The Unified Model of Tone

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One Regulated Property Beneath Health, the Nervous System, and the Convergence of the Healing Professions

Before You Begin

The Unified Model of Tone is a comprehensive framework for understanding how the body receives, interprets, and responds to information. It draws on a small number of principles from physics, information theory, and biology, but no background in these fields is required. This section introduces each concept in order, giving you the foundation needed to understand the model that follows.

When you read the word tone, you might think of tension, vibration, mood, or the activity of a muscle. By the end of this model, tone should mean something precise: the organized state of a living system, the state into which every new event arrives and out of which every new response emerges.

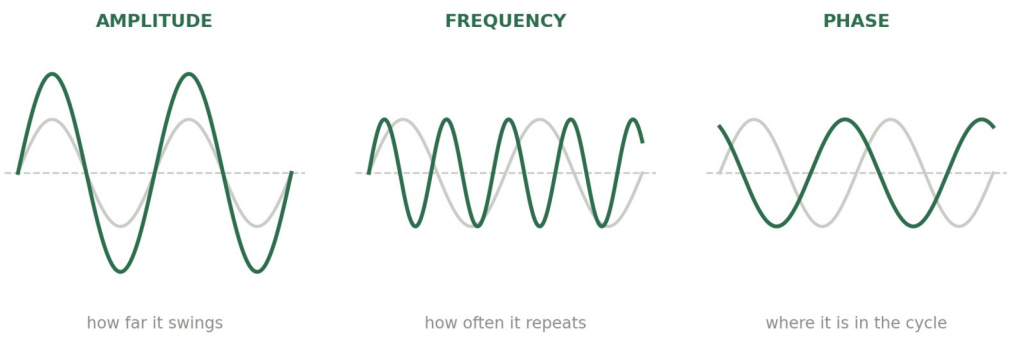
Waves carry differences. Biological systems oscillate. Living systems are nonlinear, and the response of a system depends on the state it is already in. What happens when those concepts are put together? What name belongs to the organization they describe?

Tone.

A wave, and what can change within it

A wave is a disturbance that transfers energy through space over time. When you pluck a string, it oscillates around its resting position until that energy dissipates. Drop a stone into a pond, and the disturbance spreads outward in widening circles. Sound moves through air as repeating changes in pressure. Light travels through space as oscillations in electric and magnetic fields. Although their forms differ, all the above transfer energy through a pattern of changing states.

Three properties describe a simple repeating wave. Amplitude is the size, or strength, of the wave. Frequency is how often the wave repeats. Phase is where the wave sits in its cycle at a given moment. Each of the three varies on its own. A wave can grow without speeding up, change frequency at a constant size, or shift in phase while nothing else about it changes.



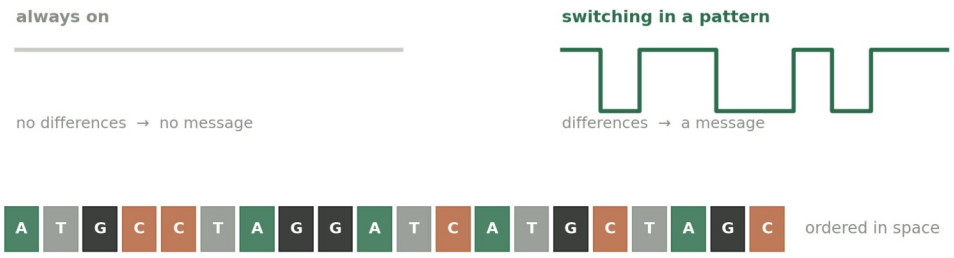
THREE DIALS each can be turned without touching the other two.

Why does that independence matter? Because anything that can vary can carry a distinct difference, and anything that can carry a difference can carry information.

Information is born from difference

A signal carries information only when it can take more than one distinguishable form. A light that switches on and off can communicate because each state can represent something different. A broken light that remains permanently off cannot send a message because it has no alternative state to express. Without a difference between possible states, there is no information to convey.

DNA stores information in the ordered sequence of four molecular bases: adenine, thymine, guanine, and cytosine, represented as A, T, G, and C. A computer stores information in the ordered sequence of two electrical states, represented as 1 and 0. In both, information lives not in the individual symbols but in the pattern of differences between them.



INFORMATION IS DIFFERENCE in time or in space, the pattern is the message.

Waves are useful carriers of information with distinguishable states. Additionally, because their amplitude, frequency, and phase can vary, waves create patterns that can move from one location to another without requiring the material itself to travel. This is a particularly efficient method of information transmission. Picture a stadium wave. Each person stands cheering with their arms up, then sits back down and remains in the same seat. What travels around the stadium is not the crowd itself. It is the changing pattern of their activity. For a stadium to do the wave no fans need to be displaced from one seat to another, yet the information can travel thousands of seats away.

THE STADIUM WAVE nobody changes seats. The organization is what travels.

The same principle applies within the living body, allowing it to communicate long distances, quickly, without displacing its own medium. Information moves through changing waves of electrical potential, mechanical tension, pressure, chemical concentration, fluid movement, neural firing, and rhythmic activity. The body continuously receives these signals, transmits them, and reorganizes itself in response. It does not merely contain matter. It contains matter continuously changing state, with those changes carrying information across the whole system.

The body is never still

Living tissue runs rhythms at nearly every scale. Notice your own breath rising and falling. The heart accelerates and slows. Vessels constrict and relax. Neurons shift their membrane potentials and fire in patterned sequences, and whole populations of them organize into measurable rhythms. Motor units engage and release. Muscle stiffens and softens. The gut contracts and relaxes. Hormone levels rise and fall. Sleep and waking cycle across the day.

None of these sequences runs in isolation. They occur simultaneously in the same organism, influencing one another continuously. So it is misleading to picture the body as a still object that events occasionally act upon. The body is dynamic; its only constant is change. Every stimulus enters a system that is already moving, already regulating, already carrying a history, already organized into a particular state.

So before asking what an input does to a body, there is an earlier question to ask. What kind of body does that input meet?

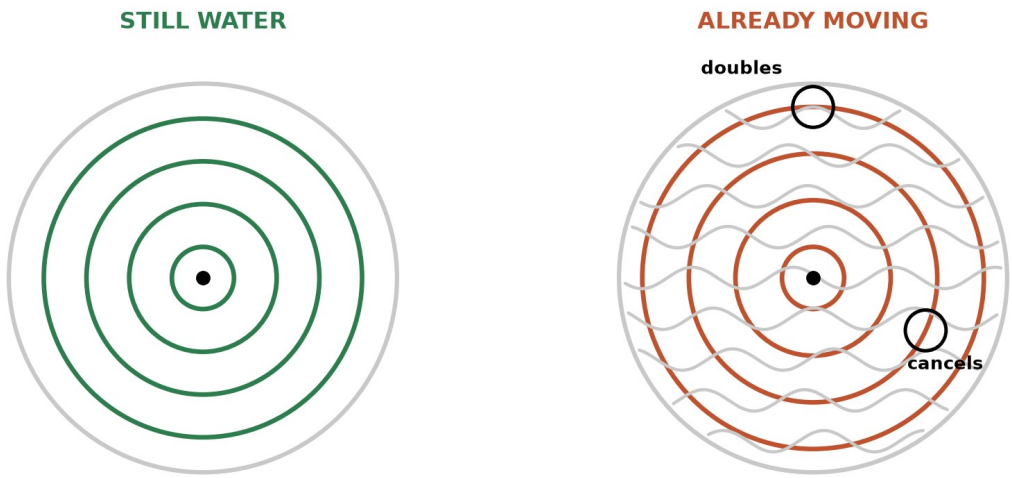
Muscle tone is a clue

Clinicians have used the word tone for more than a century to describe the resting tension and mechanical behavior of muscle. A muscle may have too much tone, too little, or an appropriate amount for the demands placed upon it. These differences are not abstract. They reflect measurable changes in the organization of the tissue and the nervous system regulating it. If you use a muscle its current state becomes visible. A muscle with excessive tone is tight and may resist movement or struggle to relax. It is considered hypertonic. A muscle with insufficient tone is loose and may have difficulty generating enough force or maintaining stability. It is considered hypotonic. A well-regulated muscle can contract when needed, coordinate with surrounding

tissues, and return to rest when the demand has passed. It is considered healthy. The same action produces a different outcome depending on the tone of the system performing it.

Muscle tone is not a frequency. It is the muscle's current state, which determines how well it can tighten, support movement, and relax. A muscle that is already tense responds differently from one that is relaxed, even when both receive the same signal. The same principle applies throughout the body. Information never enters an empty system. It enters tissues and networks that are already in a particular state, and that state influences what happens next.

The simplest way to see waves interact is through interference. Imagine dropping a stone into still water: a clean pattern spreads outward in a circle. Now drop another stone into turbulent water and the result changes. Where crest meets crest the wave grows into a taller displacement. Where crest meets trough the two may cancel, or average into an entirely new wave.



The same stone. What it meets decides what happens.

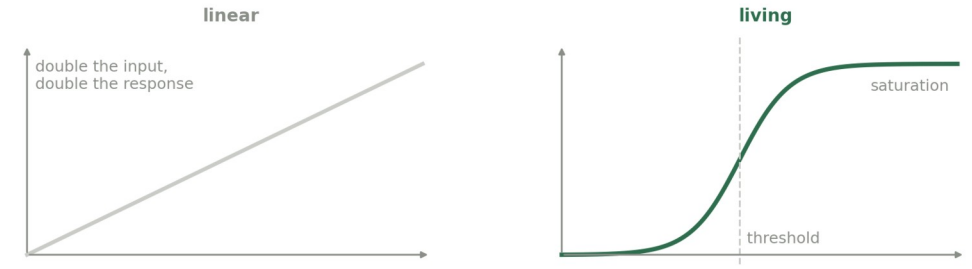
The stones are identical, but the outcomes differ because each stone enters water that is already in a different state. What happens next depends on both the new disturbance and the conditions it encounters. The human body follows the same principle, but with far greater complexity. Its activity unfolds across many interconnected layers, more like the coordinated voices of a symphony than a collection of separate waves passing through one another.

A living body is a nonlinear medium

In a linear system, the response changes in direct proportion to the input. Double the disturbance, and the response doubles. When two disturbances meet, their effects combine as a predictable sum. Small ripples on a calm pond can approximate this behavior: they may reinforce or cancel one another as they overlap, then continue without being fundamentally changed by the encounter.

Living systems often depart from this pattern because their responses change with context, history, and physiological state. A neuron remains quiet below threshold but fires once that

threshold is crossed. A receptor saturates as stimulation increases. A reflex becomes facilitated or inhibited. A muscle responds differently as its activation changes. Feedback may amplify one disturbance while suppressing another. The response does not simply reflect the strength of the input. It emerges from the interaction between that input and the condition of the system receiving it, and each response can alter the conditions under which the next one occurs.



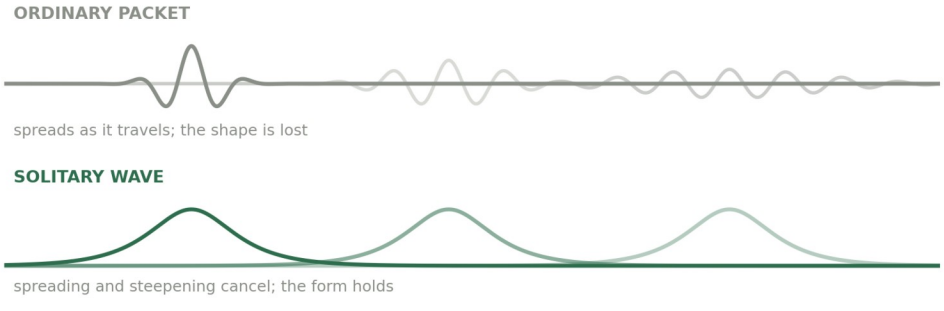
NONLINEAR the same increase does nothing, then everything, then nothing again.

Put simply, what happens to the body changes what can happen next. Every input meets a system already shaped by what came before, and every response changes the conditions under which the next input is received. This is what makes living regulation recursive: the organism is continually shaped by the information it receives, and what it becomes determines how it responds to what comes next.

What a solitary wave shows

The clearest demonstration of nonlinear organization in physics is the solitary wave, and in certain mathematical systems, the soliton.

Many waves spread out as they travel because their different components move at slightly different speeds. This process, called dispersion, gradually breaks apart the wave's original shape. In certain nonlinear systems, however, the wave also changes the conditions through which it moves. Those changes can pull the wave back together as dispersion tries to spread it apart. When the two effects balance, the wave maintains its shape as it travels.



ORGANIZATION CAN PERSIST no single particle carries the pulse. The relationship does.

The result is not simply a wave traveling through a medium. It is an organized pattern that maintains its shape as it moves. Recall the stadium wave. The spectators remain in place while the pattern passes from one section to the next. An ordinary wave might spread, lose coordination, or gradually fade. Now imagine a wave that continually counteracts those changes, keeping the same coherent form as it travels around the stadium. That is the distinguishing feature of a solitary wave. Different regions of the medium participate as the pattern passes, but the balance between dispersion and nonlinearity keeps the organization intact. In certain mathematical systems, a true soliton can even interact with another soliton and emerge with its characteristic form preserved. What persists is not the material itself. What persists is a stable pattern of organization.

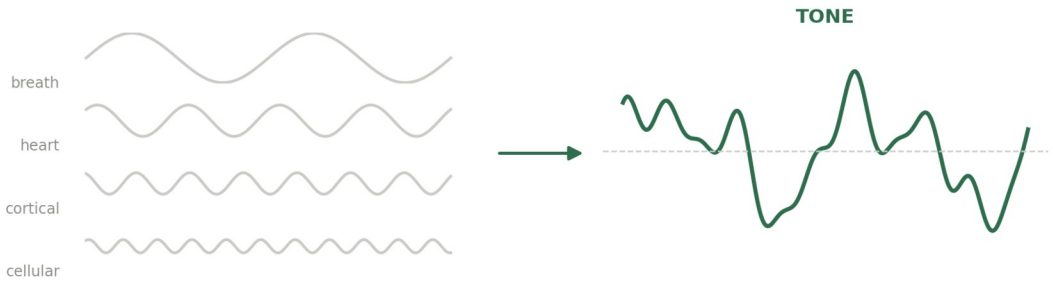
Living tissue can exhibit both dispersion and nonlinearity. Its complex structure and mechanical properties allow different components of a disturbance to travel at different speeds. At the same time, its response changes with its existing condition. Connective tissue, for example, becomes stiffer as it stretches and additional collagen fibers are pulled into tension. Cell membranes can also change their mechanical properties as they approach transitions between physical states. These features do not mean that every biological signal is a soliton. They illustrate a broader principle: how a disturbance moves through the body depends on the state of the tissue it enters.

This model does not suggest that tone is a soliton or that biological regulation can be reduced to soliton physics. The example illustrates a broader principle: an organized pattern can be a real property of a system without belonging to any single part of it. Whether that pattern can form, persist, or travel depends on the state of the medium supporting it. The same principle applies to the body. Its existing organization shapes how information is received, how disturbances move through its tissues, and which responses become possible. The state of a living system is not simply the background against which an event occurs. It helps determine what that event becomes.

Tone is not another wave

The body produces countless rhythms, but tone is not simply another rhythm among them. It is not your heartbeat, breathing, brain activity, muscle vibration, vagal signaling, or any particular frequency. Nor is it the sum of these processes. Tone is the organized state that shapes how they interact and how the body responds as a whole.

Tone is the integrated organization of the body's interacting state transitions at any given moment. It is how the mechanical, electrical, neural, chemical, metabolic, vascular, fluid, and behavioral processes of the organism are arranged relative to one another. It includes their amplitudes and frequencies where those apply, and also their timing, coupling, tension, excitability, responsiveness, constraints, and available range.



NOT ONE OF THEM tone is how all of them are arranged together, moment to moment.

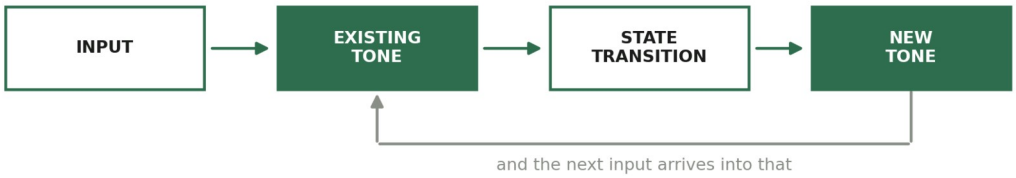
Think of a musical chord. Each note has its own frequency, but the character of the chord comes from how those notes relate to one another. Change one note, and the quality of the whole changes. The body works in a similar way. Its heartbeat, breathing, brain activity, and tissue tension are the individual notes. Tone is not any one of them. It is the way they are organized together.

The word tone already appears throughout medicine. Muscular tone. Vascular tone. Autonomic tone. Vagal tone. Cortical tone. Each names an organized state of one part of the organism. Are these unrelated uses of a convenient word? This model proposes that they are not. They are different projections of one regulatory property.

Tone describes the body that receives an input

Defined this way, tone helps explain a central clinical observation: the same input can produce very different outcomes. An input is any stimulus, sensation, or event the body receives, whether it comes from the outside world or from within. A workout may strengthen one person and injure another. A meal may nourish one body and upset the next. An infection may remain mild in one patient but become severe in someone else. One person may move beyond a stressful experience, while another continues to organize their behavior around it years later. Even the same therapeutic input can produce a meaningful response in one person and almost none in another.

These differences cannot be understood by looking at the input alone. Every event meets a body already shaped by its mechanical condition, nervous system activity, metabolic and immune function, previous experiences, expectations, and available reserve. Together, these factors influence how incoming information is received and which responses are possible. The input is what arrives. Tone is the existing organization that helps determine what it becomes.



RECURSIVE what the body has become decides how it receives what comes next.

The body therefore operates recursively. Each interaction changes its existing state, and that new state shapes how the next input is received. The outcome of one encounter becomes part of the starting conditions for the next. This ongoing cycle of input, response, and reorganization forms the foundation of the model developed throughout this paper.

The body does not need to replay its history for that history to remain active in the present. Training reshapes muscles and neural pathways. Repeated stress alters expectation and autonomic readiness. Injury changes movement patterns. Learning reorganizes synaptic connections. Each experience leaves the body differently prepared for what follows. Tone therefore connects the past, present, and future. It carries the effects of what the body has already experienced, describes how the system is currently organized, and shapes the responses available next. The past is not stored in an archive separate from the organism. It is expressed in the organization of the body itself.

Health is not one ideal state

If tone is an organized state, does health mean reaching the most ordered, relaxed, synchronized state available? It does not. A healthy body must tighten and release, accelerate and slow, attend and disengage, inflame and resolve, mobilize and recover, wake and sleep.

Stability alone is not health, because a system that holds one state perfectly and cannot leave it is rigid. Change alone is not health either, because a system that changes constantly and cannot stabilize is disorganized. Living health requires both: enough coherence to maintain an identity, enough flexibility to reorganize when conditions change. The property that matters is therefore not any single value. It is range.

When the system can move through an appropriate range, organize itself for the moment, and return or reorganize as circumstances change, tone is regulated. When some part of it can no longer leave a pattern that no longer fits the moment, tone is dysregulated. The problem is not tension, but tension that cannot release. Not sympathetic activation, but activation that cannot resolve. Not a stable pattern, since life depends on stable patterns, but organization that has lost the ability to reorganize.

The hidden variable between input and outcome

The central proposal can now be stated without a leap. A human body is an active, nonlinear, self-organizing system. Its processes continuously change state and interact. Their current organization determines how incoming disturbances are received. Those disturbances alter the organization. The altered organization changes what the organism can perceive, regulate, and do next.

That continuously updated organization is what this paper calls tone, and tone is the hidden term between an event and its consequence. It is why the same event produces different outcomes in different bodies. It is why health cannot be defined by a single static number. It is why regulation matters more than pushing a value up or down. And it is why interventions that look nothing alike sometimes produce strikingly similar changes throughout the organism. They enter through different doors. They meet the same organized system.

What to carry forward

1. Information is difference. A pattern carries information wherever a system can create differences and another system can detect them.
2. The body is continuously changing state. Electrical, mechanical, chemical, fluid, neural, metabolic, and behavioral processes run at once, not against a silent background.
3. The body is nonlinear. The effect of an input depends on the state of the system receiving it, and the response changes the state the next input will arrive into.

4. Organization is physically real. A coherent pattern can persist and propagate even though no single material component constitutes it. The solitary wave is the clearest physical example.
5. Tone is not a vibration or a frequency. It is the integrated organization of the body's interacting state transitions at a given moment.
6. Every input meets existing tone. The outcome belongs to the interaction between the event and the organism receiving it, never to the event alone.
7. Health is adaptive range. Regulated tone is stable enough to sustain coherent function and flexible enough to reorganize. Dysregulation is the loss of that capacity.
8. The body is a medium, not a container. Its tissues convert deformation into signal and back again. That coupling is what makes the body nonlinear in the first place, and it is what allows organization to travel through it.

Everything that follows develops these ideas across the nervous system, the tissues, health, disease, and healing, converging on the one property that makes us, us.

Abstract

Healers have spent centuries talking past each other, even though they all work on the same body. Chiropractic, osteopathy, physical therapy, massage therapy, acupuncture, somatic healing, and many other healing arts have each developed their own vocabulary for the same clinical phenomena. Medical doctors, working through pharmaceuticals and surgery, act on the same body for the same reasons, even when those reasons go unstated. The same goes for psychology, nutrition, exercise, coaching, and every other health-centered discipline. Each has its own philosophies, vocabularies, techniques, theories, and practitioners for the same human system.

