauty of the creation as a whole. Similarly, by further using the depiction of a tree, when we think of the components it carries, the roots that supply stability and nourishment, the bark that provides protection and insulation, and even the leaves that further deliver sustenance, among many other things, they are all equally as important. Each of their separate systems unanimously unites with the sole purpose of helping the tree thrive and be as healthy as conceivably possible. Without stability or strong roots, water would not be as accessible to the tree, and the weakness of its roots would pose a threat when a storm or strong gust of wind were encountered. These vital elements are just as important to the longevity of the tree as its bark; without protection, bacteria, fungus, and disease would also pose a threat. And lastly, the leaves of a tree, without them, could

not absorb sunlight and turn it into “energy,” or sugar, needed to prosper. In essence, all three of these separate components are pertinent to the entirety of the tree and, again, are all just as equally important as the next. As I have likely done throughout this reading, going on tangents about the beauty and wonder of Earth brings this analogy back to the beauty of yourself. We, just as trees are, are composed of such a vast number of widely different, unique components that ultimately unite as one. All in agreement and with the sole desire to keep us alive and as healthy as humanely possible. The issue, however, is the mind and our surrounding environment's almost supreme control and capability of overriding all of the system's wishes and functions. Over time, they begin to show the diversion from the ultimate goal of health that the body desires and replace it with a mess of confusion within the body. Just as we have explored during this reading, attempting to broaden our lens of perspective, those two factors are not the only ones with complete control and the ability to further affect our longevity and the central goal of health. The intricacies of how every single thing in our lives affects our health are a wonderment and are vastly complex.

If someone experiencing body pain or stiffness attempted to better understand how to resolve the issue but only viewed it through the lens of “not stretching enough” or “sitting too long,” they would already begin with a narrow view of causality. As we have learned, through the handful of examples and mechanisms explained, inflammation can stem from innumerable reasons. That same person may be fixated on getting to the root of the matter by solely looking at one perpetrator and thus will miss out on the possibilities of effects pertaining to an imbalance within their shoe support affecting fascia; repetitive stressful encounters; constant man-made electromagnetic frequency exposure; the food we consume contributing to dysbiosis within the microbiome and further promoting inflammation; and who knows how many other

things. Needless to say, I hope that the reader obtaining and comprehending the information discussed among the different sections has begun to understand the importance of broadening their perspective when aiming to interpret imbalances within their body’s health.

Understanding More About How Our Body Communicates With Itself & The World Around Us

Before exploring research for this project, I was utterly unaware of how important our communication with the external world is to our mental or physical health. Yes, many of the things we experience in daily life have the capability of impacting our emotions, such as having to go to work on your birthday, seeing a cute dog, that first sip of warm, delicious coffee on a chilly day, and so on. However, the common and obvious ways our external environment can influence our internal state were not what I intended to explore. Instead, I was interested in the subtle accumulations of daily habits or responses from the world around us being able to influence much more within our bodies than we formerly realized. As we have hopefully learned throughout this reading, our own perspective of the external world is as unique as our fingerprint. Furthermore, the mind has shaped and adapted based upon our own unique experiences. For instance, stress has been a recurring topic amongst the different chapters; within the modern era we reside within, stress and anxiety are unfortunately ever so present. The person next to you is likely not going to respond to and interpret a stressful situation in the exact same way as you. By taking this into account, we can see that situations or encounters from things that occurred years ago still have the ability to influence our own unique interpretation of the world within our current daily lifestyles. Continuously experiencing stressful moments, even in small ways, has the capacity to accumulate

detrimental effects on practically all systems within the body. Sure, these moments may have been brief, but as we have learned, the body's understanding of stressful encounters operates similarly to how our ancestors did in a life-or-death situation. We have explored the distinct ways stress, which started out in the mind, begins to show up in physical manifestations. The impacts stress has on our bodies are gravely influential. Walking you through the ways it can affect hardened fascia, heart rate variability, our microbiome, inflammation, the brain, serotonin production, and, overall, just the entire health and regulation of our body's systems has hopefully painted a better picture in your mind as to how important the communication our bodies have with the external world is.

