Understanding the Nervous System, Brainwaves, Entrainment, and Intentional Living

The Autonomic Nervous System: The System Operating in the Background

The **autonomic nervous system (ANS)** is the part of the nervous system that continuously regulates many functions that occur largely without conscious effort. These include heart rate, blood pressure, breathing patterns, digestion, pupil dilation, sweating, body temperature regulation, sexual function, and many aspects of the body's stress and recovery responses.

For simplicity, participants can think of the ANS as continuously helping the body answer an important question:

"What does this situation require of me right now?"

The sympathetic branch of the autonomic nervous system generally helps mobilize the body for action, particularly during challenges, exertion, uncertainty, or perceived threat. The parasympathetic branch generally supports conservation, digestion, restoration, and recovery. Healthy functioning is not about remaining parasympathetic all the time. Both systems are necessary. The objective is **flexibility**—the ability to mobilize appropriately when circumstances require action and to return toward restoration when the challenge has passed.

The nervous system also interacts continuously with the brain systems involved in attention, emotion, memory, motivation, threat detection, reward, focus, motivation and decision-making. Consequently, our physiological state can influence **what we notice and how we interpret what we notice**.

This has important implications for intentional living.

Our opinions, likes, dislikes, attachments, aversions, motivation, expectations, and worldview are not created by the autonomic nervous system alone. They emerge from many interacting influences, including previous experiences, learning, memory, culture, relationships, beliefs, habits, and present circumstances.

However, **the state of the body and nervous system can influence the lens through which these things are experienced.**

When highly stressed or seemingly threatened, for example, attention may narrow toward and amplify potential problems and danger. Irritation can become easier. Uncertainty may feel more threatening. Something we already dislike may become even more aversive. Obstacles may appear larger, and our available choices may seem smaller.

From a calmer and more regulated state, the external circumstances may not have changed at all, but our relationship to them may change. We may notice alternatives that were previously overlooked. An obstacle could be recognized as an **opportunity for learning, self-discipline,**

personal evolution, adaptation, growth, or positive action. What once seemed like failure may be viewed as feedback.

This is one of the central lessons of *Living Intentionally*:

Before automatically believing every interpretation produced by the mind, learn to recognize the state from which that interpretation is arising.

Neurons, Bioelectricity, and the Body's Communication Network

The human nervous system contains billions of specialized cells called **neurons**.

A useful introductory analogy is to think of neurons as part of the body's biological **wiring and communication network**.

Neurons communicate through electrochemical processes. Differences in electrical charge across neuronal membranes allow electrical impulses to travel along neurons. At connections between neurons, called synapses, communication commonly involves chemical neurotransmitters that influence the next cell.

Therefore, when we speak of the nervous system as **bioelectrical**. Electrical activity is an essential component of how neurons communicate.

Every thought, perception, movement, memory, emotion, and conscious experience involves patterns of bio-electrical activity distributed across networks of neurons. The rate, or frequency of this activity can influence mood, stress, pain perception, focus, motivation, vigilance, emotional regulation, awareness and more.

What Are Brainwaves?

When large populations of neurons participate in coordinated electrical activity, the resulting rhythmic patterns can be measured at the scalp using an **electroencephalogram (EEG)**.

These measurable oscillatory (vibrational) patterns are commonly called **brainwaves**.

Frequency is measured in **hertz (Hz)**, meaning cycles per second. A 10 Hz oscillation or brain wave, for example, completes approximately ten cycles each second.

Scientists commonly describe several broad frequency bands. These categories overlap somewhat, and different researchers may use slightly different boundaries:

Delta — approximately 0.5–4 Hz

Delta activity is strongly associated with **deep, non-REM slow-wave sleep**. Deep sleep is an important period for physiological restoration, memory-related processes, metabolic regulation, and normal immune functioning. Sleep is essential to health and recovery.

Theta — approximately 4–8 Hz

Theta activity occurs prominently during **drowsiness and lighter stages of sleep** and is also observed during particular memory, learning, internally directed attention, and some meditative practices.

Alpha — approximately 8–12 Hz

Alpha activity is commonly associated with **relaxed wakefulness**, particularly when a person is awake, physically relaxed, and not heavily engaged with external sensory demands. Alpha activity has also been studied in relation to attention, inhibition of irrelevant information, and certain meditative states. It is the relaxed but focused state of mind.

Beta — approximately 13–30 Hz

Beta activity is frequently associated with **active waking cognition**, attention, problem-solving, sensory processing, and motor activity. Higher arousal and anxiety can sometimes involve increased activity in portions of the beta range (high beta 18Hz-30Hz), but beta should not simply be labeled a "stress frequency." Normal beta activity is an essential part of ordinary waking life.

Gamma — approximately 30 Hz and above

Gamma activity has been investigated in relation to **sensory integration, attention, learning, memory, and higher-order information processing**. Gamma oscillations, including activity around 40 Hz, are also being actively investigated in neuroscience and medicine.

The important lesson is that **no single frequency equals one emotion, personality, or physiological outcome**. The brain normally contains multiple frequencies simultaneously, and their significance depends upon brain region, circumstances, behavior, and many other factors.

Nevertheless, understanding these broad patterns gives participants a useful introduction to the relationship between **brain state, body state, attention, sleep, cognition, Focus, motivation, emotional regulation, stress, anxiety, perceived experience and more.**

Entrainment and the Frequency-Following Response

Entrainment broadly describes the tendency of interacting rhythmic systems to become coordinated or synchronized under appropriate conditions.