The Unified Model of Tone proposes that these many sectors of health are not so different after all. They are different languages discussing the same phenomenon. That phenomenon is **TONE**. Tone is a regulatory system in its own right, as basic to the body as metabolism or respiration, and medicine has named it a dozen times over without ever noticing that it was naming one thing. It has been hiding in plain sight. Medicine already accepts that the body holds dozens of variables within narrow healthy ranges: blood pressure, core temperature, pH, glucose, heart rate, and many more[1]. Health is the body keeping each of these in its operational window, and disease is any of them drifting out and failing to return. What no one has claimed as one system is the property the body adjusts to move them. That property is tone. The clearest example is the autonomic nervous system, which runs on two opposing tones: a sympathetic tone that accelerates the body and a parasympathetic, or vagal, tone that slows it down[2]. The body is always setting the balance between these two. When sympathetic tone outweighs vagal tone, heart rate, blood pressure, and blood glucose climb; when vagal tone outweighs sympathetic, they fall[3]. Health is not a fixed setting of this balance but the body's ability to move it to wherever the moment demands. The same logic holds in every tissue: a muscle wound too tight is hypertonic, one too slack to do its job is hypotonic[4], and health is the tone the moment calls for. The body's own vocabulary already records this property everywhere it looks: muscle tone, vascular tone, autonomic tone, vagal tone, emotional tone[5], and more[6]. The word has been sitting in the medical vocabulary the entire time, correctly applied to a dozen separate systems and never once claimed for the single system beneath them all. That ubiquity is not an embarrassment to the claim made here. It is the best evidence for it. Each field was touching the same property from a different side, and each then went on using the word inside its own boundary without ever asking what the others were measuring.

This model does not claim the word tone. Charles Sherrington brought tone into modern physiology[7], and clinicians in more than one tradition built whole systems of care on it more than a century ago[8]. What has not been done before is the unification of tone. Muscle tone, vascular tone, autonomic tone, cortical tone and the rest are held here to be one regulatory system read at different sites. This model defines that system precisely enough to measure it and stakes the definition on predictions that can be falsified. That unification is the claim of this paper, and it defines the system with more precision than the word has previously carried. Tone is not a vibration, a single frequency, or the activity of any one part of the body. It is the integrated state that emerges from the relationship among mechanical tension, neural excitability, autonomic regulation, metabolism, circulation, immune activity, sensory processing, prediction, and behavioral readiness. At any given moment, tone describes how these processes are organized across the body and what that organization allows the system to perceive, regulate, and do next.

Vibration and rhythmic oscillation remain essential to the model, because oscillation is the medium through which tone is expressed, carried, and read.

Tone itself is the larger organizational condition: the state that embodies the consequences of prior experience while conditioning what the organism can perceive, regulate, and do next. The regulation of tone is health, and the dysregulation of tone is disease. This regulation operates across the body as one interconnected tension network, with oscillatory activity linking its processes across multiple scales. The sections that follow explain how that network functions.

The model asserts that every disease has a tonal expression, and that many are initiated, maintained, or amplified by failures of tonal regulation. Regulation is reciprocal: the nervous system shapes the tone of the tissues, while the tissues continuously report their state back, so that the two are always shaping one another. Tone does not travel through nerves alone. It propagates through many mediums at once, including neural, mechanical, fluid, and electrical fields, each transmitting at its own speed and in its own way, yet all synchronized to one another. This coupling, the same signal carried in many forms and held in step across them, allows the body to communicate information and maintain itself as a whole.

A single further principle organizes everything that follows and gives the model its clinical force. The effect of any event on the body is never determined by the event alone. It is determined by how that event interacts with the organism's existing tone. There is no such thing as an input acting upon an empty body. Every input, whether a touch, injury, pathogen, medication, meal, emotion, or therapeutic intervention, enters a body already shaped by its history, structure, expectations, and available reserve. The outcome depends not only on what arrives but also on the state of the body receiving it. This is why the same cause yields flourishing in one person and collapse in another, and it reframes health, disease, and treatment alike as properties of the encounter between input and tone rather than of the input by itself. This principle produces the model's clearest testable prediction. An intervention that directly pushes a physiological measure should move it in the same direction regardless of its starting point. An intervention that restores the system regulating that measure should produce a different result. Values that begin too high should decrease, while values that begin too low should increase, with both moving toward the body's appropriate regulatory range[9]. This response should occur across whichever independently regulated measures are displaced in that person at that time. If patients starting above and below their respective healthy ranges move toward those ranges, and the effect exceeds ordinary variation or regression to the mean, the resulting convergence would support the model's central claim.

Three kinds of statement appear in this model, and it is written so that a reader can always tell them apart. The first is established science that the model synthesizes rather than originates, including the architecture of interoception[10] and the central autonomic network[2], the convergence of somatic and visceral signals in the spinal cord[11], the metabolic cost of prediction error[12], and the mechanics of biotensegrity[13]. Those findings are cited for what their investigators established. No researcher named in this paper has proposed tone as it is defined here, and none is enlisted to endorse it. The second is the model's own contribution: its original claims and the predictions that follow from them, foremost that tone is the master regulatory variable, that it is the hidden term between every input and every outcome, and that the distortion every profession treats is a breakdown in the body's recursive registration of itself. These are offered as claims and framed as

predictions, so that they can be tested and confirmed by the results they specify. The third is illustration: the analogies and demonstrations that carry no evidentiary weight but make an abstract principle legible. A unifying framework should be judged by the standard proper to one. The question is not whether it explains little, since explaining a great deal is the whole ambition of unification, but whether the unification is coherent, whether it is parsimonious, and whether it makes predictions specific enough to be tested. This paper is written to be read on those terms.

This model seeks to answer questions that every healing tradition has confronted but none has fully resolved, including the cause of idiopathic disease, how subclinical pain and symptoms arise, and why physical, mental, and spiritual health are so interconnected. What follows is an account of what tone is, how it organizes across biological scales, how it becomes distorted, why the same input lands differently in different bodies, and why every therapeutic intervention, from chiropractic adjustments to pharmaceutical prescriptions and surgical procedures, has the capacity to help the system reorganize toward a higher level of coherence. The professions differ in how they read the body and in the names they give what they find. Beneath every one of their instruments is the same regulated property, and the sections that follow trace it from the whole body down to the single cell.

I. The Problem of Parallel Vocabularies

Walk into a chiropractor's office and hear about subluxations, nerve interference, and adjustments[14]. Walk into an osteopath's and hear about somatic dysfunction and manipulation[15]. A physical therapist will describe movement impairments and corrective exercise. A massage therapist will speak of trigger points and myofascial release. An acupuncturist will describe qi stagnation along meridians. A nutritionist will speak of inflammation, deficiency, and gut health. A psychologist will name held trauma, emotional dysregulation, and behavioral processing. A medical doctor will describe pathophysiology, receptor dynamics, and tissue lesions that require pharmacologic or surgical intervention.

These professions have spent decades defending their territory against each other, often with genuine hostility. The dominant assumption has been that only one can be correct, and that the others are either trespassing on real clinical science or hiding behind pseudo-scientific vocabulary. The clinical outcomes tell a different story. Skilled practitioners in every one of these traditions get results. Across different forms of care, patients often describe a similar pattern of change. Pain decreases, posture improves, breathing deepens, and movement becomes easier. Sleep may improve, energy may return, emotional tension may soften, and patients may report feeling more at home in their own bodies. What makes these outcomes significant is that they appear across professions using different methods and pursuing different immediate goals. A clinician may set out to improve one aspect of function, only to see changes emerge in several others. The overlap raises a larger question: are these separate effects, or different expressions of the same underlying shift in regulation? Not every patient will experience every one of these changes. The body compensates where it has capacity and expresses difficulty where that capacity is most limited. What matters is that these outcomes appear together often enough to suggest an underlying connection. When a physician sees laboratory values normalize, a psychologist sees persistent fear begin to ease, and a chiropractor observes a guarded body relax, they may be

witnessing different expressions of the same regulatory shift. Each profession observes that change through its own lens and describes it in its own language. What differs is not the body moving toward recovery but the aspect of that recovery each clinician is trained to recognize.

When different professions repeatedly observe similar patterns of improvement, the question is not which discipline owns the result. It is what those approaches may be influencing in common. The Unified Model of Tone proposes that methods built on different theories can still affect the same underlying regulatory system. This is an inference, not a conclusion established by similarity alone. Expectation, natural recovery, and the passage of time can also contribute to improvement and must be considered when evaluating any intervention[16]. Yet these influences do not exist outside the body. Expectation changes how an experience is received, and time allows biological processes to unfold. Both still depend on a living system capable of changing its state. The same principle extends to pharmaceutical medicine, surgery, nutrition, psychology, and other forms of care. A medication may block a receptor, replace a missing substance, or alter a signaling pathway. Surgery may remove harmful tissue, repair an injury, or relieve a burden the body could not resolve on its own. A change in diet may reduce an inflammatory exposure or provide the nutrients needed for repair. Psychological therapy may help a person process and integrate expectations of a threat that has shaped their nervous system for years. These interventions are not interchangeable, and their specific mechanisms matter. What they share is that each changes the conditions under which the body functions and responds. No intervention performs the body's recovery for it. Treatment may remove an obstacle, supply a missing resource, alter a harmful process, or create the conditions for change. The repair, adaptation, and reorganization that follows is still occurring within the living system itself. Chiropractic has expressed a version of this principle for more than a century[8], but the principle does not belong to chiropractic alone. It applies wherever care supports the body's capacity to recover, regulate, and respond. The question is what variable health and illness share, and how to name it in a way that does not privilege one profession's vocabulary over another's.

The proposal of this paper is that the shared variable is tone. Each profession in the list above is reading the tone of the system through its own instrument and adjusting it through its own input: the chiropractor through the spine, the massage therapist through the muscle, the physician through the receptor, the psychologist through the mind. None of them is doing something categorically different from the others. They are reading the same property at different sites and feeding the body different signals. This reframes the clinical question every tradition shares. The task is not to pick the one correct intervention but to meet the system where it is and give it the input it is most ready to receive, through whichever window sits closest to where the tone has drifted. It is also why a given discipline can be exactly right in one situation and wrong in another. A lifesaving surgery is the obvious choice for an organ failure, while that same surgical model offers little to a stress headache or a stiff lower back. The reverse holds too: the endocrinologist and the mental health professional are not interchangeable, yet each genuinely helps the people their window fits. They are all measuring the same body and affecting its tone, each in their own way. The measure is how well the input matches how the tone has drifted, whatever profession delivers it.

If this layer of regulation is so fundamental, why has it remained difficult to recognize? Part of the answer lies in three habits of clinical thought that have each proven useful but become limiting

when treated as complete. The first is lesion bias, the assumption that a genuine problem must appear as visible tissue damage. Under that assumption, a disorder of regulation can look like no disorder at all. The second is static-imaging bias, which evaluates a living system through a still image. Such images can reveal structure, but they cannot fully capture how the system is functioning over time[17]. The third is molecular-mechanism bias, which assumes that an explanation becomes valid only when reduced to individual molecules. This model proposes that changes in cortisol, cytokines, and growth factors may reflect an underlying tonal state rather than represent its original cause, although those molecules can also participate in the processes that sustain it[18]. That relationship is offered as a testable hypothesis. Together, these assumptions can obscure a layer of organization that is neither a visible lesion nor a single molecule. They can also obscure the difference between suppressing a signal and restoring the regulation that produced it.

The historical placement of chiropractic within this landscape deserves explicit acknowledgment. The profession was founded in 1895 by D.D. Palmer[19] on tone. His proposition was that the nervous system is the master regulator of human physiology, that the spine is its structural home[20], and that interference with nervous system function produces systemic dysfunction regardless of the organ or symptom through which it manifests. Palmer described this framework using the vocabulary available to him, because the fields of neuroimmunology, systems neuroscience, and computational neuroscience did not yet exist. His organizing clinical observation was that when the body's regulatory interface is clear, the body organizes its own healing, and when that interface is interfered with, it struggles with dis-ease.

In 1895 Chiropractic made one of the largest claims in the history of healthcare: that a single system underlies the function of the whole body, and that one profession had access to it. This is the source of the profession's troubled reputation. A claim that big, with no neuroscience to support it at the time, was bound to sound like overreach in the mouths of its least careful practitioners. Palmer had the central observation right, but he had no way of knowing how far it extended. Palmer named something foundational and mistook the part he understood for the whole premise. Chiropractic has spent more than a century being punished for the size of its idea rather than credited for finding tone early. This paper credits the finding and declines the ownership of the concept. A principle that turns out to govern the whole body was never going to belong to whichever profession noticed it first. It belongs to all of humanity.

Every healing tradition has independently discovered pieces of tone, which itself is far older than any modern profession. The model makes no claim of priority over any profession. What chiropractic contributed was a specification: the nervous system as the regulatory center, the spine as its structural access, and a complete system of care built on that identification. It is the genesis this paper reads as closest to the model described here, which is why it is named. The model also stands on more than precedent. The central nervous system is the most concentrated regulator of tone, the highest-density integrator that reads the state of the whole body and sets the frequency of the system and its parts. It is worth being precise about the sense in which it is the master. The nervous system is not the only tissue that regulates; every tissue in the body registers its own condition and constrains its neighbors, so that regulation is distributed across the entire organism. What the nervous system does uniquely is gather, model, prioritize, and redistribute what the whole body is already registering, folding a distributed regulatory process

into increasingly unified action. Every profession reaches this integrating system through some access point. A medication reaches it through the bloodstream, a conversation through the mind, a massage through the skin, etc.

The Unified Model of Tone has been arrived at only after hundreds of years of human study. Earlier models have pursued a concept of unification, but only within defined boundaries rather than through a single body-wide property. Osteopathy developed a neurofasciagenic model of somatic dysfunction that integrated fascial and neural mechanisms into one account[21,22]. It was an important synthesis, but it remained limited to two tissue systems, one profession, and one clinical entity. It did not propose that the variable being described was foundational to bodily organization itself. Chiropractic developed its own integrative models of vertebral subluxation during the same period. These models assembled multiple known components of the nervous system and biomechanics into increasingly complex clinical constructs, but they did not extend into a general account of how the body regulates itself. Polyvagal theory offered a broader synthesis by linking autonomic regulation, affect, and social behavior through differentiated vagal pathways[23]. Yet it remains centered on a specific part of the nervous system and depends on a particular phylogenetic interpretation of vagal anatomy. A further limitation shared by these models is that they rarely specify the findings that would establish them. With explicit criteria fixed in advance, a model can be progressively confirmed by evidence rather than merely defended or revised from outside. For this reason, the Unified Model of Tone states throughout the specific findings that would establish it. Previous models unified phenomena within a boundary. The scientific literature has near neighbors of its own, and the model owes them the same accounting. Network physiology maps the organ systems as one network of coupled interactions and has shown that the topology of that network reorganizes as physiologic state changes[24]. It establishes the coupling this model requires, and it stops where this model begins: it names no regulated property behind the couplings, gives no account of the tissue architecture that carries them, and prescribes nothing clinically. The loss-of-complexity framework showed that healthy physiology is dynamically complex and that aging and disease flatten that complexity[25]. It describes the signature of dysregulation with precision while leaving unnamed the property whose dysregulation produces the signature. Allostasis reframed regulation as prediction, the brain adjusting set points in advance of demand rather than defending them after the fact[26]. It unifies the logic of regulation without extending into the tension network that carries it or the encounter between input and organism that decides what any input becomes. Each of these frameworks establishes a piece the clinical traditions lack, and each stops at its own boundary. The Unified Model of Tone advances the stronger claim that the boundary itself is the error. Muscle tone, vascular tone, autonomic tone, cortical tone, fascial tone, and every other specialized use of the term are not separate regulatory phenomena. They are local expressions of one body-wide regulatory property, measured at different sites and through different instruments.

If tone is the shared regulatory property influenced across health professions, then dysregulated tone represents a common underlying challenge they address. To understand how that dysregulation develops, think of the nervous system as a processor with a limited amount of available capacity at any given moment. It continuously receives information from the body and the outside world, interprets those signals, and coordinates the responses needed to maintain function. A car accident, a cross-country move, a divorce, prolonged postural strain, a bad diet, and unresolved trauma may differ in form, but each places demands on the same system. Each

must be received, processed, and integrated into the body's ongoing regulation. When too much information needs to be processed at once, more than the system can integrate, things get missed and miscalculated. Cortical maps become smudged[27], the system's capacity to regulate itself is reduced, and regions of the body drift outside of a healthy range of tone. That drift is what every healing art diagnoses. It is a whole-system state, read at whatever site each profession is trained to look.

What makes dysregulation so large a phenomenon is that your body's processor, the nervous system, sets the tone of muscle, fascia, tendons, and ligaments. It is also responsible for running mood, digestion, hormones, perception, and behavior[28]. A single loss of regulation can therefore surface in many different places. The chiropractor feels it as a guarded, asymmetric segment and calls it a subluxation. The psychologist hears it as depression, or as a habit the patient cannot break. The gastroenterologist finds it in a gut that will not settle. The endocrinologist reads it in a hormone panel that has tilted off balance. Each of them is right about what they found, and each has found a reading rather than the root cause. A hormone panel is tone measured in the blood. A guarded segment is tone measured in tissue. If you mistake a doctor's symptom reading for the root cause every profession ends up with its own diseases. The four findings above are really one variable sampled at four sites. These are not separate diseases that happen to coincide. They are a dysregulated body displaying itself through four different systems. Each of those findings is a reading of tone taken through one instrument; none of them is the tone of the body itself. They also don't have to appear together. Compensating systems exist to keep the whole organism from failing, so one dysregulation may surface in many places, in a few, in one, or none. Someone with high blood pressure does not also have to carry pain, depression, and a skin condition, though they could. Tone is the signal the body is reading to know itself. Changing tone changes how the body interprets information, and the system recalculates. An intervention at any window, whether the spine, the gut, the mind, or the bloodstream, does not repair the body directly. It hands the body cleaner information so that it can reorganize itself more efficiently.

This is the ground the rest of the paper stands on. Tone is the variable every profession reads and every profession works on, whatever name each one gives it. But what is tone, that it can be regulated and dysregulated, expressed and carried and read at every scale of the body at once, from the single cell to the whole organism? The next section answers that question.

II. What is Tone?

Tone is the state variable of living tissue expressed at every scale, from the single cell to the whole organism. It is at once a mechanical property, expressed as tension, stiffness, compliance, and prestress[13], and a neurological one, expressed as excitability, firing rate, and oscillatory coherence[29]. At the level of the cell these are the same phenomenon seen through different lenses. But mechanical tension and neural excitability are themselves projections of something more general, and naming that general thing precisely is the task of this section. The intuitive definition, that tone is the body's vibration or a muscle's tension, is true but incomplete. That incompleteness is what has kept the many named tones apart. Defined as tension or vibration, tone stays a property of whichever tissue is under examination. There is then no way to see that the tone of a

muscle, the tone of a vessel and the tone of the vagus nerve are one variable read in three places. Defined as organization, they are.

There is something right in the vibrational intuition. Oscillation is genuinely everywhere in the body, and it is fundamental to matter itself: modern physics describes the material world less as static substance than as excitation, stable patterns held in fields that are never at rest[30]. A living body, built of matter that is itself organized motion, is a vibrational system and any account of its state has to begin from motion rather than from stillness. The clinical definition of tone that follows depends only on what motion in a living body is organized into.

Oscillation does more than hold matter together; it carries information. What distinguishes one arrangement from another is the pattern of its oscillation, and a difference in pattern is a difference in information, because a pattern that could not have been otherwise carries nothing[31]. Frequency is how a system encodes what it is and what it is doing. The encoding is not added to the oscillation by anything outside it. The rate is the message, in the same way that the same air carries one message at one pitch and another at a different one without the air itself changing. The qualities a body perceives, such as color[32], warmth, pitch, and texture, are differences in frequency it is built to read[33], and perception itself is the reception of frequency. In a living system, information rides on oscillation, and that is the first clue to what tone must be.

Oscillation is the medium in which tone is written, but tone is not any one oscillation, and it is not a mere fact of vibration. A living body runs countless oscillations at once, at every scale, and what matters is never a single frequency in isolation but how all of them are organized in relation to one another. Tone is that organization. More precisely, tone is the integrated organization of the body's interacting state transitions: the way its mechanical, electrical, chemical, fluid, and neural processes are related at a given instant, taken as one bound state rather than a list of parts. Vibration is a component of tone, its carrier, in the way the notes are components of a chord. But the chord is not the notes. It is the relationship among them, and it is the chord that the ear, and the body, actually reads. Tone may be mechanical, electrical, chemical, or molecular, and it carries information in every one of those registers. This is why the definition of tone is written as organization rather than as vibration.

Defining tone as organization makes it possible to explain what a purely vibrational definition cannot. DNA and binary code illustrate the underlying principle. DNA carries information through the sequence of its nucleotide bases, while computers carry information through organized differences between electrical states. In both cases, the information resides in the pattern, not in the particular material expressing it. The Unified Model of Tone applies this same principle to the body. Tone is not a vibration, a frequency, or a level of muscular tension. It is the organized state through which the body holds information, coordinates its functions, and determines the responses available to it.

This definition explains how tone can be mechanical, neurological, autonomic, metabolic, and emotional without being confined to any one of those categories. Tissue tension, membrane potential, autonomic bias, inflammatory activity, vascular resistance, cortical excitability, interoceptive accuracy, and emotional readiness each reveal a different aspect of the body's regulatory organization. They are not identical measurements, and they do not have to change together. They are different views of an interconnected whole, shaped by the tissue being observed

and the instrument used to observe it. Muscle tone, fascial tone, and dural tone are therefore not separate kinds of tone. They are local expressions of a broader organizational state that determines how the body perceives, responds, and adapts.

That state also connects the body's past, present, and future. It carries the past because previous experiences leave lasting changes in neural connectivity, tissue organization, immune activity, and learned patterns of regulation. It expresses the present because those accumulated changes constitute the state the body currently occupies. It shapes the future because that state determines which inputs the body can recognize, which demands it can absorb, and which responses remain available. The body does not need an archive standing apart from itself to remember what it has experienced. Its history is already embodied in the way it is organized. Tone is therefore how the body carries its past into the present and gives shape to what it can do next.

Defining tone as organization also reveals the loop the whole model turns on, because organization is continuously produced. Mechanical, chemical, electrical, and environmental inputs arrive and register as distinguishable state transitions; those transitions alter the body's tone; the altered tone reorganizes tissue geometry, neural excitability, autonomic output, metabolism, and perception; that reorganization influences what the body can do; what it does becomes experience and behavior; and behavior changes the inputs the body next meets, closing the loop and beginning it again. Two of those steps carry most of the weight, and the argument is not usable until both are spelled out. Take the first. A transition alters tone because tone is the sum of what is currently running. Every input that registers is one more oscillation entering a medium already full of them, and the combined state that results is not the state it entered. Nothing has to be added to the body and nothing has to break for its tone to change; the arriving signal joins what is already there, and the whole reorganizes around the new sum. Now the second. The altered tone reorganizes tissue because tissue holds the shape its tone permits. A change in tension redistributes through the network rather than staying where it landed. The resting geometry shifts to accommodate it, and the receptors embedded in that geometry begin reporting from a body no longer arranged the way it was. What the nervous system predicts is built on those reports, so the prediction shifts with them, and the regulation sent back out shifts in turn. Neither step is a leap. Each is the ordinary consequence of a body being one connected, oscillating medium, which is why the loop turns continuously rather than waiting for something to go wrong. Interaction to transition, transition to tone, tone to structure, structure to function, function to experience, and experience to the next interaction. This is the architecture by which a body maintains itself, and it is why tone applies without slippage from the single cell to the whole person. At every level the same loop is running, and tone is the name for its integrated state at that level.