Everything Has The Ability to Add to or Alter our Health

My hopes in exploring such vastly different examples, showcasing the possible influences that they all have on our well-being, are further enhanced through my own lived experiences. I am sure it is not quite uncommon for the everyday individual to experience even glimpses, if not daily occurrences, of the responses that tag along with some of the imbalances touched upon in this reading. Even if that same person feels "fine," there are such subtle ways the internal mechanisms may be working to obtain that level of "fine." Many of the things we feel are "fine" or "okay" are things we have slowly become accustomed to. Similar to the metaphoric story of boiling a frog, of course the frog would immediately escape the water if it were boiling, but when you slowly raise the temperature, there is a sort of level of tolerance it builds. I believe the modern lifestyle is quite reminiscent of this metaphor, slowly heating up as the pressures increase in ways we once would have never thought were sustainable; however, as we

experience small moments of tension, stress, pain, and so on, we are not as capable of spotting an issue. Personally, I do not think things such as body pain/stiffness, brain fog, persistent fatigue, difficulty concentrating, anxiety, stress, and innumerable other things should be as prevalent as they are now. All of these symptoms are those of chronic low-grade inflammation, and I am not attempting to diagnose anyone who may be experiencing similar symptoms or feelings; it just goes to show that they are merely signals indicating that something is imbalanced within our bodies.

Much like the study we learned about that aimed to understand how cells react to multiple stressors through their upregulation and seemingly visible representations of being "fine" or stable, that study showed that that is not always the case. Even in the most subtle and unnoticeable ways, the body is aware of the impacts. On the surface, the cells appeared to have mediated the stressor (EMF exposure); however, it came at a cost and, in actuality, was causing the body to work harder in order to maintain that level of stability. In any given moment, our body is striving to mediate all of the possible things that can alter our health through encounters in our daily lives. Even if we are unaware of each possible influence from the world around us, everything, single-handedly, has the capability to alter and influence our health. As we continue to walk through our journey in this lifetime, I strive to reflect the impacts that small and seemingly insignificant encounters have on our bodies through the accumulation of time and experience.

Limitations & Further Hopes of Exploration

Because of the broadness that the word "energy" carries, it surprisingly may seem limiting at times when attempting to encapsulate it into a closed container or definition. Therefore, by

striving to prevent that from occurring in this work as well as covering many different areas of interest, I hope that the main goal when using "energy" to define this body of work has been shown to be attained. In hopes of allowing it to mold and shape, expand and contract, it reflected many different forms. From the intangible electromagnetic fields on earth and within ourselves to the manifestations of physical imbalances, such as my example with fascia and shoe support. By displaying these representations through a broadened scope, I have aimed to reflect the integration and forms it carries. From the transition of "unseen" effects, such as how piezoelectricity has an influential impact on our visible health, to the physical accumulation presented in the form of hardened fascia. Much like water and the various forms it takes, the word "energy" was aimed at encapsulating all of those different forms. Through this, we can see how, in some instances, it is invisible to the human eye yet is still ever so present.

Since it is quite evident through my repetitive reiteration of displaying that there are countless possibilities that contribute to our overall well-being, this reading has only been able to dive into a few of those contributing factors. Because of this, I was limited in my ability to truly investigate all of the other possible factors that tie into the issues I discussed. For instance, in my ingested energy section, the few examples I used to portray the mechanism of dysbiosis are not meant to be the definitive factors that can contribute to these imbalances. Instead, they were depicted as researched to display being the main proponents that have the ability to influence and contribute to an imbalance within our gut microbiomes. I did not conduct my own research studies or experiments and therefore will not establish that the energies explored merely cause these issues. Instead, they aim to reflect the results I have learned while scouring and reviewing a plethora of peer-reviewed academic studies further enhanced through my own unique lens of life. Furthermore, to prevent displaying bias towards

a topic or correlating factor, I ushered in relaying the research I had discovered to the best of my ability.

Within future works, a major aspiration I hope to gain more insight into is exploring the multifaceted ways that our heart's electromagnetic field interacts with the world around us as well as how it influences our own internal world. Even so, exploring electromagnetic fields and their impacts as a whole is something truly fascinating and a direction I aspire to understand more of. If magnetite crystals, the same minerals found in navigating animals, have been discovered by the millions within our own anatomy, truly how impactful are magnetic and electromagnetic fields on the human body? Furthermore, one of the ultimate main goals that I hope we begin to see either within the medical field or just in the normality of modern everyday life is to normalize imbalances occurring from a wide variety of influences rather than solely stemming from one single issue. With so many questions still unanswered and even unknown to ask, I yearn to learn more about all of the various puzzle pieces that constitute the world we live in today.