Nature provides fascinating illustrations of synchronization. Certain species of **fireflies synchronize their flashing**, and some insects can synchronize rhythmic signaling. Crickets synchronizing their sounds are often mentioned in popular descriptions of biological synchronization.

Physical systems can synchronize as well. Pendulum clocks mounted to the same wall can eventually synchronize the swing of their pendulums. Similarly, multiple **metronomes placed on a movable shared platform** can gradually synchronize because each metronome transfers small amounts of energy through the common platform.

The important point is not that these examples are identical to what happens in the brain. They are demonstrations of a broader principle:

Rhythmic systems can influence other rhythmic systems.

The nervous system also responds to rhythmic sensory stimulation.

In neuroscience, the **frequency-following response (FFR)** more specifically refers to measurable neural activity that follows characteristics of an auditory stimulus. Rhythmic auditory or visual stimulation can also produce measurable neural responses sometimes described more broadly as neural entrainment or brainwave entrainment (BWE).

Binaural Beats: Using Sound Intentionally

A **binaural beat** is created when two slightly different frequencies are presented separately to the two ears through stereo headphones or earbuds.

For example:

Left ear: **200 Hz**
Right ear: **210 Hz**

The listener perceives a rhythmic fluctuation corresponding approximately to the **10 Hz difference** between the two tones. The 10 Hz frequency produced by the brain is in the Alpha frequency range.

Because each ear must receive its respective signal, **stereo headphones or earbuds are required for a conventional binaural beat**.

Research has investigated whether binaural beats can influence neural oscillatory activity and psychological outcomes such as relaxation, anxiety, attention, focus, motivation, emotional regulation, sleep, cognition, stress reduction and even glymphatic processes (the clearing of waste from the brain). Results are promising in some areas and responses vary among

individuals. Therefore, this program does not tell participants that listening to a particular binaural beat will automatically produce a particular emotion, brain state, or health outcome.

Instead, *Living Intentionally* encourages an empirical approach:

Observe yourself.

Participants can record:

What effect would be suit my intentions, right now?

How do I feel before listening to a particular frequency or frequency range?

What do I notice within my state while listening?

How do I feel afterward?

Is this the appropriate frequency or range for my intentions, right now, or would another frequency or range be more useful in this situation?

Over repeated sessions, the participant begins developing something extraordinarily important:

self-awareness.

Rather than simply being told what a practice should do, participants learn to observe what actually occurs within themselves.

Using State Intentionally

The purpose is to demonstrate that there are **simple variables within our lives that we can intentionally influence without using substances**.

We can influence our breathing.

We can influence brainwaves.

We can influence where we place our attention.

We can influence the environment we create around ourselves.

We can observe our thoughts rather than immediately acting upon them.

We can recognize our physiological state before making an important decision.

And we can practice these things repeatedly.

This is intentional living at its most practical level.

Starting Every Day Intentionally

Perhaps one of the simplest applications of this entire program is also one of the most important:

Do not allow the beginning of the day to occur entirely by accident.

When we awaken, yesterday's concerns, habitual thoughts, worries, attachments, aversions, assumptions, and internal commentary can quickly reappear. Before long, we may find ourselves experiencing essentially the same internal state from which we approached yesterday.

Living Intentionally asks participants to experiment with doing something different, intentionally, and their time incarcerated offers the ideal opportunity for this practice to become integrated before the challenges of life outside present themselves.

Before allowing circumstances to determine the state in which the day begins, **intentionally influence that state first**.

This might include a few minutes of slow, intentional breathing, meditation, visualization, binaural beats, gratitude, reflection upon one's values and goals or yesterday’s challenges and victories, or simply becoming consciously aware of one's physical and emotional state.

Brainwave entrainment provides a useful for intentionally guiding our state to that which aligns with our intentions.

Instead of leaving our state entirely to chance, we can begin influencing it intentionally.

A participant might therefore begin the morning with:

Intentional sound.
Intentional breathing.
Intentional attention.
Intentional visualization.
Intentional observation.
Intentional direction.

This does not require changing an entire life overnight.

The change can be **incremental**.

Five intentional minutes become ten. One consciously regulated reaction replaces one automatic reaction. One obstacle is reconsidered as a possible opportunity. One negative impulse is observed before it becomes an action. One morning begun intentionally becomes two mornings, then a week, then a routine.

This is where the principle of brainwave entrainment connects with the larger philosophy of *Living Intentionally*.

We are not proposing that a particular sound frequency creates free will or automatically transforms someone. We are proposing something much more practical:

Learn the processes that influence your state. Learn the tools available to influence those processes. Observe their effects within yourself. Then practice using them intentionally.

Every moment provides another opportunity to practice.

The circumstances surrounding us are not completely within our control. Unexpected obstacles will occur. Other people's actions cannot be controlled. Our past cannot be changed. Our present moment awareness and our state are not outside of our control when we have understanding and tools to regulate ourselves to best serve us in living a more intentional life.

We can increasingly learn to influence the state from which we meet challenges, circumstances, situations and other people.

That is why *Living Intentionally — The User's Manual* emphasizes beginning each day intentionally.

Before meeting the world, **meet yourself**.

Observe your state.
Influence what you can influence.
Choose your direction.
Then begin the day.

Repeated incrementally, this simple practice represents the essence of the program:

Know yourself.
Learn to guide your state of being.
Observe yourself.
Choose intentionally.
Repeat tomorrow.