Oscillation becomes form, and tone turns into structure. A vibrating system does not fill space evenly; it organizes itself into a standing wave, a fixed pattern of regions that move and points that stay still, the still points called nodes[34]. Matter, given the chance, collects at those nodes, because they are the low-energy places it can occupy without continuous effort. Scatter fine particles on a vibrating plate and they migrate off the moving regions and gather along the nodal lines, tracing the standing wave as a visible pattern[35]. Carry the same principle into a volume: vibrate a fluid from every side with particles suspended in it, and those particles are drawn into an ordered, three-dimensional lattice, a crystal-like arrangement of matter where a moment

before there was only formless suspension[36]. Vibration introduces order where there was none. And only certain orders are permitted: a standing wave can hold only where it divides its medium into a whole number of half-waves[34]. The size and shape of a structure and the vibrations it can sustain are two statements of one fact. The form permits only certain standing waves, and those standing waves are what hold the form. Living tissue adds one qualification to the textbook case. A body is a nonlinear medium, so its patterns are not fixed the way a plucked string is fixed. They are self-maintaining, which is why they can hold for years and also why they can reorganize abruptly once the balance sustaining them is changed.

This is the concrete meaning of the step in which tone becomes structure. Matter takes the shapes its own standing waves carve out, settling into the nodes those waves define. A living body is no exception. Its tissues are held in the pattern of stillness and motion that its tone lays down, from the lattice of a mineralized bone to the standing distribution of tension across a fascial sheet. It also shows why changing tone changes form. Shift the vibration and the nodes fall in new places; the pattern of rest the matter had settled into is gone, and the structure must reorganize around where stillness now lies. Resonance, in these terms, is the standing-wave pattern a structure most naturally holds, the form it can keep with the least effort. Distortion is interference that smears that pattern, so that the body can no longer settle cleanly into the shape its own tone would otherwise carve. To move tone, then, is never to push on a static object. It is to change where the nodes fall and let the body find the new form its own organization now permits.

How is such an organization carried? Through oscillation, coupled across scales. A living body is a nested set of rhythms: the roughly one-per-second cardiac cycle[37], the slower respiratory cycle, the day-long circadian cycle[38], and, within the brain, the coordinated firing of neuronal populations across the familiar frequency bands[29]. A healthy body holds these in phase with one another, each rhythm supported by the ones above and below it.[39] The coupling runs through several channels at once: chemical synapses, direct electrical junctions[40], shared extracellular fields[41], and even the mechanical deformation tissues transmit as they work[42]. These are not separate signals but one multi-domain signal expressed through whatever medium is available, and the coherence of that signal, across all its channels and all its scales, is tone. The single neuron is the same story in miniature: a tuned oscillator with preferred frequencies at which it answers most readily[43], its own tone being simply how ready it is to respond. From the ion channel to the waking coherence of a whole nervous system, the body is organization built from coupled oscillation, and tone is the state of that organization at any level one chooses to read.

If tone is a real state variable, it has to be measurable independently of whether the person turns out to be healthy, or the definition collapses into a circle. Tone shows itself wherever a rhythm can be measured for more than its average: in the variability of a signal rather than its mean, in the coupling between two rhythms rather than either alone, and in how a system responds to a challenge and recovers from it rather than how it sits at rest. Heart rate variability and its internal structure[44], the phase-coupling between slow and fast neural rhythms[45], the responsiveness of a reflex[46], the time a system takes to return to baseline after a demand[47]: each is a window onto the same underlying organization, and each can be recorded before the clinical outcome is known[5]. This is the sense in which tone is a measurable construct rather than a label applied after the fact. One could, in principle, record these measures in two people this afternoon and use them to anticipate how differently the same event will land on each of them tomorrow. The model predicts

that variability structure, cross-frequency coupling, reflex responsiveness, and recovery time, recorded together in the same subjects, will share a common underlying factor rather than varying independently. Should they load on a common factor, tone is one variable and this section holds. One guard belongs on that test, because measures recorded in the same people can share a factor for uninteresting reasons. The tone factor must survive adjustment for age, fitness, and inflammatory status, and it must predict how differently the same input lands in different people. A factor that remains after these adjustments and predicts how differently individuals respond to the same input would support the model's central claim that tone is a distinct, shared regulatory variable rather than a general measure of health.

With tone defined, health and disease become statements about the same variable. A living system does not settle into the lowest available energy; it holds itself between order and disorder, stable enough to keep a coherent pattern and loose enough to generate novelty[48]. This refines what health is. Health is not maximum relaxation, and it is not perfect resonance either. Too far toward order and the system goes rigid, over-constrained, able to hold a pattern but unable to leave it. Too far toward disorder and it goes chaotic, under-constrained, able to change but unable to organize or hold. Health is the balance between them: enough stability to keep an identity and enough flexibility to reorganize when conditions change. Complex-systems research calls this productive middle the edge of chaos[49], and coordination dynamics formalizes the same regime in the brain as metastability, in which components neither lock fully together nor run free but hold a tendency toward both[50]. This model calls its biological form adaptive coherence: coherent enough to function, flexible enough to learn and adapt, and a range of available states rather than any single ideal one. Health is regulated tone and disease is dysregulated tone. This is the same thing the physics of open systems describes from another direction: a living body, like a whirlpool, keeps its shape only as long as energy flows through it, held far from the equilibrium that, for a living system, means death[51]. Health is energy moving through the system; disease is energy bound within it.

The word is old and its lineage is honorable. Charles Sherrington brought tone into modern physiology in the first decade of the last century[52], in the same work that named integration as the nervous system's defining task, and muscle tone has been standard vocabulary ever since[4]. Claude Bernard had already established that the body defends the constancy of its own internal environment[53]. Walter Cannon named that defense homeostasis[1]. Hans Selye showed that sustained defense carries a cost the body eventually pays[54]. Norbert Wiener gave regulation its formal grammar of feedback[55]. Ilya Prigogine showed how open systems held far from equilibrium generate order rather than lose it[51]. Yoshiki Kuramoto gave the mathematics by which independent rhythms lock into a common one[56,57]. The clinical traditions arrived at the same property from the other side. More than a century ago the founder of chiropractic named tone as his central principle: the standard from which every variation of structure and function is measured, and the standard of health from which any deviation is disease[8]. He built an entire system of care on the claim that the body's regulation is set by it. He had the recognition right and the mechanism unavailable to him, and he bound the principle to one tissue and one profession, which is the ordinary fate of a large idea found early. Practitioners in other lineages reached for versions of the same idea in their own vocabularies. Every element of the architecture described in this paper was established by someone, and each is credited where it is used.

The strongest fact available in support of this model is that it has been discovered so many times by so many professions. A dozen fields kept reaching for tone and applied it correctly in each case. Physics keeps this wisdom; it has gone here before. Heat, mechanical work, and electrical and chemical processes were each measured separately for generations before the nineteenth century established that all of them were forms of one conserved quantity[58,59]. The discovery was not the arrival of a new word. It was that the old measurements all referred to one thing. The Unified Model of Tone makes exactly that claim about the body. Muscle tone, vascular tone, autonomic tone, vagal tone, cortical tone, fascial tone, dural tone and emotional tone are not a family of loosely related properties that happen to share a name. They are one regulatory system, read at many sites by many instruments. No one has made this claim, defined the system precisely enough to measure it, and staked it on predictions specific enough to be tested. The Unified Model of Tone does all three.

Named as organization, tone is legible at every scale and coupled across all of them. A neuron's membrane tension shapes how its channels gate[60,61]; the cytoskeleton's mechanical state reaches the nucleus and influences which genes are expressed[42]; muscle tone is the organized signature of many motor units firing together[62]; autonomic tone is the balance of sympathetic and parasympathetic drive[63]; cortical tone is the coherence of neural rhythms across the whole brain[64]; fascial tone is the mechanical state of the connective-tissue continuum[65]. These are one organizational phenomenon expressing itself at different scales, coupled through the physical and informational continuity of the body, so that a change at any scale is registered, to some degree, at every other. Registered is not the same as visible. A well-resourced system absorbs most of what it registers, and the change stays below the threshold of any instrument pointed at it. Restore tone anywhere in the system and the restoration propagates, because the body is one instrument played across many octaves. This legibility is a claim in its own right, stated here in its strong form: tone is fractal. Neurophysiology already describes the cellular case and calls it the central integrative state.[66] It is the running sum of every excitatory and inhibitory influence converging on a neuron at a given moment, the baseline that decides how that neuron answers the next signal.[67] That much is established.[68] What this model adds is the identification. The central integrative state is tone read at the scale of a single cell, and tone is that same state read at the scale of a whole organism. The construct does not change as the resolution changes; only the way we measure it does.

Every experience that reaches the body is a frequency arriving at the system. When the system can integrate it, the input becomes part of the whole and the body's organization grows more complex, which is learning and adaptation. When it cannot, because the input was too intense, too novel, or arrived when the system was already depleted, it is held instead as a standing dissonance, a frequency out of phase with the rest, and dysfunction follows. What that held distortion looks like when it takes physical form, how it is stored across the body's many layers, and how every profession comes to read and interact with it are the subjects of the sections ahead. Tone is what all the body's oscillations together compose, the organization a clinician feels soften under the hand and a patient feels as a breath that finally deepens, and the one thing that every effective intervention, whatever its instrument, is ultimately changing.

III. The Architecture That Makes Tone Possible

The Unified Model of Tone asserts that the human body is a biotensegrity structure. Stephen Levin has argued and developed the case for decades[69]. Donald Ingber's work established the same principle at the scale of the single cell[70], where the evidence is least disputed[13]. This model posits the architecture as load-bearing and states that a living body is held in shape by distributed tension rather than by stacked compression. Tone is the state of that tension. Bones float within a continuous tension network composed of every soft tissue in the body: muscle, tendon, ligament, joint capsule, fascia, dura, and the connective tissue investments of every organ. The tension network is prestressed.[13] It holds the compressive elements in spatial relationship through distributed tensional forces rather than localized contact pressure. No single tissue carries the architecture. The architecture is the integrated tensional state of all of them.

This architecture is what allows tone to exist as a geometric property, and here the model departs from the account it inherits. Biotensegrity, as it has been argued in the literature, is a claim about load. This model adds a claim of its own: the tension network is the body's geometric self-registration, which is to say that its integrated tensional state is how the body knows its own shape. Holding the body up is only part of what it does. The tension network continuously registers, in its own organization, where every part of the body is[71]: how each element is loaded, what is compressed, what is stretched, what movement is available, what movement is being protected against, and how each local region stands in relation to the whole. The tension network does not simply send messages about bodily geometry to some other system that reads them. Its current organization is the current bodily geometry. Fascia, muscle, ligament, joint capsule, dura, bone, fluid pressure, and visceral suspension serve as structural materials, and together they also form a continuously updated geometric model of the organism, embodied in tissue rather than represented apart from it. Geometry here is embodied relational information rather than structure alone: the parts generate the geometry of the whole, and the geometry of the whole constrains what each part can do. This is why a change in tension anywhere becomes information everywhere, and it is the mechanical face of the recursive self-registration the whole body is engaged in.

This has profound implications. A local change in tension does not stay local. It redistributes throughout the system. When one corner of a tensegrity structure is stressed, the entire structure adapts to preserve balance and function.[13] It is why the model expects, and clinicians commonly report, remote effects that a purely local view finds puzzling: a plantar fascia that influences headaches, a big toe injury that alters contralateral shoulder gait, cranial work that reaches the sacrum. These are offered as consequences the tensegrity principle predicts rather than as independently established facts. They follow directly from a single premise: the tension network is the medium through which mechanical and informational continuity is preserved across the body, and every soft tissue contributes to that continuity in its own way.

Each tissue class plays a specific role within the network. Muscle is the active tensioning element, capable of generating and modulating force on demand. Tendon transmits muscular force into the skeletal architecture and reports load back to the nervous system through Golgi tendon organs[72]. Ligament stabilizes joints at end-range and reports position through Ruffini and Pacinian endings[73]. Joint capsules contain the four classes of mechanoreceptor described by

Freeman and Wyke[74] and produce the dense afferent stream the brain uses to know where the body is in space. Not all of the body's governing runs through the brain. Central pattern generators, the local circuits in the cord that produce rhythmic output on their own, keep organizing movement even when descending control is removed: a decerebrated cat placed on a treadmill still walks. Locomotion, breathing, and chewing are governed locally, and the cord is a regulator in its own right rather than a cable carrying orders. The dura anchors at the foramen magnum, the lower cervical transverse processes, and the sacrum; it transmits tension along the entire length of the central nervous system and modulates the mechanical environment of the spinal cord itself. The dentate ligaments, typically twenty-one pairs of them, extend from the pia mater to the dura[75] and suspend the cord within the dural sleeve like a hammock. The Hofmann ligaments do the same in the other direction, anchoring the dura mater to the vertebrae[76]. The connective tissue investments of the viscera tether the organs into the same tensional field, which is why postural distortion can influence digestion, breathing, and pelvic function. Bone, although traditionally considered the passive compressive element, is itself a piezoelectric tissue that generates electrical signals in response to mechanical load[77] and remodels its own architecture in response to those signals over time. This is Wolff's law expressed at the cellular level. Every tissue is both tensioned and tensioning, both signaler and signaled, and tone is the coordinated state of the whole.

What is true of bone is true of the network that holds it. Collagen is piezoelectric[78], and collagen is the principal structural protein of every tissue just named. Tendon, ligament, joint capsule, fascia, dura, and the connective investments of the organs are all collagenous. The tension network is therefore not a mechanical architecture that happens to contain one electrically active tissue. It is a continuous electromechanical medium. Strain it anywhere and charge separates. Impose a field and it strains.

The cell membrane contributes the same property by a different route. A bilayer is polar across its thickness, so bending it separates charge, a coupling called flexoelectricity[79]. Every cell held within the tension network is an electromechanical element in its own right, and the mechanically gated channels already described sit inside a membrane that is itself turning deformation into potential.

In hydrated tissue a substantial share of the measured strain-to-voltage signal is streaming potential, an electrokinetic effect produced by fluid moving through a charged matrix rather than piezoelectricity in the strict crystallographic sense[80]. Both mechanisms convert deformation into electrical signal. Both depend on the rate at which deformation arrives rather than on its final magnitude. Both therefore make the same prediction for the model: how a load arrives counts for more than how large it is.

One structural condition underlies everything. Electromechanical coupling requires a medium that is not symmetric about its resting state, because a perfectly symmetric structure produces no net polarization under load. Opposing contributions cancel. The tension network is prestressed, and prestress is precisely a standing bias away from the symmetric point. The same prestress that gives biotensegrity its stability is what gives the network its electromechanical sensitivity. These are not two properties of the architecture that happen to coincide. They are one property described two different ways.

How many distinct tension patterns can the body hold? This model's answer is that there is no closed list. Tension weaves through skin, fascia, muscle, tendon, ligament, bone, and organ in combinations that are effectively countless. Any fixed taxonomy of patterns is a teaching device rather than an inventory of what a body can hold. This is why two people presenting the same complaint rarely hold it the same way.

Fascia warrants particular attention within the body's network because it is the most continuous of the soft tissues and serves as the primary medium through which tension is distributed across regional boundaries. Systematic investigation of fascial innervation has demonstrated that fascia throughout the body, and particularly the thoracolumbar fascia, contains free nerve endings, Pacinian corpuscles, and Ruffini-like endings capable of mechanosensory and proprioceptive signaling[81]. Fascia transmits force and information simultaneously. Robert Schleip's research on fascial mechanoreceptors adds an essential detail. The majority of fascial nerve endings are interstitial receptors[82], and these participate in two direct autonomic feedback loops. The first operates through intrafascial vasomotor reflexes: mechanoreceptor stimulation alters local blood flow and tissue viscosity through autonomic pathways[83]. The second operates through the hypothalamus: sustained deep pressure on fascial tissue activates the parasympathetic anterior hypothalamus, producing global neuromuscular relaxation[83]. Helene Langevin and Schleip established that fascia is a sensory organ and a mechanical continuum, densely innervated and coupled to autonomic outflow[84]. Neither of them wrote what the model writes next. The model holds that fascial tone and brainstem and hypothalamic state are one variable read at two sites, so that a change in either is a change in both. This is part of why sustained hands-on contact, regardless of tradition, produces the parasympathetic shift every bodywork practitioner recognizes. The principle generalizes. Mechanoreceptive afference from muscle spindles, Golgi tendon organs, joint capsule receptors, ligamentous endings, and visceral mechanoreceptors all feeds the same integrative architecture[72], and tone change at any of these tissues registers in the same regulatory centers.

A complementary anatomical model from Epstein's framework refines the picture of how tone is held and regulated through the spine specifically[85]. Epstein extends Manohar Panjabi's foundational model of spinal stability, which describes three interacting subsystems[86]: the passive subsystem (vertebrae, discs, and ligaments), the active subsystem (muscles and tendons), and the neural control subsystem. Epstein adds an essential refinement. The meninges act as a transducing component of the neural control subsystem, because dural tension state is itself a regulatory variable rather than a passive consequence of position[87]. An emotional subsystem occupies portions of the same anatomical and physiological space as the three subsystems and becomes most responsive when they can no longer dissipate the tension placed upon them. This causes dysregulation in the body. The closest established neuroanatomical model is the emotional motor system described by Holstege, which projects from prefrontal cortex and caudal brainstem into the spinal cord, influences sympathetic and parasympathetic tone, establishes specific emotional behaviors, and triggers rhythmical spinal reflexes[88]. Each subsystem holds and dissipates energy through the medium. When they coordinate synergistically, the spine maintains the far-from-equilibrium responsiveness life depends on. When coordination breaks down, energy that should be moving through the system gets stored, and the subsystems begin pulling in incompatible directions. The model recognizes that what Epstein names and what the larger literature names as biotensegrity, soft tissue continuity, autonomic regulation, and the body's

retention of what has happened to it are descriptions of the same multilayered architecture from different vantage points. Each subsystem is tone observed at a different stratum.

Biotensegrity scales down to the cellular level. The cell itself is a tensegrity structure, as Ingber's work on the cytoskeleton established, with microtubules as compression elements and the actin cytoskeleton as tension elements[70]. Mechanical forces applied at the tissue scale are transmitted through the soft tissue continuum to cell membranes, where they activate mechanotransduction pathways that change ion channel behavior, second messenger cascades, and gene expression[89]. This is how manual therapy reaches the cell. Touch propagates through the mechanical continuum all the way to the nucleus[90], regardless of which tissue first received the contact. And because the tension network's organization is the body's geometric self-registration, that touch does not only move tissue; it changes the account the body is keeping of where it is.

The prestress in this network is measurable. In adherent contractile cells, cytoskeletal prestress has been recorded across a range of contractile states from roughly 350 to 1900 pascals, and cell stiffness rises in direct proportion to it, following the relation $G = 0.18\tau + 92$ in pascals[91]. Stiffness is not a fixed material constant of the cell. It is a linear function of how much tension the cell is currently carrying. That is the defining prediction of a tensegrity structure, and it is confirmed at the scale where the measurement is cleanest.

The same relation holds in the extracellular network by a different mechanism. Collagen, fibrin, and actin gels stiffen steeply as they are strained, because semiflexible filaments resist extension increasingly hard as their thermal slack is pulled out[92,93]. Prestress therefore sets stiffness at both scales, inside the cell through the cytoskeleton and outside it through the fiber network, and in both cases the tissue's mechanical properties are a readout of its current tensional state rather than a constant of its material.

Distributed tension and discrete contact are not alternatives, and the model does not claim that bones never touch. Instrumented joint replacements record hip contact forces near 238 percent of body weight in level walking and several times that in a stumble, transmitted through cartilage in direct contact. What the tension network determines is not whether contact occurs but how much force appears at any given contact, in what direction, and at what moment. A tensional configuration that distributes load well produces low and well-timed joint contact forces. One that distributes load poorly concentrates them. The compression is real, and it is an output of the tensional state rather than an independent structural system.

The biotensegrity principle extends to the pregnant body in a particularly illustrative way. The fetus develops within a uterine environment whose shape and available space are determined by the tensional state of the surrounding pelvic structures: the sacroiliac joints, the pubic symphysis, the round and broad ligaments of the uterus, and the soft tissue attachments connecting pelvis to diaphragm. When pelvic tension is asymmetric, the uterus takes an asymmetric shape, and the space available to the fetus contracts in predictable directions. This is called intrauterine constraint, and it is one of the recognized contributors to malpresentations including breech position[94]. The model makes a prediction: reducing asymmetric pelvic tension should expand the space available to the fetus, and a fetus will often reposition when that space opens. The tensegrity structure around it has changed and now permits a different configuration. The prediction is precise enough to be tested. The test measures pelvic tension asymmetry before and after an

intervention that targets it, with the assessor blinded to fetal position and the change in asymmetry treated as the mediator rather than the outcome. If position changes in step with the reduction in asymmetry, the mechanism proposed here is confirmed. Webster's work belongs in this lineage as a pelvic balancing procedure rather than a breech turning maneuver, a distinction its own literature draws[95]. The model claims the mechanism and leaves the outcome figures to trials that have not yet been run.

Whole-body biotensegrity is a model that will mature, like many of the other mechanisms named here. The model states them as the best account the present century can give, and expects the next century to revise several of them. Galvani was right that the body runs on electricity, long before anyone could describe a membrane potential. Volta disputed his account and built the first battery in the course of the argument.[96] Nearly every mechanism either of them proposed has since been rebuilt, but the core insight survived. This model makes the same wager. Its prediction is that whatever architecture is finally confirmed, in the distant future, as an answer to humanity's health problems will be organized by tone. Any revision falls on that mechanism, not the thesis. The model stands wherever tone is shown to be the organizing variable and the predictions named through the sections that follow hold.