Within all the indications I have ushered in throughout my reading, absolutely none of them are medical/scientific claims attempting to diagnose anyone with similar experiences; this reading is solely meant as an exploration into "why"—why certain things may be manifesting in the physical or mental body—and in doing so, I used this work as an exploration to not only learn mechanisms behind the "why" but also to understand how some examples from our everyday lives may help in pointing to an answer. Now, through the information that has been scientifically explored, I did not aim to bend those results in hopes of tailoring them to a specific answer; instead, I reflected on what I learned while also adding my own separate questions that may be worth exploring through the basis of scientific data collection. I am by no means a medical professional and make zero claims in resolving or

fixing anything the reader may be experiencing; I am instead a curious mind seeking exploration, expressing my desire for answers while bringing the viewer along in hopes of broadening their perspective on some of these topics discussed. I further hope that the handful of factors I sought to explore have allowed the reader a chance to ponder as well as learn more about not only their own energy and its entirety but also the energy that resides within the world around them. As they carry with them a new exploration of knowledge, may these small seeds of wonder grow into the beauty of expansive branches that extend out in every direction, aiming to connect to all.

Final Notes

When I first began caring for and obsessing over houseplants, it not only opened my mind up to an entirely different world and perspective, but it also taught me many things about myself. In hindsight it is quite silly to think that caring for a houseplant can reflect many beautiful life lessons, but I am a true believer that in any given moment we experience, there is an opportunity for growth and a chance for reflection if we so choose to find them. I not only learned about such intricacies and intelligence these little plants carry, but they also taught me that beauty is found in anything we encounter. Over time, I began caring for more than I could handle and ultimately abandoned them all, and in that, another lesson was shown; however, I did not bring this up to display all of the life lessons plants have taught me. Instead, I wish to reflect on the very start of my connection with houseplants. Whenever a yellowish leaf would appear, I always assumed it pertained to one of two things: the amount of water it got (or did not get) or the amount of sun it received (or did not receive). As I mentioned, the true intricacies of houseplants were a wonderment, and I would one day come to understand more of

their language. Yet, at the start, I was only fixated on those two factors. Just as we reflect similarities to Earth, as we are an extension of her in another form, so many other things were not taken into consideration when they should have been. One or two factors do not determine our health; yes, they may have a huge influence, but there are innumerable other components that add to this ripple of effects. As I would come to learn, not just water or sun could have caused their leaves to change: the quality of their water, the pH of it, how many minerals it contains, the quality of the air, the humidity levels, the soil, and if the roots are aerated, and as you can imagine, the list is endless. These all were not taken into consideration as I did not yet have the knowledge to understand their true and seemingly subtle impacts. Much like how leaves can, in some ways, symbolize our skin, showing the imbalances and internal state, growing up, my acne was not solely caused by food or genetics. Yes, those may have been the main influences, but there were many other things to consider as well that were able to further enhance the ripple of effects. In all, these houseplants showed me that singling out and only focusing on one thing that may contribute to an imbalance of our physical or mental health will always prevent us from truly speaking our body's language and understanding how it communicates with us and the world we are entwined in. If reading this body of work has taught the reader anything, I hope at the very least it delivers a similar message that these houseplants gifted me. In all, everything through our lived experiences shapes our lives in uniquely complex ways. Even mental or emotional experiences all have the potential to vastly influence even the smallest components of our health. Remembering this alternative perspective as you continue to walk through this beautiful puzzle called life may help guide you in ways once unimagined.

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Glossary

Acetylcholine—A chemical the vagus nerve will release, which aids in suppressing immune cells. In the analogy of telling your boss something, waiting for their signal before fixing the issue, acetylcholine is the "fix" to the issue.

Alpha brain waves—Ranging from 8 to 12 Hz; think of alpha waves as a period of relaxed wakefulness, moments of quiet downtime, and other states when the brain is peaceful and not intensely focused on something.

Antigens—Toxins, chemicals, bacteria, viruses, or other outside substances that trigger an immune response within the body.

Antioxidants—Compounds found in food that release an electron, neutralizing free radicals. They are mentioned as the extra companion to the "wild dogs."

Beta brain waves—Found within ranges of 12 to 35 Hz and are often associated with alertness, focus, and more complex states of consciousness.

Blood-brain barrier (BBB)—A barrier within the brain that protects it from toxins, chemicals, and harmful bacteria.

Butyrate—Short-chain fatty acids that strengthen the gut barrier and reduce inflammation.

Carboxymethylcellulose (CMC)—A widely used food additive that acts as an emulsifier or polymer to thicken/stabilize things.

Cholinergic anti-inflammatory pathway—A mechanism or reflex within the vagus nerve that assists in controlling the inflammatory responses.

Circadian rhythm—The natural, innate clock almost all living organisms contain. It aids in the stability and regulation of critical bodily functions such as sleep, hormone control, and body temperature.

Collagen—The body's main ingredient in building connective tissue, muscles, and tendons.

Cortisol—The hormone that is commonly associated with the stress response. It is a signal in the body to be alert and is also useful when first waking up.

Cytokines—They control immune responses and are mentioned as the messengers that hold the alarm bells. Cytokines are triggered to let the body know that there is inflammation and that they must direct the immune cells by telling them where to go/who to target.

Dopamine—Its main function in the brain is controlling pleasure, reward, and aiding in memory and response.

Dysbiosis—An imbalance in the microbial community, which can cause the more harmful bacteria to take over.

Electromagnetic field (EMF)—A combination of both an electric field and a magnetic field from the movement of ions. Resulting in a physical field that exerts force upon other charged objects.

Endorphins—Hormones within the body that act as the body's own pain reliever and elicit a reduction in stress hormones, overall resulting in a positive response.

Energy—the fundamental force that animates, connects, and influences all forms of life.

Extremely low frequency electromagnetic fields (ELF-EMF)—Frequencies less than 300 hertz.

Fascia—Connective tissue that encompasses and is spread throughout all parts of the body.

Fibroblasts—The main cells and primary "workers" found in the connective tissue to ensure that everything is supporting and building smoothly (FibroBiologics, n.d.).

Free radicals—When one of the electrons is missing a partner, it begins to search for and steal electrons that are occupied by other neighbors such as cells, fats, proteins, and DNA. They are considered highly unstable and reactive (Pham-Huy et al., 2008).

Gut-brain axis—The bidirectional communication link between the gut and the brain, which uses 3 primary modes of communication.

Heart-brain axis—The bidirectional communication link between the heart and the brain.

Heart-brain coherence—coherence between the heart's variability and the brain's waves. More prominent when a person is in a calm state of being.

Heart rate variability—The variation in time between each heartbeat. It displays the variation in the fight-or-flight response with the rest-and-digest response (Shaffer & Ginsberg, 2017).

Herbivore-induced plant volatiles (HIPVs)—A chemical blend that plants emit based on their attackers. Predators of that specific threat will sense these chemical blends and come towards the plant.

Inflammation—The immune response inflicted when the body undergoes a period of injury or harm. It is a defensive response meant for temporary occurrences.

Inorganic—Atoms or particles that carry either a positive or negative electrical charge, often referred to as electrolytes. They do

not contain carbon and are useful for providing the body with minerals and nutrients.

Interbrain synchrony—Also referred to as neural coupling, it is when multiple people's brain activity synchronizes during interaction.

Ions—A charged particle.

Leaky Gut—When the bad bacteria take over and begin to break down the intestinal wall, antigens or other harmful substances begin entering the bloodstream and other areas of the body.

Lenard effect—It was named after scientist Philipp Lenard and commonly called the "waterfall effect." It explains the releasing of negative air ions due to the force of water crashing the ground below, ultimately changing their molecular structure.

Liquid crystalline fascial structure—When the collagen fibers from the solid structural state of the fascia and the water molecules from the liquid/gel-like state of the fascia intersect, they are arranged in such a precise, repeating triple helix pattern.

Liquid-gel-like Fascia—Commonly called "sol" or "ground substance." It is responsible for lubrication, preventing friction within the fascial layers. It also supplies nutrients, oxygen, and blood by also flushing out unwanted matter.

Lorentz force—A force that entrains ions to follow a specific path when interacting with both an electric and magnetic field.

Magnetic field—An invisible force that is generated from the moving of electric currents.

Mechanoreceptors—Sensory receptors convert physical or environmental changes into electrical signals for the brain and spinal cord. Things such as sound, movement, and pressure.

Methicillin-resistant Staphylococcus aureus (MRSA)—A bacterial infection resistant to many common antibiotics.