Every scale of this architecture expresses the same state variable. Cellular tensegrity, ligamentous balance, muscular tone, fascial continuity, dural tension, visceral suspension, postural organization, and intrauterine shape are tone observed at different resolutions, in different tissues, through different instruments. A change at any level is a change in the conditions at all of them, though not a visible change at all of them, since a level with capacity to spare absorbs the difference without registering a finding. The levels are mechanically and informationally coupled across every tissue the body contains, and the whole network is at every instant registering, in its own geometry, the state of the body it composes.

IV. How a Tone Travels

When tone shifts, something physical changes, and the change reaches tissues that took no part in producing it. A body accomplishes this with several physically distinct carriers running at once: mechanical strain moving through the prestressed tension network; electric fields generated wherever that network deforms; magnetic fields generated wherever charge moves; chemistry diffusing across cells and riding the blood across the body; bulk fluid shifting through ventricle, canal, vessel and interstitium; and the pressure pulse that travels along elastic walls far ahead of the fluid inside them. Each carrier answers the same five questions. What generates it. What scale it works at. What it hands off to. What it can carry that nothing else can. And how tone changes it. The answers differ carrier by carrier. A disturbance does not cross the body the way a wave crosses a uniform medium. It crosses by relay, translated at boundaries into whichever physical form suits the next distance, and every translation happens under conditions the body's present state has already set. The carriers are the notes. The relay among them is where the chord is played.

No carrier spans the body's full range of scales, and none needs to. The model's commitment is explicit: the body moves tone from microns to meters by handing off between scales, not by any single carrier crossing them. A shear wave that dies within a centimeter or two is not a failed long-

range messenger; a centimeter is its assignment, and within it the wave resolves detail no body-wide carrier could. Diffusion that would take years to cross a limb is instantaneous across a synapse. Blood-borne chemistry that cannot distinguish one cell from its neighbor blankets every tissue in a minute. The pressure pulse crosses the whole body in a fraction of a second but carries no molecular identity at all. The carriers form a cascade: each generates, within its own range, the conditions that launch the next, so that a local event climbs to global reach through a chain of translations rather than a single propagation. A carrier judged in isolation always looks inadequate to the whole task, and that inadequacy is the division of labor, which is one of the things tone organizes.

The list of carriers is open at the far end, and the model commits to that openness in advance. The magnetic field of the human brain existed unmeasured until 1968, when superconducting instruments first resolved it[97]. The receptor family that converts membrane stretch into ionic current went unidentified until 2010, a century after the sensation it serves was first described[98]. Both cases follow one pattern: the physiology was present, the physics was known, and only the instrumentation lagged. Instrumentation will lag again. Channels now open, the photonic among them, will be settled by measurement, and channels not yet imagined will be added by instruments not yet built. The frame survives every such extension for a structural reason. Tone is not a property of any carrier, so no new carrier can displace it; tone is the state of the coupling among the carriers, the arrangement of their timings, gains, tensions and handoffs, and a newly discovered channel enters that arrangement as one more voice, subject to the same five questions as every voice already named.

Mechanical strain is the carrier the architecture makes unavoidable. Because every soft tissue is already under tension, no element of the network can change length privately: a contraction, a swelling, a postural shift anywhere redistributes strain through everything attached to it, which is everything. Prestress also changes what the medium is, not only what it does, because the biological filaments are strain-stiffening. Networks of collagen, fibrin and actin grow steeply stiffer as the stress on them rises, a behavior generic to semiflexible filaments rather than special to any tissue[92,93]. The same law, recorded in the preceding section, holds inside the cell, where cytoskeletal prestress runs from roughly 350 to 1900 pascals and measured stiffness rises linearly with it[91]. Stiffness is resistance to deformation, and in this network resistance to deformation is set by tension: pulling on the body makes the body harder to pull. A disturbance therefore never travels through a neutral mechanical medium. It travels through a medium whose stiffness at every point reports the tension at that point, so the mechanical carrier propagates through tone itself and reads the network's state in the one currency a wave understands, speed.

Mechanical disturbances travel in two distinct modes, and the body treats them entirely differently. In a longitudinal wave the tissue compresses and expands along the direction of travel, so its speed is set by the longitudinal modulus, the tissue's resistance to compression. Tissues are 60 to 80 percent water, and water barely compresses, so the longitudinal modulus of soft tissue is about 2.6 gigapascals, essentially the value of water itself[99]. Whether a boundary between two tissues reflects such a wave is governed by acoustic impedance, the product of a tissue's density and its sound speed; the closer two impedances lie, the more transparent the boundary. Soft tissue impedances cluster tightly, from 1.38 megarayls in fat to 1.81 in dense connective tissue, with cerebrospinal fluid near 1.52, cord near 1.60 and muscle near 1.66[99]. The reflections follow: under

a tenth of a percent between cord and fluid, a fraction of a percent between muscle and fat, 37 to 44 percent at bone, 99.9 percent at air[99]. To compressional sound, a body is very nearly a single bag of water, crossed in about a millisecond, interrupted only by skeleton and airway.

The transparency has a price: the longitudinal mode is blind to the one thing tone changes. The longitudinal modulus exceeds the shear modulus, the resistance to change of shape, by five to six orders of magnitude, so tension and stiffness contribute nothing measurable to compression speed; the longitudinal wave crosses a clenched body and a sleeping one at the same speed. The shear wave is the opposite instrument. In a shear wave the tissue slides sideways, layer past layer, and its speed is set by the shear modulus, which is exactly the quantity tension governs. Shear speeds spread across the very range where the longitudinal mode is silent. Brain runs at about 1.0 to 1.2 meters per second. Relaxed muscle runs near 1.7 meters per second across its fibers and 3.4 along them. Thoracolumbar fascia runs at 2.4 to 4.6 meters per second. The median nerve sits near 3.1 at rest and climbs toward 5.7 to 6.0 under neurodynamic tension. The Achilles tendon runs at 20 to 36. Contraction drives muscle above 9 meters per second, a change produced by state alone, with no change of anatomy.

Shear boundaries are as opaque as longitudinal ones are transparent. Between fat and deep fascia about 24 percent of shear intensity reflects; between relaxed muscle and tendon about 54 percent; between fascia and tendon about 50 percent; even between the across-fiber and along-fiber directions within a single muscle, about 11 percent. Between relaxed and strongly contracted muscle, about 24 percent of shear intensity reflects: a boundary as sharp as fat against fascia, created by state alone. Tone does not merely ride the shear channel; it sets the channel's reflection coefficients. A contracting muscle erects an acoustic wall where a moment earlier there was continuous tissue, and a releasing muscle dissolves one. The body's internal map of shear boundaries is redrawn from moment to moment by its pattern of tensions; the paths available to mechanical information are themselves a readout of tone. Elastography already exploits half of this relation, inferring stiffness from measured speed. The model reads the same physics in the other direction: a changed pattern of tensions is a changed routing of every mechanical signal inside the body.

The shear channel is also short. In brain, a 50 hertz shear wave falls to about a third of its amplitude within roughly 1.1 centimeters, and a 100 hertz wave within about half a centimeter; measured attenuation in liver at 100 hertz spans 105 to 167 nepers per meter, a decay to a third of amplitude within about 6 to 10 millimeters. High resolution, strong tone dependence, a range of a centimeter or two: a local instrument, and the cascade employs it as one. What happens at the end of its range is the handoff. At a boundary a wave partly reflects, partly transmits and partly converts between modes, and where it is absorbed its energy becomes local strain and strain rate, the quantities transducers read. Mechanically gated ion channels sit in membranes as the terminal converters: PIEZO1 opens in response to bilayer tension itself[60,61], turning a mechanical state directly into ionic current with no intermediate messenger. A boundary is where mechanical information changes carrier, into the electrical and chemical channels that take over the next scale. A disturbance's mechanical death and its electrochemical birth are the same event, at the same interface.

What the tissue does not hand off, it keeps, and what it keeps, it spends. Loading a tendon and releasing it traces two different curves, and the area enclosed between them is energy dissipated

into the tissue; the loop has been measured directly in intact human tendon[100]. That loss, repeated every cycle, is damping, and damping is summarized by the quality factor Q: the number of cycles an oscillation survives before it dies away. A high Q medium rings like a bell; a low Q medium thuds. Soft tissue is the second kind. Elastographic damping ratios of 0.1 to 0.3 correspond to Q of roughly 2 to 5, which means a freely oscillating tissue decays to about a third of its amplitude within 0.6 to 1.6 cycles, and its resonances are smeared across fractional bandwidths of 20 to 50 percent. Nothing in the body rings. Whatever the mechanical channel carries, it cannot carry as a sustained pure frequency, because the medium erases pure frequencies almost as fast as they are launched. What survives transport is the transient: the steep edge, the timed arrival, the shape of the event.

The formal statement of tone's entry into this channel is acoustoelasticity. The acoustoelastic constant is the coefficient that tells how much a medium's effective stiffness, and with it a wave's squared speed, rises for each unit of stress applied to it; it converts tension into speed the way a spring constant converts displacement into force. For a body it means that every sustained tension is legible as a change in propagation. In tissue the relation is linear: the density times the squared shear wave speed equals the shear modulus plus the acoustoelastic constant times the applied stress, with the constant set by the material's third-order elastic behavior, and the relation has been measured in transversely isotropic muscle. Tension sets stiffness; stiffness sets speed; speed sets the natural frequency of every tensioned element; and therefore the pattern of tensions, the mechanical face of tone, determines how fast every mechanical message moves, which paths it takes, where it reflects, and what each anatomical structure will do with it on arrival. The mechanical carrier does not report tone as content. It undergoes tone as a condition.

Deformation does not stay mechanical. Collagen is piezoelectric, generating charge separation when strained[78]; bone shares the property[77]; cell membranes are flexoelectric, converting curvature into polarization[79]; and in hydrated tissue much of the measured strain-to-voltage signal is a streaming potential, generated by fluid dragging its dissolved ions through a charged extracellular matrix[80]. Whatever the mixture at a given site, the outcome is the same: strain writes an electrical copy of itself as it happens, everywhere, in a network that is strained everywhere. All of these mechanisms are rate-dependent. A deformation held constant generates nothing new; generation belongs to change. So the electrical copy is not a duplicate of the mechanical state but its derivative, a map of where and how fast the tension network is changing rather than of where it stands. The mechanical carrier reports configuration; the electrical carrier reports its rate. They are one deformation with two physical faces, and the tissue that produces the strain produces the field in the same motion.

The electrical face is short-lived by construction. Tissue is a conductive ionic solution, and charge separated inside it is neutralized by that conductivity almost immediately: the relaxation time, the interval a displaced charge distribution survives before the surrounding electrolyte cancels it, is about 0.2 milliseconds at 10 hertz, far shorter than any physiological timescale. At low frequencies tissue also shows an enormous alpha dispersion, the relative permittivity of muscle reaching a million to ten million below about 100 hertz. Together these make tissue a leaky volume conductor: it cannot store a quasi-static field and cannot steer one. A slow, even load produces a signal that leaks away as fast as it is made; what survives is rate of change, not magnitude. A small input with a steep leading edge delivers more electrical signal than a heavy sustained one, which

is the physical reason the shape of an arrival matters more than its size. Tone enters this carrier as timing. A network whose tensions change abruptly is electrically loud; a network whose identical tensions were reached gradually is electrically silent; and the difference between them is not state but trajectory.

Within its short range the electric field is not a byproduct, because neurons answer to it directly. The extracellular fields a working tissue generates feed back on the membranes inside it, a coupling called ephaptic, requiring no synapse; endogenous fields inducing membrane changes of less than half a millivolt entrain the timing of spikes, most effectively for slow fluctuations below 8 hertz[41]. The field does not tell a neuron what to say; it biases when the neuron says it, and in a system where phase carries information, biasing timing is carrying information. The electric carrier's working range follows from its physics. The volume conductor smears any field with distance, blending contributions from many sources into an average that preserves rhythm but blurs geometry, so the electric channel works at millimeters, where it coordinates timing among neighbors, and degrades into summary beyond. It hands off inward to the spike traffic whose timing it biases, and outward as the summed rhythms electrodes at the scalp record. What it alone can carry is a shared local clock, imposed on every excitable membrane in a neighborhood simultaneously, without wiring.

Every one of those ionic currents also generates a magnetic field, oriented perpendicular to the current that made it, and the magnetic field obeys different rules. The magnetic permeability of biological tissue is essentially that of free space, so the boundaries that smear and attenuate the electric field are simply not there for the magnetic one; it passes through cerebrospinal fluid, skull and scalp undistorted, which is why magnetoencephalography localizes its sources better than electroencephalography localizes the same activity[101]. It is faint: cortical fields run from 50 to 500 femtotesla and the heart's field near 50 picotesla, while the Earth's standing field, at about 50 microtesla, is a hundred million times larger; the measurement therefore required superconducting magnetometry inside shielded rooms. The magnetic carrier's scale is the whole body: the one field channel indifferent to the boundaries that stop everything else. On present evidence it hands off only to the instrument; no tissue receiver is identified, an absence whose weight is priced below. What it alone can carry is undistorted geometry, the true spatial arrangement of the body's currents, and tone reaches it upstream, because the timings and couplings of those currents are the very things tone sets: a change of state redraws the broadcast at its source.

Chemistry begins where the fields end, and its native transport is diffusion, a random walk under a hard law: the time to cross a distance grows as the square of that distance. For a body the law divides the world absolutely. A small molecule in water crosses a micrometer in about half a millisecond, a millimeter in roughly 500 seconds, and a meter in about sixteen years. Within a cell or a synaptic cleft diffusion is effectively instantaneous and needs no machinery; beyond a millimeter it is useless, and the body never asks it to work there. What the chemical carrier alone can transport is identity. A wave carries pattern but no substance; a molecule is a shape, recognized by receptors built for it, with a specificity no mechanical or electrical signal can approach. The mechanical and electrical channels report that something happened, how large it was, and how fast it arrived; only chemistry can say what has happened, in a vocabulary of distinct

molecular species, each with its own receivers, its own lifetime, and its own radius of action set by how far it spreads before it is destroyed.

Advection rescues chemistry from its own law. The blood circulates the body's entire volume in about a minute, so a molecule that could never diffuse across a limb reaches every tissue by riding bulk flow and diffusing only the final fraction of a millimeter. Range that diffusion prices at years, circulation delivers in a minute, at the cost of addressing: the bloodstream blankets and cannot aim. The nervous system exploits the same principle internally as volume transmission. Neuromodulators released diffusely, rather than across a synapse onto a single cell, change the excitability of a whole territory without addressing any neuron in it. What such a signal adjusts is not any message but the gain on all messages: the responsiveness, threshold and coupling of an entire population. That is tone, literally, a chemically written state of readiness that determines what every subsequent signal will accomplish while asserting nothing itself. Nitric oxide shows the format at its purest, crossing membranes without any transporter, acting over 100 to 200 micrometers, gone in seconds, a broadcast whose radius is set by its own decay rather than by any anatomical boundary.

The chemical channel also carries rhythm, which multiplies its capacity. Intracellular calcium does not simply rise and fall; it oscillates, and the information is encoded in the frequency of the oscillation rather than in the concentration, with frequency determining both the efficiency and the specificity of the gene expression that results[102]. One molecular species thereby carries multiple distinguishable messages separated by rate, in a domain with no membrane potential involved: multiplexing is not an invention of the nervous system but a general property of the body's signaling. The receiving proteins differ in the frequencies that drive them most effectively, so distinct rates of the same oscillation activate distinct downstream programs. What the mechanical channel cannot do, sustain a frequency against a Q of 2 to 5, the chemical channel does routinely, because a chemical oscillation is not a decaying vibration but an actively regenerated cycle, driven by the cell's own energy at every period. Timing, which the electrical carrier writes in milliseconds, the chemical carrier writes in seconds to minutes, extending the body's clockwork downward in speed and inward to the genome.

Between diffusion's millimeter and circulation's whole body lies a gap, and regenerative chemical waves fill it. In a reaction-diffusion wave each patch of tissue is not a passive conduit but an active repeater: local chemistry regenerates the signal, the signal diffuses to the next patch, and the wave propagates without decrement, an action potential's logic executed in molecules. Astrocyte calcium waves cross tissue at tens of micrometers per second[103]; cortical spreading depolarization moves at a few millimeters per minute[104]. Those speeds occupy a timescale no other carrier serves, slower than any electrical or mechanical event by orders of magnitude, faster and more spatially organized than hormonal broadcast: the pace of regulation rather than of reaction. Chemistry, more than any other carrier, transports tone itself, because what it predominantly moves is gain. A neuromodulator field, a calcium rhythm, a slowly crossing wave of altered excitability: each is a change in what tissue will do with the signals that reach it, rather than a signal in its own right. In the chemical register tone stops being an inference from other measurements and becomes the payload.

Bulk fluid is the only carrier that moves the material itself rather than a pattern through material. Blood, lymph, cerebrospinal and interstitial fluid physically relocate molecules, cells and heat,

and everything chemistry gains in range it gains by riding them. Inspiration, not the heartbeat, is the dominant regulator of cerebrospinal fluid movement, exceeding the cardiac contribution and directing flow upward from the spinal canal toward the cranium[105], past the roof of the third ventricle, where the pineal gland hangs in the stream as a candidate phase reference. The cardiac cycle superimposes its own oscillation, with peak cervical velocities of 2 to 6 centimeters per second and a volumetric stroke of 0.5 to 1 milliliter per beat. Centimeters per second is slow against the meters per second of waves; bulk flow is the freight carrier, delivering substance on a schedule rather than signals at speed. The schedule is written by breath and heart, both of them continuously governed rhythms, which places the fluid carrier under tone's control at its source. A body that changes how it breathes has changed the timetable of its own internal transport.

How a fluid moves through fine anatomy is classified by two dimensionless numbers. The Reynolds number is the ratio of inertial to viscous forces in a flow; when it is low the fluid moves in ordered layers, and only at values far higher does it break into turbulence. The Womersley number is its counterpart for oscillating flow, the ratio of oscillatory inertia to viscous forces; when it is high the fluid core surges back and forth nearly as a plug, with velocity profiles blunt rather than parabolic. In the spinal subarachnoid space the Reynolds number based on the chord of a denticulate ligament is about 180 to 303, firmly laminar, and the Womersley number is about 5 to 10, confirming inertia-dominated oscillation. The oscillating boundary layer, the Stokes layer, is about 430 micrometers thick, comparable to the thickness of the ligaments themselves, so the canal's fine structures live entirely inside the layer of the flow where shear is concentrated. The flow around the cord is orderly enough to be steered by anatomy, and the anatomy is scaled to the very stratum of the flow where steering acts.

The steering vanes are the denticulate ligaments: 20 to 21 pairs of collagenous processes anchoring the cord to the dura along roughly 60 centimeters of canal, spaced about 30 millimeters apart[75,106]. Each process stands about 3.2 millimeters tall with a chord of 5.3 millimeters and a thickness of 0.32 millimeters, a thickness-to-chord ratio near six percent, the thin-foil regime, the geometry of a wing section rather than a wall[107,108]. A foil's interaction with flow is governed by its angle of attack, the angle between the foil's chord line and the oncoming stream: at zero the foil parts the flow with minimum disturbance, and as the angle grows it deflects the stream increasingly until flow separates from its surface. At rest each denticulate process sits near perpendicular to the cord's long axis, which presents it edge-on to the predominantly longitudinal flow of the canal: an angle of attack near zero, the minimum-disturbance orientation. The anatomy has built a longitudinal array of thin foils and parked every one of them at the angle where they disturb the flow least.

Thin foils at Reynolds numbers of 200 to 300 hold attached flow up to an angle of attack of about 8 to 12 degrees and separate beyond it. Cord axial strain of only 4 to 5 percent rotates the denticulate processes to that threshold. Past it come enhanced vorticity, expanded recirculation zones, asymmetry between the two halves of the oscillatory cycle, and elevated shear stress at the wall; the flow remains laminar, the Reynolds number being far too low for turbulence, but its organization changes character. Measured and computed flow confirms that nerve roots and denticulate ligaments generate vortex pockets, redirected flow and elevated wall shear[109], and that this fine structure enhances solute dispersal five to tenfold over molecular diffusion[110,111]. Cord tension, tone in its most literal anatomical sense[112], selects between two fluid regimes: below

threshold, quiet axial transport; above it, active stirring of the fluid that bathes the cord and carries its chemistry. A few percent of strain, invisible to the longitudinal wave and marginal to the shear wave, switches the mixing state of the central nervous system's own solvent.

The same fluid logic runs down to the tissue scale. The glymphatic system drives cerebrospinal fluid along paravascular channels through the brain's interstitium, clearing solutes[113]; the exchange is most active in sleep[114] and depends on body position[115], so the brain's housekeeping is scheduled by behavioral state and posture, two more of tone's registers. At the finest scale the fluid and solid accounts merge. Poroelasticity describes a fluid-saturated deformable solid, which is what every tissue is, and such a medium supports three waves: a fast compressional wave, a shear wave, and a heavily damped slow compressional wave consisting of fluid moving relative to the solid matrix[116]. That relative motion is exactly the motion that generates streaming potentials, so the electrical and fluid descriptions of a loaded tissue are one process written twice. Poroelastic behavior depends on the ratio of loading time to the time the fluid needs to redistribute: load faster than the fluid can move and the tissue is stiff; load slowly and it is compliant and lossy. Rate decides what a tissue mechanically is, a second independent reason the shape of an arrival matters more than its magnitude.

The pressure pulse is commonly mistaken for the flow it rides above. Squeezing one end of a fluid-filled elastic tube sends a bulge of pressure racing along the wall far ahead of any displacement of the fluid; the wave and the water are different travelers. In arteries the pulse wave moves at 5 to 10 meters per second in health, while the blood moves at under half a meter per second, so every tissue receives the pressure event before it receives the blood[117]. The wave's speed is set by the stiffness of the wall it travels in, so the arterial tree measures its own state on every beat: carotid-to-femoral pulse wave velocity is the clinical reference measure of arterial stiffness, and it rises with age and disease[117]. Cardiology reads the number as pathology. The model reads the same number as a direct measurement of tone: the standing state of a tissue, expressed as the speed of the most pervasive mechanical broadcast the body owns, delivered to every organ roughly once a second on a clock set by the heart. No other mechanical event is so global, so regular, so directly a function of state.

The same physics runs down the spine in a richer geometry. The spinal subarachnoid space is not a rigid pipe but a compliant elastic waveguide: a fluid annulus bounded by the cord within and the dural membrane without, both deformable. A waveguide supports modes, distinct patterns of coordinated wall and fluid motion that the geometry permits, each traveling at its own speed. Coupled analysis of fluid and structure in the coaxial spinal geometry yields several such modes, at roughly 13, 15, 30 and 125 meters per second[118], while the bulk fluid itself surges at centimeters per second. A pressure event entering the canal therefore reaches distal segments as a wall-borne wave long before any fluid arrives, and it reaches them several times, once per mode, with different motion patterns and arrival times. The canal is a multichannel line: one anatomical structure carrying parallel mechanical signals distinguished by mode shape, precisely the multiplexing that survives in a low Q medium. Every one of those mode speeds is a function of the elastic state of the boundaries, of the tension held in the dura and the cord.

Inside the canal the individual obstacles are almost transparent. The longitudinal acoustic impedances of cerebrospinal fluid, cord, pial and denticulate collagen, and dura lie at about 1.52, 1.55, 1.71 and 1.81 megarayls respectively, so the intensity reflected at each single interface ranges

from one part in ten thousand to under one percent: individually negligible scatterers. But the denticulate ligaments are not individuals; they are 21 pairs at a regular spacing of about 30 millimeters, and arrays of weak scatterers behave collectively. A periodic array selectively reflects wave components whose half-wavelength matches its spacing, building strength from arbitrarily weak elements by making their reflections add in phase. The canal is therefore a structured filter as well as a waveguide, disposed by its geometry to attenuate some wavelengths and pass others. That geometry is not fixed. The spacing and orientation of the array follow the length and strain state of the cord that carries it, and the model claims the consequence: the tension of the cord tunes the spectral filter through which the body's central pressure signals pass; what reaches a given segment is a function of the state of the whole line.

The waveguide's walls are more compliant in life than the laboratory long suggested. Collagenous membranes have a J-shaped stress-strain curve: a toe region where crimped fibers are still straightening and the tissue is soft, then a linear region where straightened fibers bear load and stiffness climbs; where a membrane sits on that curve in life determines its working stiffness. Measured wave speeds settle where the dura sits. Spinal cerebrospinal fluid waves travel at a few meters per second in vivo, which implies a dural tangent modulus of order 1 megapascal; cadaveric testing reports 111 to 194 megapascals, values taken from the linear region past the toe. The living dura sits in its toe region, two orders of magnitude more compliant than the excised sample, on the steep early slope where small changes in tension produce large changes in stiffness. Every mode speed in the canal is therefore adjustable, set by dural tension, and the anatomy provides the adjusters: the dura anchors at the foramen magnum, the lower cervical spine and the sacrum, and the myodural bridge ties it directly into the suboccipital musculature[119,120,121], so muscular state writes onto the boundary of the waveguide without intermediary.

Several properties belong not to any one carrier but to the medium as a whole, and the first is that boundaries rule interiors. In any bounded medium it is the boundaries, not the bulk, that fix which patterns of vibration can exist: a string's available notes are set entirely by where it is held and how hard it is stretched, and the natural frequency of any tensioned element rises with the square root of its tension. A body is bounded everywhere, at attachments, septa, anchorings and investments, and nearly all of those boundaries are tensile structures whose state the body itself sets. Changing tone therefore changes the catalogue of modes the body can support without launching any wave at all: a shifted pattern of tensions is a rewritten list of the vibrations, postures and coordinations that are physically available, before any of them is excited. This is action by precondition rather than transmission, requiring no delay and no carrier, because nothing travels; the conditions themselves have changed. Of the two routes by which tone acts, this is the first: not sending a different message, but being a different instrument.

Speed itself divides into two quantities. In any wave packet the individual crests move at the phase velocity, while the envelope, the overall shape that carries the energy and the information, moves at the group velocity; in strongly dispersive media the two differ greatly and can even oppose in sign, so a packet's content and its crests part company and the packet smears. For a body the distinction separates what merely oscillates from what actually arrives. In a solitary wave the two velocities coincide, which is why its shape and its energy travel together instead of dispersing[122]; when two such waves collide they pass through one another and emerge with identical shape and velocity, marked only by a shift of phase, the behavior for which the word soliton was coined[122].

Action potentials obey the opposite rule: counter-propagating impulses annihilate on meeting, because each runs into tissue the other has just left refractory. Two collision laws, superposition with a phase memory and mutual erasure, coexist in one body because they belong to different carriers, and which law governs an encounter depends on the channel it happens in.

That diversity of collision rules is one face of a broader fact: the body's channels are in large part mathematically independent. An elastic waveguide such as a limb, a cord or a canal supports compressional waves, two polarizations of shear, and surface, torsional and flexural modes, and these are orthogonal under the elastodynamic reciprocity relation: each carries its energy independently of the others even in a strictly linear medium, with no nonlinearity required. Orthogonality is provable multiplexing, simultaneous signals sharing one piece of anatomy without mixing. Add the physically distinct domains, mechanical, electrical, magnetic, chemical and fluid, each deaf by construction to most of what the others carry, and the picture becomes polyphony: many simultaneous voices in one medium, separated not by frequency but by mode shape and physical kind. A palpating hand rests on tissue that is at that moment carrying shear in two polarizations, torsion, pressure, current and chemistry, all lawfully independent. What binds the voices into one performance is not the carriers themselves but their couplings, and the standing state of those couplings is tone: the polyphony is available to any medium, but the music is a property of the state.

Low Q disciplines which encodings survive. Any scheme that requires a stable phase reference maintained across many cycles, frequency-division channels and quadrature encoding among them, dies in a medium that forgets its phase within one or two cycles, so the mechanical domain cannot multiplex the way radio does. What survives is separation by mode shape, by time, and by physical domain, and the body's best-studied channel shows all three in mature use. Within the electrical domain alone, distinct oscillatory bands carry partly independent information[123]; the fast and slow components of a single spike train carry complementary messages[124]; a neuron's firing phase encodes position independently of its firing rate[125]; and items are held in ordered slots nested within a slower carrier cycle[126]. Cross-frequency coupling binds those layers into coordinated structure[45,127], and decomposition methods now exist that would measure the same layered organization across physical domains rather than within one[128]. The model's claim is the generalization: multiplexing of exactly this kind, separated by mode and by time, runs in every carrier the body owns, and the tissue-level measurement has not yet been attempted with the tools the electrical domain enjoys.

Coupled rhythms do not align freely. Two coupled oscillators lock to a common rhythm only when the difference between their natural frequencies is small relative to the strength of their coupling; in the plane of frequency ratio and coupling strength, the locking regions form wedge-shaped domains, wide where coupling is strong, vanishing where it is weak[56,57]. Raising a signal's amplitude widens the window but can never substitute for proximity in frequency: a powerful rhythm at the wrong rate recruits nothing. Broad low Q resonances make the body's entrainment windows wide and shallow, easy to enter and weakly held, so the body synchronizes readily and releases readily, which is what adaptive coordination requires. A regulatory loop with excessive gain overshoots in proportion to its error; a loop with excessive delay oscillates regardless of gain, because each correction arrives timed to a state the system has already left. The two failures can look identical from outside and demand opposite fixes, damping the response in one case,

shortening the loop in the other. Coupling strengths, frequency proximities and loop delays are coordinates of tone, and a body's capacity to synchronize and to stop oscillating is read directly from them.

Every carrier operates above a floor of thermal agitation. The quantity kT is the average energy of molecular jostling at a given temperature, the background tremor in which every molecule of the body is immersed; at body temperature it is 4.3 × 10^-21 joules, and any single event carrying less is, in one detector, indistinguishable from the tremor. The body's escapes from the floor are statistical and thermodynamic. Averaging across N independent detectors improves signal-to-noise by the square root of N; integrating over a time T improves it by the square root of T; and living tissue is not at thermodynamic equilibrium, so energy-consuming detectors are not bound by equilibrium limits at all. Noise can even be recruited. In a nonlinear system with a threshold, added noise raises the probability that signal plus noise crosses the threshold in time with a subthreshold signal, so detection improves as noise increases up to an optimum, a phenomenon called stochastic resonance[129]. A weak periodic input that would never fire a receptor on its own is lifted over threshold by the very agitation that was supposed to bury it.

The record of measured sensitivity runs in one direction. Rod photoreceptors respond to single photons, the smallest quantity of light physics permits[130,131]. Hair cells of the inner ear detect displacements of a fraction of a nanometer, smaller than the thermal motion of the structures that carry them, a feat managed by amplifying actively, spending energy to sharpen what a passive detector would lose[132]. Sharks and rays strike at electric fields of a few nanovolts per centimeter, the faintest signal any animal is known to read[133]. Each of those numbers was implausible before it was measured, and each had failed the skeptics' arithmetic for the same reason: the calculation assumed a single passive detector at thermodynamic equilibrium, and the organism was none of those things. The model therefore takes its position in advance rather than case by case. The measurement floor is a property of the instrument, not of the organism. Wherever a signal exists physically and a structure exists that could transduce it, the default expectation is that it is read, and the burden of proof falls on the claim that it is discarded.

The energy scale of information itself sets the deeper bound. The Landauer bound is the minimum energy physics permits for erasing one bit of information, kT times the natural logarithm of two, about 3 × 10^-21 joules at body temperature[134]; it prices computation in the same currency as the thermal floor. Biological molecular machines operate within one to two orders of magnitude of that bound, while human digital logic runs four to five orders above it, and the brain performs its entire function on about 20 watts. A system computing that close to the physical minimum can afford to run channels whose energies look negligible, so an argument from faintness carries almost no weight against a proposed carrier. Neither does an argument from the missing receptor. The century mechanosensation waited for PIEZO1 and PIEZO2[98] was an interval in which the absence of a receptor was repeatedly mistaken for the absence of a sense. No receptor identified is a statement about the current state of molecular biology, not a statement about the organism, and the model treats it as such.

The photonic channel is the open case, and its tiers separate cleanly. Melanopsin, a human opsin outside the classical rods and cones, operates in the inner retina[135], and non-visual opsins are expressed in tissues outside the eye altogether, so the body demonstrably builds light receivers where no image is formed. Near-infrared light penetrates tissue centimeters deep, so an internal

optical path exists. Tissues measurably emit ultraweak photons, but whether the emission carries information rather than merely leaking metabolic energy is not settled, and the settling measurement is information-theoretic, a demonstration of correlation between emission and state beyond what chance and temperature explain. The model keeps the channel on the list at that tier: receivers established, path established, message unproven. Metabolism enters not as a carrier but as the constraint on all of them. Every pump, every regenerated wave, every active detector is paid for in ATP, so metabolic state bounds the gains, amplitudes and repetition rates of every channel at once. A depleted tissue is not a quieter version of itself; it is a differently tuned medium, and that retuning is a metabolic statement of tone.

Catching a single footfall shows the system whole. The impact loads the tension network and a strain field crosses the limb; the strain generates piezoelectric and streaming potentials as it passes, and those currents write their magnetic signature; pressure rises in the vessels and the pulse redistributes along the arterial tree; fluid shifts in the canal, where the denticulate array meets it at whatever angle the cord's tension has set; mechanically gated channels open, spindles report, and within seconds chemistry has moved, gain adjusted here, a calcium rhythm shifted there. These are one event under six descriptions, simultaneous because the carriers are coupled at every scale, each generating the conditions of the others; the channels were never separate to begin with. What differs from moment to moment and from body to body is the state of the coupling: which handoffs are efficient, which boundaries reflect, which windows admit entrainment, which gains are high. That state is tone, and the fate of the footfall's information, amplified, dispersed, stored or extinguished, is decided by it.

Tone, then, is not the message and never was. It is the condition of the medium that determines what any message becomes, and it acts through two routes. The arithmetic rules out a third. Between the extremes of full contraction and full release, the sustained states a body actually holds alter tissue stiffness by a few percent to low tens of percent; wave speed goes as the square root of modulus, so those changes shift speeds by only a few percent; and at a Q of 2 to 5 no resonance in the body is sharp enough for a few percent of detuning to matter on its own. A model that relied on tone retuning sharp mechanical resonances would fail, and this one does not rely on it. The first route is boundary conditions: tone sets the tensions and anchorings that determine which patterns the system can hold at all, action by precondition, requiring no propagation. The second is transduction gain: tone sets how much neural signal a given mechanical event produces, action at the point of conversion, where small physical differences become large informational ones. Neither route requires a mechanical wave to cross the body, and the second contains an amplifier of documented steepness.

Peripheral nerve is that amplifier. Nerve conduction is a steep function of longitudinal strain: at 6 percent strain sustained for one hour, compound action potential amplitude falls by about 70 percent, and at 12 percent conduction is blocked entirely[136]; intraneural blood flow is compromised at 6 to 8 percent elongation and arrested near 16[137]. Set those thresholds against the wave physics. To a wave, strain is a parameter change: propagation continues, retuned but intact. Held on a nerve, the same strain removes most of the information the nerve carries. The tension network delivers strain to nerves continuously, along their full length and at every interface they cross, and the near doubling of the median nerve's shear wave speed under tension shows the delivery operating in a living limb. Mechanical tone thereby converts into informational

consequence at a gain no wave phenomenon approaches: the physics of the medium survives what the physiology of the channel cannot. A held pattern of tension is a standing edit of the nervous system's own bandwidth, imposed wherever it crosses a nerve.

The gain route runs through dedicated instruments, and the body adjusts the instruments themselves. Muscle spindles and Golgi tendon organs are the specialized mechanoreceptors of the tension network[72,73,74], and fusimotor drive sets spindle sensitivity independently of muscle force, so the nervous system chooses, moment to moment, how much mechanical information it acquires from each muscle. The fascial map needs no inflation: the thoracolumbar fascia contains free nerve endings only, no corpuscular receptors, densest in its outer layer and the overlying subcutis[138]. The acquired information is then spent ruthlessly. Sensory transduction delivers about a billion bits per second while behavior extracts about ten[139], and the settings of the gains decide which ten survive. The loop closes on itself. The nervous system's output is itself tone, delivered with directional precision: confronted with an instability along one axis, it learns within a handful of trials to stiffen the limb along that axis without stiffening it uniformly[140]. Tone sets what is sensed; what is sensed resets tone; and the regulator is the loop itself, not any single pass through it.

The remaining question is how local physics earns global reach, and criticality answers it. Neural activity organizes into avalanches with scale-free statistics[48], the signature of a system poised near a critical point, at the edge of chaos where responsiveness is greatest[49]. Near criticality the correlation length diverges: fluctuations at one site cease to be local, and events at the scale of microns become statistically visible at the scale of the organism. That is the formal mechanism by which a cascade of short-range carriers behaves as one long-range system, and holding the system near that poise, stable enough to sustain coherent function, flexible enough to reorganize, is what health as adaptive range means in the language of physics. This account will be extended. New instruments will add carriers, as superconducting magnetometry added one in 1968 and molecular biology added the stretch receptors in 2010, and every addition will arrive with a generator, a scale, a handoff, a unique cargo and a dependence on state. The frame absorbs each addition because it was never about the carriers. It is about the organization among them, and the organization among them is tone.

V. How the Body Knows Itself

Earlier sections established that the nervous system is a coupled oscillator network and the body's highest-density integrator of tone. This section describes the specific anatomy through which the coupling occurs, why autonomic regulation is the clinical readout of that coupling, and how the body comes to know its own state at all. It begins with a correction to a phrase this paper has used. The nervous system is often called the body's master regulator. But the word master can mislead if it implies that regulation happens in one place. Regulation is distributed everywhere. Cells register their own chemical, mechanical, electrical, thermal, and metabolic conditions and adjust accordingly. Tissues integrate the states of many cells. Organs regulate their internal relationships. The nervous and endocrine systems coordinate relationships across the whole organism. The brain constructs increasingly integrated representations of the body, and consciousness makes some portion of that organization internally experienceable. Every tissue

participates in regulation, and every tissue, in its own way, knows something of its own state. What distinguishes the nervous system is not that it alone regulates but that it is the body's most concentrated system for integrating, modeling, prioritizing, and redistributing what the entire body is already registering. It is the highest-density integrator and self-modeling network of a distributed regulatory whole, and it is through that integration that the local knowing of every tissue is folded into unified action. Read at this level, tone is the central integrative state at the scale of the whole organism, the same construct Section II identified at the scale of a single cell. It is the measure of how well the nervous system is blending what the whole body reports into a single coherent account of itself. Two older definitions converge on exactly this. Physiology gave tone to the muscle as its standing readiness to respond.[141] The early clinical literature gave it to the nerve as a normal degree of tension, whose every variation, too tense or too slack, marked the beginning of disease. The model keeps both and widens the coverage. Read across every tissue at once, readiness and tension are one integrated state.

Thayer and Lane's neurovisceral integration model gives the oscillator principle its first specific anatomical expression. Prefrontal cortex activity, vagal tone, and heart rate variability are functionally linked through a distributed network that includes the medial prefrontal cortex, the anterior cingulate, the insula, the amygdala, and the brainstem autonomic centers[5]. The coupling is bidirectional: prefrontal activity modulates vagal output, and vagal afferent signaling shapes prefrontal processing[5]. Autonomic flexibility directly reflects and supports cognitive flexibility, emotional regulation, and adaptive behavior[142]. A person whose heart rate variability is high has access to the full range of their executive function. A person whose heart rate variability is collapsed has lost access to it, regardless of effort. Thayer and Lane established that heart rate variability indexes the regulatory capacity of a prefrontal and vagal circuit[143], and the Unified Model of Tone takes it one step further: what the number indexes is tone. Heart rate variability is a window onto the organizing state rather than the state itself. The rhythm of the heart and the capacity of the mind are the same phenomenon measured at different levels, and that identification is the model's own claim.

Eduardo Benarroch's Central Autonomic Network gives this architecture its most complete anatomical description. The CAN is a distributed brain circuit encompassing the insular cortex, anterior cingulate cortex, ventromedial prefrontal cortex, amygdala, hypothalamus, periaqueductal gray, and brainstem nuclei including the rostral ventrolateral medulla and the nucleus tractus solitarius[2]. It integrates sensory, emotional, cognitive, and homeostatic information to produce coordinated autonomic responses[144]. Functional neuroimaging consistently identifies the amygdala, bilateral insula, and midcingulate cortex as the cortical hubs of autonomic processing, with sympathetic-associated activation predominating in executive and salience networks and parasympathetic activation linked to default mode regions[145]. The brain's resting-state activity patterns directly determine sympathovagal balance. Tone is set by the whole network, with the brainstem as the final common pathway. Emotional state, cognitive load, interoceptive accuracy, and postural input all modulate heart rate, airway caliber, blood pressure, and gut motility because they are inputs to the same integrated circuit.

Within the brainstem, the rostral ventrolateral medulla generates sympathetic vasomotor tone, providing continuous excitatory drive to spinal sympathetic preganglionic neurons[146]. When RVLM activity becomes pathologically elevated through oxidative stress, neuroinflammation, or

altered afferent inputs from higher CAN centers, the result is a sustained sympathetic bias expressed throughout the system[147]. This is the neural substrate for what clinicians recognize as "stuck in fight or flight," and it is specific, measurable, and anatomically localized. Naming these structures is not the same as locating regulation inside them. What this network holds is a level of readiness that can be raised and lowered rather than a function stored at an address. This is why the same circuit produces defense in one situation and digestion in the next with nothing structural having changed, and it is why an intervention that alters tone can alter everything functional. A regulatory function is a tunable state rather than a fixed place, and the state is never null. Resting membrane potential is charge held in reserve and paid for continuously[148]. The readiness it represents is not neuronal alone, since astrocytes buffer potassium and recycle transmitter without ever firing[149]. The resting substrate is loaded rather than empty, and what is loaded into it is tone. That readiness is the state that matters rather than a preparation for it, and every input the body meets is read against it.

Interoception is the sensory foundation of the Unified Model of Tone. A.D. Craig's work established that the brain continuously constructs a representation of the body's internal physiological state through afferent signals[10] ascending via the lamina I spinothalamic pathway to the posterior and then anterior insular cortex[150]. The accuracy of this interoceptive representation directly determines the flexibility and appropriateness of autonomic output. When interoceptive input is noisy, distorted, or incomplete, as occurs when spinal dysfunction degrades mechanoreceptor signaling, autonomic regulation loses precision and drifts toward rigid patterning. Interoception is the input stream on which all autonomic regulation depends.

These pathways together describe how the body registers itself. Registration in a living system is never a one-way report: it is a loop, and the loop is recursive. Receptors live in the tissue. They send information to the brain, the brain reorganizes the tissue, and the altered receptor dynamics change the information those receptors send back. A region of tissue holds a certain state; that state is written into afferent signaling; the signaling is integrated centrally; the integration issues efferent and autonomic output; the output changes the tissue; and the changed tissue writes a new afferent signal. Tissue state gives rise to afferent registration, registration to central integration, integration to efferent reorganization, and reorganization to a new tissue state, which begins the loop again. A receptor is not an instrument observing the body from outside it. It is made of the body, embedded in the tissue whose state it reports, influenced by that tissue's tone, and involved in producing the tone that comes next. Proprioception and interoception are, in the most literal sense, the body registering itself, and the registering is part of what it registers.

One consequence of this recursion is that the act of reading tone changes tone. Because registration is embedded in the very loop it reports on, there is no way to sample the body's state without altering it. Palpation changes the tissue being palpated. Attention changes autonomic and sensory processing. Movement changes the proprioceptive map. Breath changes circulatory, mechanical, and autonomic relationships all at once. An adjustment works precisely through this fact: it changes the system by being registered by it. This is not a source of error to be corrected for. It is the mechanism by which every hands-on intervention in every profession operates, and it is why the same contact can be both an assessment and a treatment in the same motion.

This is also why movement does more than carry the body through space: it is the primary means by which the body knows itself. A joint carried through its range rocks each segment through

small arcs, fires the proprioceptors embedded in muscle, capsule, and ligament[72], and generates a fresh afferent picture that the brain reads against its own predictions. The body cannot form an accurate model of where it is by holding still. It must move to sample itself, and each movement updates the map from which the next movement is planned. This is the same principle engineers rediscovered when they built machines that must locate themselves in space. An autonomous robot performs what is called simultaneous localization and mapping, moving continuously while its sensors update both its model of the world and its estimate of its own position within that world[151]. The motion is not separate from the mapping; the motion is the mapping, and a robot that cannot move cannot localize itself even with perfect sensors. A 3D printer probes its bed point by point before it prints, because it can learn where the surface actually is only by touching it. An aircraft inertial navigation system runs known motions on startup to find true vertical and true heading, because orientation is knowable only by moving through it. Any system distributed across many parts must rhythmically sample itself to function as a whole, and the living body is the richest such system there is. It localizes itself by moving, which is why rhythmic movement, like the breath, matters so much to a body coming to know itself.