Microbiome—The small community of life that consists of trillions of microorganism cells, which are crucial for maintaining the body's health.

Myofibroblasts—Specialized cells present in times of injury or wound repair.

Natural killer (NK) cells—A specific type of white blood cell that identifies and removes cancerous and infectious cells around and within the human body.

Negative air ions (NAI)—Air molecules that contain an extra electron.

Nicotinic acetylcholine receptor (nAChR)—A receptor that aids in regulating the release of neurotransmitters as well as engaging in things such as memory, learning, reward, and mood.

Organic ions—They contain carbon, which enables them to carry out greater roles by creating proteins, fats, and carbohydrates. The carbon essentially allows them to build.

Oxidants—Molecules that steal electrons regardless of if they are unpaired or not.

Oxidative stress—The chain reaction of free radicals stealing electrons from other molecules in the body. This imbalance can result in cell damage, inflammation, or even disease.

Parahippocampal gyrus—A region of the brain that governs navigation, memory encoding, and spatial organization. Studies found that it activates more for landscape images than it does for images of people. The coherence from subjects and the SR was found in this region, indicating a possible connection between the frequency and landscape.

Parasympathetic nervous system—State of being correlated with the rest and digest response. It is the body's natural response and is associated with calamity, healing, maintaining homeostasis, and all other normal processing functions.

Phages—A common virus in the microbiome that is vital for limiting the growth of specific unwanted bacteria. Their main job is to target these bacteria, so they do not begin to overrun the microbiome.

Phytoncides—Chemicals containing natural antimicrobial and insecticidal compounds that aid in the trees' protection from parasites and other unwanted bacteria (Thangaleela et al., 2022).

Piezoelectricity—The small electrical charge generated by the mechanical stimuli. It occurs due to the highly ordered alignment from both the collagen fibers and water molecules within the fascial structure.

Postbiotics—They are what the healthy bacteria produce, in the analogy, they are referred to as the nutrient-dense byproducts of composition from worms and other decomposing organisms.

Reactive oxygen species (ROS)—They are unstable and easily reactive oxygen molecules. ROS signaling is a process that healthy cells produce in order to regulate physiological processes but can result in oxidative stress if it begins to overwhelm the body's electron balance.

Redox Reaction—The balancing of losing and gaining electrons within the body. A persistent imbalance can result in oxidative stress while a healthy redox reaction is able to maintain a state of equilibrium.

RF-EMF—Radiofrequency electromagnetic fields. Much higher waves commonly associated with things such as cell towers, Wi-Fi routers, bluetooth devices, etc.

Schumann resonance—The earth's natural frequency, which is produced from the continuous lightning strikes ricocheting between the ionosphere and the surface of the earth.

Sinoatrial node (SA node)—a small group of highly specialized cells within the heart that generate electrical impulses that force all nearby cells to fire in sync with them, resulting in the body's heartbeat.

Solid Fascia—It consists primarily of collagen and is responsible for protecting and supporting every organ, muscle, and bone.

Superficial back line—A major line of connection within the fascial structure that runs from the toes to the head, aiding in posture, stability, and movement.

Sympathetic nervous system—State of being correlated with the fight-or-flight response in times of stress, heightened awareness, injury, and defense. It shuts off all of the nonessential functions of the body that lower the chances of survival in a potentially threatening situation.

Synchrony—When two or more things are operating in harmony with one another.

T-cells—A type of immune cell that aids in recovery and active defense. The overactivation of these cells, especially without a specific need to heal or defend, may cause dysregulation in the immune system. Stress increases T-cells, which can impede the "rest and recover" immune state.

TGF-beta1—A cytokine that is crucial for regulating cell growth, tissue repair, and the immune response. Chronic stress can trigger this cytokine to be released as well, which can lead to tightness and compression within the fascial system.

Vagus nerve—The longest cranial nerve in the body, which runs through and connects many vital organs. It is essential for monitoring and regulating many of the functions within these areas.

Volatile organic compounds (VOCs)—Easily evaporable mixtures of elements that are able to diffuse into the air.

Voltage-gated ion channels (VGCC)—The "gates," or "checkpoints," that control the amount of ions, or electrically charged particles, entering and leaving cell membranes. They help to regulate electrical signaling in neurons, neurotransmitters, muscle cells, and hormone secretion for hormone regulation.

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