Because movement is how the body reads itself, movement is also how the body diagnoses and corrects itself. The quality of a person's movement is a direct readout of the quality of the commands the nervous system is issuing. That is why so much can be learned from watching how a patient turns their head, shifts their weight, or tracks a target with their eyes. The movement makes the state of the regulator visible. And because the system weights its senses by their reliability, what the body moves changes what it trusts. The nervous system continuously reweights the relative contributions of proprioceptive, vestibular, and visual input[152]. When spinal proprioceptive input is reliable and high-fidelity, it is weighted heavily and used to calibrate balance, movement, and autonomic output. When it becomes noisy or degraded, the system compensates by leaning harder on vestibular and visual channels[153], a strategy that is less efficient and more vulnerable to failure. This reweighting has been recorded after inputs delivered to dysfunctional spinal segments, which places the effect at the level of how the system listens to itself rather than at the tissue contacted[154]. Any input that restores the fidelity of proprioceptive signaling therefore does more than move tissue. It changes the weight the brain assigns to an entire class of signals and reorganizes how the system listens to itself. This is the deepest sense in which the body is self-diagnosing and self-correcting. Given accurate information about where it is, generated by its own movement, it updates its map and reorganizes its tone. Every healing tradition that works through the body is ultimately a way of handing the system that information.

Taken together, the body's self-registration can be read as the continuous answering of four questions, and that makes the architecture legible. Where am I? Proprioception answers this with body schema, posture, spatial orientation, biotensegrity, joint position, and the suspension of the organs: the body locating itself in space and within itself. How am I related, and what is different from what? The answer is sensory discrimination, membrane polarity, excitation and inhibition, and the distinction of self from non-self, of threat from safety, of figure from background: the body differentiating and orienting. What whole do I belong to? Molecular assembly, cellular and protein adhesion, tissue integration, circuit synchronization, body ownership, and the felt coherence of being one organism rather than a heap of parts: the body binding itself into a unity. And what can I become next? Metabolism, immune response, development, learning, plasticity, repair, and emotional processing: the body sensing and

enacting its own transformation. Integrated biological tone is the single answer the organism gives to all four at once, and a dysregulated organism is one whose answer to one or more of these has become impaired. A body that has lost the answer to where am I cannot organize movement; one that has lost how am I related cannot separate threat from safety; one that has lost what am I part of loses the coherence of the self; one that has lost what can I become cannot heal or adapt. These are four dimensions of the one integrated state that tone names.

The prefrontal cortex, the Central Autonomic Network, the brainstem RVLM and NTS, the vagal afferents, the cardiac pulse, the respiratory rhythm, and the interoceptive stream form one regulatory circuit, and the variable that circuit regulates is tone. Every symptom, every biomarker, every intervention that follows addresses this same variable through one or another access point.

Dysregulation is the uncoupling of the nested rhythms. When a neuron's resonance drifts outside tolerance, it cannot participate fully in its local circuit. When a circuit loses coherence, it cannot couple cleanly to the cortical rhythm. When the cortical rhythm decouples from the breath, the breath from the heart, the heart from the slower regulatory cycles, the system loses its integration. Information becomes noisy. Commands degrade. Adaptive responses become maladaptive. Read through the recursive loop, dysregulation is a failure of correspondence: the body's registration of itself no longer tracks its actual state, and the output it generates no longer fits the conditions it is meant to meet.

Biophysically, dysregulation is the loss of oscillatory flexibility: the inability to shift between states as context demands, whether the system is stuck in arousal, in shutdown, or in freeze. The healthy nervous system oscillates across a wide range of states fluidly. The dysregulated nervous system has lost its range. This is the same point Section II reached about the edge of chaos, now stated dynamically: health is a wide, organized state-space, and dysregulation is the narrowing of that space to a few costly configurations the system can no longer leave.

A network of nested oscillators holds together only against a shared reference. Coupled oscillators can lock to one another directly, and the body does a great deal of that, but a system running rhythms whose periods span nine orders of magnitude, from millisecond firing to the day-long circadian cycle, also requires something that answers the question of when in absolute terms rather than only relative to a neighbor. The anatomy supplies a candidate, and its position is the first thing to notice about it. The pineal gland does not sit buried in parenchyma. It hangs on its stalk in a cerebrospinal fluid cistern at the posterior roof of the third ventricle, directly in the path of the fluid displacement described in the preceding section. It is a circumventricular organ with fenestrated capillaries and no blood-brain barrier, and it receives one of the highest rates of blood flow per gram in the body. Of every structure that could be nominated as a mechanically loaded timing element, it is the one physically placed to be loaded by the fluid and chemically placed to read the blood at the same time.

It also contains a mineral that the model has reason to be interested in. Distinct from the familiar hydroxyapatite concretions, the gland carries calcite microcrystals whose stacked structure is not symmetric about its center, which is the condition under which strain separates charge[155,156]. The mechanism proposed in the preceding section applies here without modification: fluid displacement loads a structure suspended in the fluid, the stiff inclusion concentrates shear at its boundary, and charge appears at a rate set by how fast the loading arrives rather than by how

large it is. What makes the gland worth naming separately is not the transduction, which is ordinary by now, but what it does with the result. Its principal output, melatonin, is less a substance that acts on tissue than a signal that sets phase, and the timing of clearance[114], of repair, and of consolidation is organized against it. A structure that converts a mechanical rhythm into a chemical phase signal is functioning as a reference, and the breath, through the fluid, is what loads it.

This is why the gland belongs in an account of how the body knows itself rather than in an account of how disturbance travels. It is not a carrier. A metronome does not play the music and it does not carry the music; it establishes when, and everything else is read against it. That distinction matters for what its failure looks like. Losing a reference does not silence the rhythms and does not reduce their amplitude. It allows them to drift relative to one another, which is precisely the uncoupling of nested rhythms just described, arrived at from the other direction. The model states the proposal and names what would settle it. The piezoelectric constant of these crystals has never been measured, and until it is, the transduction step is inference from structure rather than demonstration. The prediction is specific: that the crystals are piezoelectric, that the gland is mechanically loaded on the respiratory cycle, and that disturbing that loading shifts melatonin phase without necessarily changing melatonin quantity.

The cardiovascular system demonstrates this principle with the most quantitative precision. Blood pressure variability, measured visit-to-visit or over twenty-four hours, independently predicts stroke and cardiovascular events above and beyond mean blood pressure[157]. Two patients with the same average blood pressure but different variability profiles face substantially different cardiovascular futures, with the more variable patient at higher risk[158]. The master pathology is the loss of the adaptive range within which values should fluctuate. Health lies in the width of that range and in the system's ability to move appropriately within it, not in proximity to any particular set point. An apparent contradiction sits between this paragraph and the earlier account of heart rate variability. High variability in heart rate is a marker of health. High variability in blood pressure is a marker of risk. Both are true, because they are variability in two different things. Heart rate variability is variability in the regulator's output, the trace of a system adjusting continuously to what it meets. Blood pressure variability is drift in a value the regulator is supposed to be holding. One is a controller working. The other is a controller losing its grip. The model states the rule generally: variability in the act of regulating is health, and variability in the thing regulated is dysregulation.

Karl Friston's free energy principle[159] sharpens the Unified Model of Tone considerably. Friston did not propose tone, and nothing in his work should be read as endorsing it. Active inference proposes that the nervous system runs on prediction, and that prediction error is costly. The next step is the model's own. What the body predicts, beneath everything else, is itself, and the variable it predicts is tone. The free energy principle is a contested account[160], and the model is not built to depend on it. If active inference is superseded, the surviving claim is that the mismatch between a body and its own account of itself is expensive, and that the expense is clinical. The brain operates as a prediction engine[161], continuously generating internal models of expected sensory input: joint position, muscle tension, visceral state, postural configuration[162]. Those predictions are then compared against incoming afferent data. When predictions match reality, the system operates efficiently. When they do not, the mismatch, called prediction error, demands additional

cortical processing, attentional resources, and metabolic energy to resolve. Under active inference, descending motor commands are themselves proprioceptive predictions, and spinal reflex arcs function to minimize the error between predicted and actual body state[163]. Movement is the nervous system acting to fulfill its own predictions about where the body should be. This is the same recursive self-registration described earlier in this section, now stated in computational terms: the body's model of itself and the body's actual state must be kept in correspondence, and the work of keeping them so has a price.

This framework is the computational backbone of the Unified Model of Tone. It explains precisely why distorted afferent input is so costly. Neural information processing is metabolically expensive[148], and it is expensive at the level of the individual signal: the neuroenergetics literature prices a single bit carried across a chemical synapse in thousands of ATP molecules[164]. The brain carries about a fiftieth of the body's mass and consumes roughly a fifth of its energy[165]. When predictions are chronically violated by corrupted sensory input, the system must increase cortical firing rates and recruit additional processing networks. It must also devote metabolic resources to resolving uncertainty that cannot be resolved at the level of processing, because the noise is present in the input itself. Information theory establishes that noise introduced at the source cannot be recovered by downstream processing[166]; it can only be compensated for, at cost. The model predicts a specific energetic signature and offers it as a prediction rather than a result in hand. Two stimuli matched in intensity and differing only in predictability should differ in metabolic cost, and the difference should scale with the size of the mismatch rather than the strength of the stimulus. If predictability carries a metabolic premium, the model is confirmed at its foundation.

Accepted physiology assumes the electrical channel is the whole of the transmission, and the Unified Model of Tone predicts it is not. A neural event is a voltage change and simultaneously a mechanical deformation[167], a thermal shift[168], an ionic redistribution, and a change in the local field[41], and more. Each domain stands in one of three relations to the information the event carries. It may protect the information, carrying a copy that guards the message against noise. It may reinforce it, entraining neighbours and holding them in phase. Or it may encode independently, carrying something the other channels do not. The first two roles are uncontroversial. The third is our new claim. Stated as a prediction it runs this way: at least one non-electrical domain occupies the third role. The test is specific. It records a single neuron across several domains at once and decomposes the result into what the channels share and what each contributes alone. A reproducible contribution that no single channel accounts for confirms the prediction. The sharpest objection to this is that a physical byproduct is a signal only if something downstream reads it, and for several of these domains no reader has been identified. That objection assumes an architecture Section II ruled out. The organization is the information. The measurement above is what tests the part of it measurement can reach.

"Too much information not being processed efficiently" is the cumulative metabolic and cortical cost of living in a nervous system whose afferent input does not match its internal models. The resources consumed by this compensation are drawn directly from the pools that would otherwise fuel growth, repair, learning, adaptation, and creative engagement with the world. Stress physiologists have long called this allostatic load[18]: the wear and tear produced by chronically maintaining stability through energy-expensive compensatory mechanisms. The term arose from

a wider proposal that the body regulates by prediction rather than by correction. The cost is incurred in advance of the demand rather than in response to it[26]. It is the macro-scale expression of this micro-scale energetic accounting. A dysregulated nervous system is, in the most literal biological sense, an expensive one.

The chiropractic subluxation, in the model, is a standing source of prediction error. The same standing source of prediction error is what every other profession is meeting under its own name. It introduces persistent noise into the afferent stream. The nervous system compensates by increasing sensory gain[169], which carries additional metabolic cost and produces the sensory hypersensitivity commonly observed after concussion[170], trauma, and chronic stress. Gain of this kind is readable in cortical rhythm[171], and the model states the consequence as a prediction. A standing distortion should carry elevated sensory gain with the metabolic cost that implies, and that signature should fall when the distortion is corrected and not when the symptom is merely quieted. Stated that way the claim can be tested. A distortion carrying that gain signature, and a correction that lowers the signature as it resolves the distortion, would confirm the model.

This section owes one measurement of its own. A tone measure recorded before a task should predict what that task costs the body, so that two people given identical work pay different prices in proportion to a number taken beforehand. That result is not yet in hand. The model asserts it, and that result would confirm it.

The clinical implication in our unified model of tone is precise. The adjustment, regardless of modality, succeeds to the extent that it reduces the prediction error the nervous system is attempting to resolve. It does this by restoring afferent fidelity at the source. When the input becomes accurate, the internal models update, the compensatory processing stops, and the metabolic and cortical resources consumed by that compensation return to the adaptive pool. A nervous system in good tone is cheap to run, because its predictions match its reality. A nervous system in poor tone is expensive, because the mismatch consumes resources the body needed for something else. Metabolic cost and clinical weight are the same accounting.

VI. Distortion

In this section, the Unified Model of Tone makes a claim about what dysregulated tone looks like once it takes physical form in the body. A loss of tone regulation does not stay abstract. It manifests as a concrete, locally stabilized distortion that then propagates through the body along many coupled pathways. Every healing profession is looking at some face of that one manifestation through its own instrument. The traditions have partial names for what they see: chiropractic has called it the subluxation[20], osteopathy somatic dysfunction[172], physical therapy a movement impairment, manual therapy a trigger point[173], and other lineages qi stagnation or held trauma. But the model does not inherit its authority from any of those terms, nor from the research or belief that accumulated around them. It is the model's own synthesis, built from established neuroscience and advanced as the model's claim: that beneath all those names is a single event, and that the event can be defined with more precision than any inherited vocabulary allowed. It is a persistent distortion of recursive self-registration: a standing prediction error held in tone, locally stabilized and globally consequential, in which a region's tone, its frequency, no longer updates in correspondence with the body's present needs. It is a dynamical lesion rather

than a structural one. It is not a part out of place, and it is not simply a tissue held too tight. The solitary wave is the precedent for taking such a thing seriously. A localized disturbance can travel through a medium holding a coherent form while no particle of that medium travels with it, and it is a real physical feature of the system even though no single component constitutes it. The distortion is that kind of object. Asking which tissue it is located in is the wrong question, in the same way that asking which molecule of water the pulse is made of is the wrong question. Nothing needs to be broken for it to be present, and nothing an image measures needs to be abnormal, because what has failed is a relationship rather than a part. That is true at the outset, and it does not stay true forever. Dysregulation can also be subacute, showing up nowhere at all, or it can run long enough to become the lesion the imaging finally finds: the herniation, the occlusion, the visible damage. Aberrant tone is all of the above. Nor does it have to appear everywhere at once. Compensating systems exist to keep the whole organism from failing, so one dysregulation may surface in several systems, in a few, or in one. Someone with endocrine trouble does not necessarily carry depression and back pain alongside it, though they may. It is a failure of correspondence among the processes that should be tracking one another: the local tissue state, the sensing of that state, the prediction built on it, the regulation sent back out, the mechanical geometry, and the demand of the moment. When those relationships lock around an outdated account of the body and stop updating, that is the distortion the model names. Its palpable and structural signs are the visible expression of a deeper regulatory pattern that every profession is already observing in its own way.

Seen this way, the distortion is best understood as a loop that has failed to complete. An experience or demand arrives, and the system mounts a protective response, appropriate and often life-saving in the moment. But the response is not fully integrated and resolved, and instead stabilizes into a protective structure. That structure distorts the input the system afterward receives, and the distorted input calls forth continued protective output. The pattern may have been adaptive when it formed. It becomes dysfunctional when conditions change and the system can no longer update it. This is why tone is at once three things: stored history, because a past interaction remains embodied in present organization; present organization, because the pattern is being actively maintained right now; and future possibility, because it narrows the responses available going forward. It is tone as memory, presence, and possibility, held in a maladaptively narrowed form.

This also clarifies the old polarity between tissue that is too tight and tissue that is too slack, because both are failures of constraint rather than simply too much or too little vibration. Excessive tone is excessive constraint: over-protective stabilization, reduced variability, high maintenance cost, few available transitions, and resistance to updating. The system can hold a pattern but cannot easily leave it. Deficient tone is insufficient constraint: a reduced capacity to organize, an inability to sustain functional relationships, weak responsiveness, and the collapse of adaptive participation. The system can change but cannot adequately organize or hold. Health lies between them, in the adaptive coherence named earlier: enough stability to keep an identity and enough flexibility to reorganize when conditions change. Every mechanism that follows in this section is one or the other failure of constraint, read at a particular tissue by a particular profession.

“Too much” is always relative to the resources available at the time. A well-resourced, coherent person integrates several stressors at once without losing function. A depleted person is destabilized by one additional demand, because earlier stressors have already consumed the cortical space, neural bandwidth, metabolic energy, and attention that would otherwise be available to meet a new one. This is a principle a later section develops in full: what an input does is never a property of the input alone, but of the input meeting the tone of the system.

The categories of input that can overwhelm the body are few and old. Modern neuroscience and psychoneuroimmunology group them as mechanical, chemical, emotional, and cognitive load, and the earliest clinical articulations named essentially the same set more than a century ago, when the three recognized insults were rendered as trauma, toxins, and thoughts[174]. The underlying phenomenon is a nervous system overwhelmed by simultaneous input across several categories, and any clinician who attends carefully to what actually disrupts regulation in their patients can discover it. That is why careful observers in unrelated traditions arrived at the same short list. Stressors compound nonlinearly[18]: a problem that would be trivial alone becomes crushing after a divorce, a car accident, or a stretch of poor sleep. The large-scale brain systems that handle self-referential processing and goal-directed attention lose their ability to allocate resources efficiently[175], and the system shifts toward defensive patterning. Defensive patterning is metabolically expensive, cortically consuming, and rigid.

Distortion, once it forms, does not stay in one place or one system. It propagates the way an organized disturbance propagates through any coupled medium, with successive layers entering the organized state and leaving it as the pattern passes through. It moves through several coupled mechanisms at once, and each mechanism is the same dysregulated tone expressed through a different biological layer. They are described separately below for clarity, but in most cases they occur together and coupled. Each is a place where the loop of self-registration has broken down. Each is also a window: a profession trained to read that particular layer encounters the same distortion there and names it in its own terms. The unifying claim is the model’s own: these are not separate findings from separate fields but one distortion seen at different depths.

The medium described in Section IV gives propagation a second and less obvious outcome, and it is the one that matters most for a distortion that will not resolve. In a nonlinear medium a travelling organization can be captured. Where a region of tissue has properties differing from those around it, a coherent disturbance entering that region can lose the balance that allowed it to travel and be held there instead. It does not disperse and it does not move on. It sits, and it continues to draw on the system to sustain itself.

What lifts this above analogy is that the trap and the distortion are the same object. A region whose properties differ from the surrounding medium is, in this model's own terms, a region of altered tone. The held pattern alters the local medium, and the altered local medium is what holds the pattern. This is the recursion already described, stated mechanically, and it answers a clinical question that otherwise needs an answer of its own: why a held pattern is stable, why it does not simply fade once the original demand has passed, and why the system defends it. It is not being maintained by a continuing cause. It is being maintained by the conditions it created.

Coupling is not co-expression. That every system is connected to every other does not mean a distortion in one appears as a finding in all of them. What stands between the two is

compensation: another property that medicine has named repeatedly without ever claiming as one system.

Hepatology divides cirrhosis into a compensated stage and a decompensated one, and the division carries more prognostic weight than the pathology underneath it. Median survival runs beyond twelve years while the liver still compensates and falls to roughly two years once it stops[176]. Cardiology draws the same line through heart failure and treats the transition, rather than the ventricle, as the clinical event. Trauma teaches that blood pressure holds through the early stages of hemorrhage and then falls steeply, so a normal pressure in a bleeding patient reports intact compensation rather than adequate volume. Nephrology watches surviving nephrons raise their individual filtration until filtration rate as a whole looks untouched. Neurology describes this phenomenon as cognitive reserve. A person may have substantial Alzheimer's pathology without developing dementia. Education and mental activity can raise the threshold at which that pathology becomes clinically apparent[177]. Geriatrics measures frailty, which is reserve read across several systems at once[178]. Cardiology has collateral circulation, where a vessel closes and its territory stays alive because another route had already enlarged[179].

Each specialty developed its own language for compensation, its own way of measuring reserve, and its own threshold for clinical failure. What none of these frameworks established was whether the capacity a hepatologist observes in the liver and the reserve a neurologist identifies in the brain belong to the same underlying property. The Unified Model of Tone argues that they do. Compensation is the ability of the whole system to absorb demands that one part can no longer meet. Reserve is the amount of that ability that remains. Both describe tone in terms of available range: the capacity to redistribute demand, preserve function, and maintain organization as conditions change.

When one region becomes dysregulated, the body does not leave the disturbance isolated. It redistributes the burden across other systems, and each system pays for that adjustment with some portion of its available range. Mechanical reserve is consumed when neighboring segments take on additional movement to protect a guarded region. Autonomic flexibility declines when the nervous system maintains a defensive state it would otherwise release. Metabolic resources are spent sustaining that state. Cortical capacity and attention are diverted toward monitoring an area the system can no longer regulate efficiently. Sensory gain may increase to compensate for degraded information, but that amplification carries its own cost. Compensation, therefore, is not the absence of distortion. It is the redistribution of its burden into systems that still have enough reserve to carry it.

Compensation is not inherently pathological. It is a normal, protective function that allows the body to absorb disturbances without immediately expressing their full consequences. Without this capacity, even ordinary demands could overwhelm the system. By redistributing the burden, the body preserves function while it processes the disturbance and restores coordination. Many distortions therefore resolve before symptoms ever appear. Compensation buys the time required for integration, but that time is purchased with reserve. When the compensatory response persists, the cost accumulates. Stress physiology identifies this burden as allostatic load, the cumulative expense of maintaining stability through adaptive mechanisms that remain active too intensely or for too long[18]. A regulated body and a compensated body may produce identical

results on static measurements. They differ in the effort required to maintain those results and in the regulatory range they have left.

This distinction helps explain how a structural abnormality can exist without producing symptoms. Imaging frequently reveals disc degeneration, bulges, and annular fissures in people who report no pain, and these findings become increasingly common with age[17]. They are often described as incidental, but imaging alone cannot determine whether a finding is clinically irrelevant or whether its effects are being absorbed elsewhere. The Unified Model of Tone proposes that when a structural change imposes a functional burden, the absence of symptoms may reflect sufficient reserve to compensate for it. The image shows the structure, not the effort required to maintain function around it. The same principle appears in cognitive reserve, where Alzheimer's pathology can exist in the brain without producing measurable impairment because the system retains enough capacity to preserve performance[177]. In both cases, symptoms depend not only on the disturbance but also on the body's ability to absorb it. Silence does not necessarily mean the burden is absent. It may mean the body still has enough regulatory range to carry it.

This framework also explains why an input that once produced no symptoms can eventually produce a disproportionate response. Reserve is finite, and persistent compensation gradually consumes it. Each unresolved burden leaves less capacity available for the next demand. Yet the system may continue to produce normal outputs even as the range supporting those outputs narrows. A body operating near its limit can therefore appear identical, on a single static measurement, to one with substantial capacity remaining. Eventually, an input that would have been absorbed a year earlier exceeds what the system can still carry. Because regulatory dynamics are nonlinear, the depletion can occur gradually while the transition appears sudden. This helps explain why patients often attribute a major problem to a minor event that seems too small to account for it. The final input is not necessarily the origin of the problem. It is the demand that arrived after the reserve required to absorb it had already been spent.

That depletion, however, does not have to remain invisible. As some systems approach a critical transition, they recover more slowly from ordinary disturbances. Their fluctuations may also become larger and more closely correlated[180]. These changes can appear while conventional measurements remain within normal limits because they reflect how the system responds over time rather than where it sits at a single moment. Similar patterns have been observed before relapse in mood disorders[181]. The Unified Model of Tone proposes that this principle extends beyond any one diagnosis. If compensation draws on a shared regulatory capacity, its depletion should become visible in the changing dynamics of the systems carrying the burden. A compensated state would therefore be more than an absence of symptoms. It would be a measurable condition distinguished by reduced recovery, diminished flexibility, and a narrowing margin for further demand.

Compensation also follows the organization of the body, which helps explain why its effects do not necessarily appear close to their source. Because mechanical and regulatory networks connect distant regions, a disturbance can be redistributed according to those connections rather than anatomical proximity. One region may stiffen so another can remain mobile. The pelvis may tilt to preserve the position of the eyes. Gait may shift away from a painful limb while transferring the load to the opposite hip. The second region can appear abnormal precisely because it is doing the additional work. This means a coupled measure may change in the opposite direction from what

a simple local explanation would predict. It also means other measures may not change at all. Tight paraspinal muscles do not necessarily produce back pain, and their presence does not automatically imply a mood disorder, hormonal dysfunction, or gastrointestinal injury. When changes do emerge across several domains, the model asks whether a shared reduction in regulatory range helps explain their coexistence. Dysregulated tone does not mean that every system must fail at once. It means that the body has less capacity to absorb disturbance, and that symptoms emerge wherever the remaining burden can no longer be carried.

Expression should therefore be most likely at the site with the least remaining capacity, which may differ from the site where the disturbance began. Local vulnerability can accumulate through prior injury, scar tissue, reduced vascular supply, inherited predisposition, repetitive demand, or persistent immune sensitization. When the system encounters additional stress, the first region to express dysfunction may simply be the one with the smallest margin left. This separates the location of a symptom from the origin of the pattern producing it. The loudest tissue is not necessarily the source. It may be the tissue with the least reserve remaining, while a quieter region continues to carry or organize the broader compensation.

Under this interpretation, compensation generates specific and testable predictions. The number of systems expressing dysfunction should increase as available reserve declines. Symptoms should emerge preferentially in regions or systems with the least remaining capacity, regardless of where the disturbance originated. Dynamic measurements collected before symptoms appear should distinguish a compensated state from a genuinely well-regulated one, even when static values are identical. Cardiology and hepatology already recognize compensated and decompensated states and use organ-specific measures, including ejection fraction and the Child-Pugh classification, to characterize disease severity. The model predicts that comparable assessments of regulatory capacity can be developed in systems that do not yet have an established compensated stage. Its strongest prediction is prospective: measures of reserve obtained in advance should help identify which system is most vulnerable to dysfunction and when a transition becomes more likely. If those measures provide predictive value beyond existing clinical indicators, then compensation is established as a shared, measurable regulatory variable rather than a useful description.

The individual mechanisms that follow are established physiology the model gathers under that claim. One major territory is the spine, because it carries the densest stream of position information in the body. The vertebral column is among the most densely innervated regions[182] of the musculoskeletal system; every joint capsule, ligament, disc, and deep muscle contains specialized endings continuously reporting position, motion, and load[183]. The Freeman-Wyke classification[184] identifies four receptor types in joint tissue: slowly adapting Ruffini endings for static position[185], rapidly adapting Pacinian corpuscles for acceleration and deceleration, Golgi-like endings that guard the end of range, and free nerve endings that signal threat[186]. Together they encode the quality, speed, direction, and limits of movement as a continuous stream to the cord and brain. When a segment loses its normal motion, the fidelity of that stream degrades, and the nervous system receives a distorted map of the very body it is trying to regulate.

The neck contributes disproportionately to this stream. Gram for gram, the deep suboccipital muscles carry more than ten times the spindle density of the large superficial muscles of the trunk and limbs[182],[187],[188]. That is tissue built to report position, not to produce force, and it makes the upper cervical region the most position-rich real estate in the body. These spindles connect

directly to the balance and eye-movement centers of the brainstem[189]. Even modest dysfunction here therefore produces outsized effects on balance, gaze, and spatial orientation[190], and inputs delivered to this region, by skilled hands that reach it, have far-reaching systemic effects.

The spinal cord cannot cleanly separate signals from the body wall from signals from the organs. Direct electrophysiological recording has established that somatic and visceral afferents converge on the same projection neurons in the thoracic cord[191]. Reported proportions vary with species, level, and method, and the argument rests on none of them. It rests on the fact that convergence at this relay is a normal property of the wiring. These neurons cannot tell whether an incoming signal originated in a paraspinal muscle, a facet joint, the pericardium, the gut wall, or the uterus; they integrate both and send the blended message upward as one. This is why referred pain exists, and why input to the body wall can measurably influence organ function[191]. At the first relay into the central nervous system, these are the same neurons. Akio Sato's research on somatoautonomic reflexes demonstrated this experimentally[192], showing that stimulation of somatic afferents reflexively modulates cardiac, gastrointestinal, and glandular function through both segmental loops and higher circuits in the brainstem and hypothalamus[11]. The long-standing claim that working on the spine can influence the organs is not a leap of faith but a necessary consequence of dorsal horn neuroanatomy.

The cord also has a mechanism for storing the distortion in its own circuitry. Irvin M. Korr, in osteopathic research through the middle of the 20th century, characterized a state he called the facilitated segment[67]: a cord level at which sustained bombardment from a dysfunctional joint, muscle, or organ has chronically lowered the firing thresholds of its neurons. Those neurons, both motor and autonomic, become hyperexcitable, firing to smaller inputs and producing larger outputs. The segment therefore delivers sustained sympathetic amplification to the tissues and organs it serves long after the original insult has resolved. A facilitated segment in the upper thoracic cord amplifies to the heart, lungs, and upper viscera; one lower down amplifies to the gut, kidneys, and pelvic organs. What a clinician feels as a guarded, hyperreactive area is often, mechanistically, a facilitated segment. The palpable finding is the surface readout of the cord's altered excitability, and a well-matched input relieves it by delivering a signal specific and salient enough to reset the segment's threshold.

This is one of the most important claims the model makes, and it has direct consequence for where input into the body should go. It separates the leverage point from the compensation. The leverage point is a focal, high-influence location, typically near a major connective-tissue anchor, at which a small, well-matched input can initiate system-wide change. The compensation is the region of aggregate, referred tension that has accumulated downstream from one or more leverage points, where tissue is already at the limit of its capacity to dissipate load. Force applied to the compensation deepens defense and reinforces the pattern, because to tissue already at its limit any added input reads as further demand rather than as an organizing signal. The same force applied at the leverage point can recruit the system's own capacity to release the tension downstream. This is the principle the model names throughout: the active ingredient is correspondence to the leverage point, not force at the symptomatic site. It also explains why the same intervention transforms one person and does nothing, or worse, for another. A guarded, hypomobile region is not necessarily the primary distortion; it may be the body's own defense, splinting a problem elsewhere. Input to the compensation is then force applied to the brace rather

than the lesion, and outcome research that ignores the distinction averages two opposite responses into a mean that reflects neither.

One clarification belongs with the above principle. There is rarely a single lynchpin. A body ordinarily holds several points of critical tension at once, each with a different potential to reorganize the whole, and that potential shifts with the system's state from one moment to the next. Each critical tension point is a place where the body has lost accurate contact with itself, where the local tone is held or aberrant and no longer updates against what the rest of the body reports. The healing art lies in reading which of several real leverage points is, at this moment and in this body, the one whose release the system is most ready to use, rather than in discovering a hidden master site that governs everything. A tradition that fixes on one anatomical answer has converted a variable into a doctrine, and the model expects its results to become hard to reproduce, because what produced them was the match rather than the location. The model states leverage as a variable and not as an address. Leverage is real, leverage is plural, and it moves.

The membranes around the cord participate in the body's tension network as well. The dura is innervated by autonomic branches and its tension is dynamic.[193] Like a string, a muscle, a ligament, or any other tissue, tighter dura carries higher frequencies and looser dura lower ones, and that tension determines which signals propagate cleanly through the cord. A dysregulated autonomic state therefore changes the mechanical environment of the cord directly, and the change does not stay put. It localizes outward through two coupled pathways at once: mechanically, as asymmetric membrane tension pulls on its bony anchors and on the connective tissue around each segment; and neurologically, as the same dysregulated cord sends asymmetric signals to the deep muscles, capsules, and vasculature that hold each vertebra in place. The two forces converge on the bone as a rotational moment. The vertebra is not pushed out of place from outside; it is twisted into position by the combined torque of asymmetric membrane tension and asymmetric muscular tone, and held there by tissue whose tone the nervous system itself produced. The usual account runs the other way: an outside force displaces a bone that then irritates the nerve. The Unified Model of Tone holds that the nervous system distorts first, redistributes tension and tone through the membrane-and-tissue continuum, and the bone moves as a consequence. Both directions are real: the bone can pull the cord, and the cord can pull the bone.

The cord's own geometry is held under tension, which makes tension, not compression, the pathologically decisive force. Alf Breig established that the spinal cord is a tensioned structure whose shape is maintained by the dentate ligaments anchoring it within the canal[112]. His central insight anchors this entire section: raised tension, rather than compression, carries the primary neurophysiological consequence, since even compressive lesions generate axial tension[112]. The implication is that any input capable of changing cord tension can, in principle, change cord function. The condition has been named Adverse Mechanical Cord Tension: a state of the cord and its soft tissues, produced by factors that traction, elongate, or compress it, a state that interferes with its function and oscillation and predisposes the whole nervous system to facilitation. It is non-linear and system-wide, so that a small change in tension at one site can produce a large global effect while a large change at another produces little, depending on the system's current state. Cadaver studies confirm the dentate ligaments are stronger in the neck than lower down[106], and modeling of cervical cord pathology concludes that dentate-mediated

tensile stress, rather than compression alone, best explains the dysfunction[194]. When membrane tension changes, the cord's tension distribution changes; when that changes, the signals it sends to the periphery change, producing asymmetric muscle, fascial, and ligamentous firing. In brain injury, post-concussive states, and upper-neck trauma, sustained traction on the brainstem through these ligaments can keep the autonomic centers, the arousal system, and the vagal nuclei dysregulated long after the original injury has healed.

A single connective-tissue link makes the top of this system unusually accessible. A bridge of tissue connects the deep suboccipital muscles to the dura at the first two vertebrae[119], one of the highest-leverage mechanical translators in the body. A held pattern of suboccipital tension is therefore a held pattern of dural tension, which is a held pattern of cord mechanics, which feeds back into autonomic and cortical tone. This bridge is evolutionarily conserved across all mammals, strong evidence that it serves a necessary function.[120] Direct stimulation of the muscle involved changes intracranial and cerebrospinal fluid pressure through it[121], so muscular tone at this level reaches central nervous system structures by a mechanical route. The mechanical link is measurable and conserved. You can feel your own suboccipital muscles firing when you move your eyes; the connection between eye movement and these muscles is that direct.

Two claims are embedded in the model's account of cord tension, and both can be tested. The first is that mechanical tension changes what the cord transmits, so that the mechanical state of neural tissue is itself a computational variable. The test is that a controlled mechanical strain applied to neural tissue should change the fidelity, timing, and rate of what passes through it. A tissue whose transmission changes under physiological strain establishes the claim, and makes mechanics a part of signaling rather than only its condition. The second claim is that the body regulates this tension rather than merely suffering it. The model holds that cord tension is a controlled variable with a set point, sensed through the cord's own state, adjusted through the tissues that suspend it, and reported upward into the autonomic centers. The test is to change autonomic state while holding posture fixed and image the cord for a corresponding change in its tension or length. A cord whose mechanical state shifts with autonomic state while posture is held fixed confirms the loop.

The fluid around the cord and brain carries the rhythm on which coherence depends. Cerebrospinal fluid flows in laminar patterns driven by the cardiac and respiratory cycles[105], bathing the tissue in a rhythmic medium that supports coherent oscillation. It is also the medium of the glymphatic system, the brain's waste-clearance network that flushes inflammatory mediators and metabolic debris through paravascular channels[113], most actively during sleep[114]. The model predicts that when postural distortion, restricted breathing, or mechanical restriction at the junction of skull and spine disturbs this flow, two failures should follow together. The rhythmic substrate for coherence degrades, and clearance becomes less efficient, so that inflammatory debris accumulates in tissue that should be processing cleanly. This is an inference drawn from the established roles of fluid pulsation and glymphatic clearance rather than a demonstrated pathway. Upright imaging has shown that flow characteristics change substantially with body position[115], and that misalignment at this junction can obstruct flow and raise intracranial pressure. What the model takes from the finding is the direction. Posture is a variable in central fluid dynamics, which means that anything changing posture or the mechanics of this junction is already acting on that system, whether or not the practitioner intends it. The tissue

just below the base of the skull is where this whole system becomes accessible to the hand. Its tone is the surface reading of everything above at once: membrane tension distributing through the cord, fluid patency at the junction, and brainstem drive expressed through the muscles those centers govern. A region locked toward defense, or collapsed away from its capacity to hold healthy tone, marks a restriction at the most mechanically privileged junction in the body, where the smallest, most specific input could produce the largest whole-system response. The inference of the model is testable. Cerebrospinal fluid flow at the craniocervical junction and a marker of clearance can be recorded in the same people across conditions that change mechanical loading there: posture, breathing pattern, or before and after an input that changes tone at that level. The model predicts the two will move together. If cerebrospinal fluid flow and clearance move together, the coupling the model asserted between rhythm and drainage is confirmed.

Because the body is a single tension network, distortion is never a local event. The moment one region loses its regulatory awareness and the surrounding tissues are pulled into asymmetric tone, the entire network is forced to compensate. Tension redistributes through the fascial continuum, the muscular envelope, the ligaments, the dural sleeve, and the suspensions that hold the organs, until the system settles into a new configuration consistent with the altered signature. Vertebrae rotate to accommodate the changed pull, the pelvis tilts to keep the eyes level, the skull torques to keep the airway open and the gaze horizontal, the shoulders shift to balance the load, the feet change how they grip the ground, the diaphragm angles itself to keep breathing efficient, and the organs adapt within their connective-tissue suspensions. None of this is voluntary or conscious. It is the nervous system's automatic solution to remaining functional in a body whose primary geometry has shifted, and because that geometry is the body's own self-registration, the compensations also change what the body believes about where it is.

The regulation that flows outward from the cord shapes organ function directly. The autonomic nervous system reaches every organ through neurons housed at specific cord levels[195], and facilitation at a given level produces predictable consequences in the organs that level serves. The upper thoracic cord supplies the heart, lungs, and upper viscera, and the same levels drive the stellate ganglion, which sets blood-vessel tone in the arterial tree feeding the head and the inner ear[196]. Lower thoracic and upper lumbar levels govern the gut, kidneys, adrenals, and pelvic organs; the sacral cord carries the parasympathetic supply to the bladder, lower bowel, and reproductive organs; the diaphragm's motor supply arises in the mid-neck[197]. When cord tension is distorted at any of these levels, the outgoing signal becomes asymmetric and inefficient, and airway tone, heart rhythm, gut motility, breathing mechanics, kidney blood flow, and pelvic-organ function shift in ways the segmental anatomy predicts. The broader principle is what matters, and the anatomy makes it unavoidable: input to the spine can reach organs a wiring-diagram model would never connect to it, because the connection runs through segmental autonomic tone rather than a direct nerve. Sustained sympathetic facilitation in the upper thoracic cord is the clearest case. Preganglionic fibers from the upper thoracic levels reach the stellate ganglion at the cervicothoracic junction, which supplies the sympathetic plexus travelling on the vertebral artery, and the labyrinthine artery feeding the cochlea arises from that circulation[198]. A cord level held in facilitation could therefore constrict the blood supply of the inner ear and produce ischemia of the kind proposed in vascular accounts of sudden hearing loss[198], a route from spine to cochlea that no direct wiring diagram would predict. The model advances this as a prediction that follows from the anatomy rather than an established clinical fact: where a given level is a critical leverage point

driving such a facilitation, input delivered there should release it, and the organ effect should follow.

The reproductive axis follows the same pattern. The hypothalamic-pituitary-ovarian axis governs the menstrual cycle through pulsed release of hypothalamic hormone that drives the pituitary, which in turn drives ovarian output, and it is fully subject to autonomic and stress-axis influence. Elevated cortisol suppresses that pulse directly, the mechanism behind stress-induced loss of cycles and functional infertility.[199] The pelvic organs receive dual autonomic supply from lower thoracic and sacral levels, and chronic sympathetic dominance constricts pelvic vasculature and reduces uterine and ovarian blood flow[200]. Because the reproductive axis is autonomically and hormonally governed like any other, the model holds that it is modulable by tone in the same way. The Unified Model of Tone predicts that lowering sympathetic drive at the levels serving the pelvis will move pelvic perfusion and the hormonal markers of the cycle toward the midpoint from either side. Whether the effect proves large enough to matter clinically is exactly what such a trial would decide.

Whatever the layer, degraded input corrupts every center that depends on it. The position stream feeds the pathways carrying conscious touch and position sense into the thalamus and cortex, and the pathways carrying unconscious position sense into the cerebellum[195]. At the brainstem it integrates in the relay centers that set heart rate, breathing, gut motility, and stress-hormone output; from the cerebellum, most of which maps to association rather than motor cortex[201], it projects on to the prefrontal, parietal, and limbic networks. When the input is degraded at its source, every one of these centers receives corrupted data. The cerebellum's internal models depend on accurate input to stay calibrated: the forward predictions of what a movement will feel like, and the inverse models that turn an intended outcome into a command[202]. When the input is distorted, the predictions drift, and the system issues commands that no longer match reality. This is what dysregulation looks like from the inside.

In many conditions the primary lesion is sensory, not motor. Imaging in cerebral palsy has shown that injury to the sensory relay from thalamus to cortex tracks both the sensory and the motor deficit more closely than injury to the motor tract itself[203]. The disorder is fundamentally one of sensorimotor integration, the motor output distorted because the sensory input it predicts against is corrupted. The principle generalizes. The guarded region a manual clinician feels, the spasticity a neurologist observes, and the postural distortion a physical therapist measures are predominantly downstream of a failure of sensory integration. Fixing the output without fixing the quality of the input is chasing a symptom. An input that changes the afferent stream rather than the motor output can reach what exercise and pharmacology often cannot. Inputs delivered to dysfunctional spinal segments change sensorimotor integration and motor output together, which is the signature this reading predicts[154,204]. Two consequences follow. The first concerns what a hand actually feels. Guarding and stiffness are usually sustained motor output rather than shortened collagen, which is why they can change in seconds under a well-matched input. Tissue does shorten and remodel over time, and where it has, that is real and must be treated as such. The model holds that in most presentations the protection matters more than the collagen. The second concerns asymmetry. The model of tone reads a limb or a segment whose report the nervous system cannot use as one the system down-weights, so that it is driven less, felt less, and guarded more, whichever side the symptoms appear on. Strength work then adds output to a

channel the system has already discounted. Restoring the quality of the signal is what returns the region to the map.

Loss of inhibition tracks the impairment. Cord-level recording in spastic cerebral palsy has found that a large proportion of affected individuals produce purely excitatory potentials at the spinal motor neuron, entirely lacking the normal inhibitory component. The degree of that loss tracks the degree of motor impairment[205]. This is cord-level evidence for the model's master claim: the pathology is loss of regulatory flexibility, the inability to modulate between excitation and inhibition as context demands. Whether read as heart rate variability at the autonomic level, reciprocal inhibition at the cord, or cross-frequency coupling at the cortex, the principle holds. Health is the range of possible states; disease is collapse into a single one.

The distortion is stored in the brain itself as well as in the periphery. Neurons in the insular cortex encode specific inflammatory states, and experimentally reactivating those ensembles reproduces the original immune response in the body long after the peripheral episode has cleared. The finding is recent, and it has been named immunoception.[206] The nervous system can therefore perpetuate the pattern internally. The stored pattern keeps generating distorted output until the pattern itself is updated, which is why persistent dysfunction can continue with no identifiable ongoing cause. This is the mechanism beneath what clinicians have long called stored patterns, and beneath the observation that the body keeps the score[207]. Those carrying unresolved trauma hold its physiological signature long after the event, and effective treatment must reach and update the somatic encoding alongside the cognitive one. The score is kept in ensembles in the insular cortex, in the excitability thresholds of specific cord segments, in the tension distribution of the fascial continuum, and in the coupling of the autonomic rhythms. Any input that reaches and updates these encodings, whether through psychological awareness, somatic sensation, or structural contact, is working on the same stored pattern from a different angle. Held patterns in the cortex and held patterns in the cord are two expressions of one principle: the nervous system's tone distortions are held in, rather than filed by, its own architecture. That is why disease can persist without ongoing cause, and why an intervention must reach the level at which the pattern is actually kept.

The nerve and immune systems close a loop between them. Sensory neurons release neuropeptides that directly activate local immune cells and shift the chemical environment toward inflammation.[208] Increased nociceptive traffic from a dysfunctional region therefore generates low-grade inflammation independent of any central injury or infection, and that inflammation feeds back into systemic inflammatory tone. The counterweight is the inflammatory reflex, carried mainly by the vagus, which releases acetylcholine onto immune cells and restrains cytokine production[209]: when vagal tone is high, inflammation is held in check; when it is diminished, inflammation runs unchecked[210]. This is why autoimmune, allergic, and chronic inflammatory conditions travel so consistently with autonomic dysregulation, and why autonomic dysfunction can be documented before the clinical onset of a disease like rheumatoid arthritis[211]. The same directionality holds for essential hypertension, where elevated sympathetic firing to the heart, kidneys, and vasculature is present early, before the pressure has settled into its raised state[212], rather than appearing only as its consequence. In several conditions, then, autonomic dysregulation is causal and upstream rather than a consequence, and how widely this generalizes across disease is itself a prediction the model offers. The Unified Model of Tone reads the

directionality as expected, because it identifies loss of tone regulation as a primary pathology, with disease categories as downstream expressions of where the dysregulation localizes. The test is prospective, and the two conditions named here already show its shape. The model predicts that a cohort phenotyped for autonomic regulation while still well, and then followed, will show a measurable loss of autonomic flexibility before clinical onset. It predicts this across a wide range of conditions rather than these two alone, and in people whose conventional markers are still normal. A body of prospective data in which autonomic dysregulation reliably appears before diagnosis would establish the generalization and extend the finding well beyond the conditions where it has already been shown.

The endocrine system belongs to the same field. The conventional wall between immune and hormonal signaling obscures that inflammatory cytokines function as hormones, crossing into the bloodstream and acting directly on the hypothalamus and pituitary: one stimulates the stress axis[213], another impairs insulin signaling[214] and suppresses thyroid conversion[215], another over-stimulates the adrenal and suppresses reproduction[213]. Any input that durably lowers inflammatory burden lowers the hormonal load on every endocrine axis, and any input that improves autonomic regulation lowers cytokine output through the vagal anti-inflammatory pathway[209], with downstream hormonal consequences. Immune and endocrine function are components of a single regulatory field, and tone is the master variable that sets the output of both.

Medicine's own diagnostic categories supply another set of faces. Fibromyalgia, irritable bowel syndrome, temporomandibular disorder, and chronic pelvic pain are classified as four unrelated illnesses, assigned to four specialties and four organs. Clifford Woolf characterized central sensitization, an amplified state of the central nervous system in which the gain on protective output is raised and stays raised.[216] That these four conditions overlap in the same patients is already documented.[217] The model takes the next step. They are not four diseases that happen to co-occur. They are one hypervigilant regulatory state with four names. Read that way the model owes predictions the overlap literature does not make. It expects a shared regulatory signature readable before any of the four is diagnosed, migration between systems across a lifetime rather than residence in one, and an intervention lowering the underlying vigilance softening together whichever of them a given patient is expressing, rather than one at a time. It does not expect all four in every patient. Most people carrying the state carry one of the four, because compensation is absorbing the rest, and the number present tracks how much reserve is left.

All of these are the same event, read at different depths by different instruments. Whatever a given profession calls it, whether the guarded segment, the somatic dysfunction, the movement impairment, the trigger point, or the held trauma, it is the projection of a neural state into the body's tensioned architecture. The nervous system has lost full regulatory awareness of a region. The brain is built to self-assess, self-diagnose, and self-correct, so the persistence of the distortion is itself the sign that something in the regulatory apparatus has failed. Were the brain fully integrating those circuits, it would resolve them on its own, as it regulates insulin, immunity, inflammation, and sleep without conscious direction. The distortion persists because something has kept the brain from closing the loop: accumulated stress, an unresolved threat response, degraded sensing, corrupted prediction, a facilitated segment, or a pattern encoded in the cortex. In the model's terms, self-registration has become locally constrained, and the loop that would

ordinarily update the region and dissolve the pattern can no longer close. These concepts are advanced here as original parts of the Unified Model of Tone: the physical distortion understood as a breakdown of self-registration, its propagation through coupled biological layers, its storage as a held pattern, and its identity across every profession that meets it. They are the model's own account of what practitioners in every tradition have been seeing and working on, rather than claims that lean on any single tradition's prior research or acceptance. Everything the professions do to that region, under all their different names, is an attempt to help the loop close again.

VII. One Mechanism, Many Types of Healing

The previous section described a distortion in tone as a regulatory loop the body can no longer close on its own. From this perspective, every health intervention attempts to restore the conditions the body needs to complete that loop. That is the mechanism that unifies healing. No intervention repairs the body directly. Each one is a deliberately structured input introduced at a critical leverage point of the body's organization, meant to change the constraints governing its next state. It alters what the system senses, predicts, or is able to do, so that it can reorganize around better information. The patient cannot ordinarily supply this to themselves. A system generating its own input from its own model tends to miss its own blind spots, which is why a well-matched perturbation reaches what self-directed effort often cannot. The perturbation may shift a receptor's signaling, change a tissue's geometry, interrupt a habitual pattern, redistribute mechanical tension, quiet a runaway chemical signal, or dissolve a threat the system had been bracing against for years. Whatever it does, it does by being registered, and the reorganization that follows is performed by the body. The clinician changes the conditions. The body does the healing.

This account explains a set of clinical facts that a mechanical model leaves mysterious. It explains why a small, well-placed input can produce a change out of all proportion to its size, and why a large one can produce almost none. It explains why the same intervention transforms one person and does nothing for the next, why the right input depends on the state the system is already in, and why force must be matched to receptivity rather than chosen by conviction. All of it follows the moment one stops picturing treatment as a mechanic acting on inert parts and sees it instead as an input perturbing a self-organizing system. The result depends as much on the landscape the input enters as on the input itself.

Two choices specify every intervention in healthcare, and the logic of care becomes legible the moment they are kept separate. The first choice is the type of the input, and type is set by the interface the input enters through. Every discipline reaches the same regulatory system through a different access point. A psychological therapy enters through meaning, expectation, and prediction, changing the interpretation the system is organized around. Breath and meditative practices enter through interoception and the coupling of the body's rhythms[10]. Manual and movement work enters through the mechanoreceptors and the proprioceptive field, changing the body's sense of where it is. Nutrition enters through metabolic substrate and inflammatory tone; medication through receptor coupling and signaling; heat, cold, current, compression, and tape through what a region reports about itself; surgery through the structural boundaries the system has to work within. These access points are the doorways, and the doorway is the type. A hand

resting on tissue and a surgeon's scalpel are the same type of care: both are physical inputs, delivered through the body's mechanical interface. A whispered reassurance and a confrontation that names what a patient has been bracing against are the same type of care: both are psychological inputs, delivered through prediction. A needle and a conversation are different types, whatever their intensity.

The second choice is magnitude: how much force the input carries within its type. Every doorway has its own dial, and each dial runs from whisper to scream. Through the physical doorway it runs from the lightest sustained contact, through mobilization and adjustment, to the scalpel. Through the psychological doorway it runs from a passing reframe to the direct confrontation of a core belief. Through the chemical doorway it runs from a nutrient to a high-dose drug. Each magnitude suits a different state of the system. At the low end, a minimal input can reorganize a whole system, because a living system poised at the edge of order and chaos[48] answers to information rather than to force. This is the nonlinear response curve from the opening section, read clinically. In a linear medium the size of the effect follows the size of the cause, so more force would always buy more change. In a nonlinear one the same increase does nothing below a threshold, a great deal across it, and nothing again past saturation. At the high end, a distortion may have descended so far that no surface input can reach it: a barrier the body cannot adapt around, an architecture it can no longer remodel, an organ overwhelmed past self-recovery. Then the system needs a signal large enough to reach the level the distortion is being held at. Surgery is the loudest setting on the physical dial, and it expresses the same principle the lightest contact does: it removes a barrier the body could not resolve alone, and the body integrates the change and heals. A successful surgery is one whose magnitude was matched to the system. An unsuccessful one is mismatched, too small to reach the distortion or too large for the system to absorb. The default follows from the asymmetry of failure. Begin with the least invasive input that can carry the message: a small input that fails has cost the system little and taught the clinician something, while a large input that fails has cost a great deal and often removed the option of finding out. The default is a starting point and not a rule. When a distortion has descended past what any surface input can reach, the larger magnitude is the correct one, and delay becomes its own kind of harm.

The two choices repeat inside every doorway, at every scale of the decision. Through the chemical doorway, type does not end at "medication." A molecule that drives sympathetic output upward and a molecule that damps it are different types of chemical input, addressed to different receptor systems, pushing the regulation in opposite directions, and a system already locked in sympathetic dominance answers the first with deeper dysregulation at any dose. The type is wrong before the first milligram is chosen. Dose is the magnitude within the type, and medicine has drawn its curve for a century and calls it dose-response: nothing below threshold, a steep middle where the input delivers, and injury past saturation. The therapeutic window is the name pharmacology gave to matched magnitude, and mechanism of action is the name it gave to type.

The same coordinates run through every doorway. In nutrition, the diet chosen is the type, because an anti-inflammatory pattern, an elimination protocol, and a ketogenic shift each enter a different metabolic conversation, and the direction must fit the state: a depleted system needs surplus and an overloaded one needs restriction, opposite types through the same door. Calories and quantities are the magnitude. In movement, the workout is the type, because strength work loads the contractile system, endurance work loads the metabolic one, and balance work loads the

proprioceptive field, while intensity, volume, and load are the magnitude, and training past what the system can integrate injures it by the same curve that governs overdose. In manual care, the segment chosen and the vector of the contact are the type, and force is the magnitude. In psychological care, which belief is addressed is the type, and how directly it is confronted is the magnitude. Each profession has already formalized its own corner of this grid under its own vocabulary: mechanism and dose, diet and calories, modality and load, segment and force. That every tradition independently arrived at the same two choices is one more instance of the parallel vocabularies this paper opened with, and one more sign that they were always describing a single system. Specificity is the same question asked at every scale: the type and the magnitude, fitted to the state.

Specificity is the accuracy of both choices at once, and the word has to be rescued from its casual use, because it is not the same as precision of delivery and it is not the same as force. Specificity is the correspondence between the input and the state: the right doorway for where the distortion is organized, at the right magnitude for what the system can receive, at the right place and the right moment within that doorway. The two failure modes are not symmetrical. The wrong doorway fails at any magnitude, because no volume of input reaches a pattern held at an interface the input does not touch. A distortion held in tissue does not answer to a scream, and a threat held in prediction does not answer to a scalpel. The right doorway still fails at the wrong magnitude: force beyond what the system needs to receive the message degrades the message, and force short of what it needs fails to deliver it. This locates specificity somewhere the professions rarely look for it. It is not primarily a property of the hands, the needle, the dose, or the instrument. It is a property of the reading that precedes them, because an input can only correspond to a pattern that has first been found. What is read is the state, and a structure can be imaged in fine detail while the pattern it holds stays invisible[17]. Every window onto that state is partial and carries its own error, which is why the discipline is triangulation across several of them rather than confidence in any one. Assessment, and not delivery, is the true seat of accuracy. The several points of critical tension described in Section VI sit in varying degrees of potential. The skill of every tradition, under its own vocabulary, is the same: find the point that will yield the most at this moment, choose the doorway that reaches it, and deliver exactly the input it calls for, no more and no less.

The doorways are not the same physical act, and they are not interchangeable. They are inputs delivered at different locations in one self-reinforcing loop, and because the loop is continuous, a change introduced at any point propagates through the whole. That is the unifier the professions have been missing. A common physical act cannot cover a needle and a conversation. A shared tissue cannot cover a manual contact and a molecule. A shared chemistry cannot cover a surgical decompression. The common element is informational. Every effective intervention changes some dimension of the body's constraint landscape, and the body carries that change through the rest of itself. Which doorway fits a given person at a given moment, and at what magnitude, is a question of judgment, training, and match. It is also why the future of care lies in many professions working the same system together, each fluent in its own access point, rather than in one prevailing over the others.

The medium constrains one more thing: how a held pattern can be released, and the constraint is unusually strict. A captured organization cannot be removed by force directed against it.

Increasing magnitude deepens the very asymmetry that holds the pattern in place, or exceeds what the tissue tolerates and produces injury instead of change. Two routes remain. The first alters the properties of the surrounding medium until the region can no longer hold what it is holding, which is what sustained entrainment accomplishes and why repetition over time changes what a single large input cannot. The second introduces a second coherent disturbance, timed to meet the held one, so that the encounter displaces its timing rather than overpowering its amplitude. In the physics of solitary waves this is the characteristic result of a collision. The waves pass through one another, emerge with their shapes intact, and carry away a shift in phase. Structure preserved, timing changed.

This is the model's account of why the interventions that work in this domain share features that look, from outside, like preferences of a school rather than requirements of a system. They are small. They are precisely located. They are timed rather than sustained. And they change the relationship among parts instead of the parts themselves. Those are not stylistic commitments. They are what the medium permits.

The model does not rank the doorways any more than it ranks the magnitudes. It draws one line, and that line runs across the professions rather than between them. It separates interventions by aim. An intervention that restores tone resolves the aberrant organization at its root, and the body reorganizes around the change. An intervention that masks tone improves the experience while leaving that organization intact. It quiets a signal, blocks a receptor, suppresses a report, or disconnects a region from the awareness of the whole, and the distortion goes on operating underneath. Restoration reorganizes. Masking disconnects. Every profession contains both, because a manual contact, a prescription, a supplement, and a conversation can each be delivered either way. Relief has real and honorable value, and the model grants it that place. Unremitting pain that costs a person sleep and work is a regulatory burden in its own right, and quieting it is sometimes what returns the reserve a system needs to reorganize at all. Relief is worth having. It is simply a different achievement from resolution, and the first is routinely recorded as the second.

Relief versus resolution is a distinction that has been hard to draw, because the variable it depends on was never claimed as one system. Without a recognized tone system there is no framework in which quieting a symptom and resolving the organization behind it are different acts, so both are entered in the record as the same success. Name the variable and the difference becomes obvious, along with the reason so much care is organized around changing symptoms rather than restoring the organism. The critique is therefore not an accusation. Practitioners in every field are already working with tone. They have had no single name for what they were working with, and so no way to ask, of any intervention, whether it restored the organization or concealed it.

What a well-matched input does, once it lands, is recalibrate the tone of the loops the body uses to govern itself, rather than force any single value. A regulatory reflex is not a fixed arc but a loop with a responsiveness of its own, which can be sharp or sluggish. Much of disease is that responsiveness going slack[218], and an input that restores it restores the loop’s capacity to answer changing demand. The framework makes this testable. It predicts that a well-matched input reaches the body’s integration centers, not merely the local tissue it touches, and that it does so on the timescale of neural signaling rather than tissue repair, in seconds rather than weeks. There is an established physiology behind the speed of the claim. Large myelinated mechanoreceptive afferents conduct far faster than the small unmyelinated fibers that carry nociception.[219] Erlanger

and Gasser mapped that difference in the classical conduction-velocity classifications[220,221], and Melzack and Wall built it into gate control theory in 1965[222]. Those findings establish the timing and inhibition. What the model adds is that the window the timing opens is where a matched input delivers its information, and that reorganization rather than analgesia is what the window is for. The measurements that would settle it are already routine. The design records heart rate variability[44], the phase coupling between slow and fast cortical rhythms[45], and cortical band synchrony immediately before a well-matched input and again within minutes of it. The site is chosen in advance, and a matched control input is delivered elsewhere. The model predicts a change in coupling and variability after the well-matched input, and little or none after the mismatched one, on that timescale. A result in which the well-matched input moves the central measures and the mismatched one does not confirms the prediction. Work in this area has already established part of the pattern. Manipulation of dysfunctional spinal segments alters sensorimotor integration and motor control[154], and source-localized recording places a measurable share of that change in the prefrontal cortex within minutes of the input[204]. Those findings establish that a mechanical input at a spinal segment reaches central integration on the timescale claimed here. What the model adds is the prediction that the size of the change tracks correspondence to the leverage point rather than the force delivered. The model rests on no single finding. It rests on this general prediction, and it submits it to exactly this kind of test.

None of this is the clinician's doing, in the strict sense. The input only sets the conditions; the reorganization is performed by the body. It is often visible within seconds: in the small involuntary settling of posture as the system remaps itself against its own predictions, in the breath that drops, in the tissue that softens under the hand. It is also why the body's response is itself diagnostic: whatever the doorway, a practitioner can read what was reached by watching how the system answers. And the model predicts the effect compounds. With repeated well-matched input the body does not simply reorganize once. It should grow more coherent over time, widening the range of states it can hold and move between. That widening should be readable in the measures Section II named. That widening is the deepest aim of any course of care: not a single correction but an enlargement of what the system can do.

Beneath every instrument, then, one thing is changing. The evoked potentials and the imaging signatures, the shifts in stress and inflammatory chemistry, the softening a hand feels and the ease a patient reports, are all readings of the same variable. The light touch and the surgical incision, the needle, the dose, the spoken insight, and the practiced contact are all deliveries of input to it. Tone is what changes. Everything else is the instrument through which the change is delivered or seen.

VIII. Input Meets Tone

Why does the same event yield different outcomes in different people? The previous section treated the therapeutic input as a special case of a far more general law, and that law is the clinical heart of the entire model. The effect of any event on the body is not determined by the event alone. It is determined by how the event interacts with the organism's existing tone. This is true of a therapeutic adjustment, and it is equally true of an injury, an infection, a medication, a meal, an emotional shock, a night of lost sleep, or a word spoken by a person the patient loves. There is no

such thing as an input acting upon an empty body. Every input arrives at a system that already has a history, a structure, a reserve, an expectation, a receptor landscape, an autonomic state, a metabolic capacity, and a range of possible responses. The outcome is the product of that encounter. An input does not create an outcome. An input interacting with a tone creates an outcome. The same input passing through a different tone becomes, in the most literal biological sense, a different event.

The outcome, then, is a function of more than the input. It depends on the input, on the current tone, on the accumulated history embodied in that tone, on the reserve the system has available, on the context in which the input arrives, on the timing relative to the system's state, and on how strongly the input is coupled to the systems it can reach. Tone is the hidden variable standing between cause and outcome. Treated as one variable rather than a dozen, it turns a long list of clinical phenomena that have resisted the standard cause-and-effect model into expressions of a single principle. The remainder of this section works through those phenomena, because together they constitute much of what medicine has found most mysterious. None of the individual observations behind this principle is new to medicine, and the model does not pretend otherwise. Pharmacogenomics knows that the same drug meets different metabolic machinery.[223] Allostatic load knows that accumulated demand changes what the next demand costs.[224] Pain science knows that identical tissue findings produce different experiences in different people.[17] Each field found the same fact inside its own boundary and gave it a local name. What the model contributes is the recognition that these are one fact, governed by one variable, statable as a single law rather than a dozen local exceptions. The unification of tone is the claim.

Begin with health itself, because the principle immediately revises what it means to be healthy. Conventional assessment evaluates health through snapshots: a blood pressure, a glucose, a hormone level, an image, a range of motion, an inflammatory marker, the presence or absence of a symptom. A snapshot can miss the property that matters most, which is not any single value but the range of organized states the system can enter and how effectively it can move between them. A healthy system is not permanently relaxed, parasympathetic, pain-free, or free of inflammation. It can activate, defend, inflame, clot, tense, raise blood pressure, raise heart rate, mobilize glucose, suppress digestion, and prioritize survival, all appropriately. Its health lies in being able to leave those states when they are no longer required. Health is therefore the breadth, flexibility, and coherence of the organism's available state-space, and disease is most often the narrowing of that space[25]. A person may still function, but only by repeatedly using the same costly solutions: chronic sympathetic activation, muscular guarding, sensory suppression, inflammation, fatigue, dissociation, altered movement, hormonal compensation, or cognitive hypervigilance. The body is not necessarily failing. It may be succeeding through an increasingly expensive and limited strategy, and the cost of that strategy is what eventually surfaces as symptom.

This reframes what subclinical pains and symptoms are. Subclinical dysfunction is not the absence of dysfunction; it is compensated tonal distortion, a distortion the system is still hiding. Regulation moves through recognizable stages. In flexible adaptation, the system meets a demand, changes tone, resolves the demand, and returns with greater capacity than it began with. In compensated dysregulation, the original pattern is not fully resolved, but other systems take up the slack, and function remains outwardly normal. In subthreshold symptoms, the person begins to notice vague or intermittent changes: fatigue, tightness, reduced recovery, poor sleep,

brain fog, irritability, altered digestion, headaches, exercise intolerance, or intermittent pain. In persistent symptomatic dysfunction, the compensatory system can no longer fully conceal the distortion. In diagnosable pathology, measurable tissue, immune, endocrine, neurological, or organ-level changes become consistent enough to satisfy a diagnostic category. And in structural or regulatory failure, the system loses enough adaptive capacity that it can no longer maintain essential function. The crucial recognition is that diagnosis often marks the moment compensation became insufficient, not the moment disease began. This is why patients so often say their problem came out of nowhere. From the tonal perspective, it did not come from nowhere. It crossed a threshold. What appears above the surface, whether pain, symptom, abnormal value, lesion, or lost function, is frequently the last stage of a long process below the surface: altered autonomic regulation, reduced sensory fidelity, compensatory tension, disrupted sleep, metabolic strain, immune sensitization, reduced movement variability, predictive mismatch, psychological load, and declining recovery reserve. The symptom is the first thing the person notices and often the last thing to arrive. Taken together, these stages describe a layer of illness for which the diagnostic system has no category: people with real suffering, real functional loss, and no lesion. Medicine sorts them into its residual bins and calls them functional, non-specific, medically unexplained, or subclinical[225], every one of which names the absence of a finding rather than the presence of a state. The model holds that this layer is neither residual nor unexplained. It is regulatory, and it has its own organization. Counting it requires measures of regulation rather than measures of structure, which is why it has gone uncounted. The model expects that when it is counted properly it will prove to be the largest layer of illness there is.

The Unified Model of Tone holds that symptoms are outputs of the system, not direct measurements of damage. Pain, fatigue, nausea, dizziness, anxiety, stiffness, and brain fog are real, but their intensity does not reliably correspond to the amount of identifiable tissue damage[17]. A symptom is the organism's integrated interpretation of many things at once: tissue condition, threat, prior experience, expectation, immune signaling, sensory input, available energy, emotional meaning, context, and predicted consequences. A symptom is the experiential projection of the system's current regulatory tone. Pain can therefore arise when tissue damage is present and accurately represented, but it can also arise when a healed structure remains encoded as dangerous, when sensory gain has increased, when inhibition has decreased[216], when immune signaling has sensitized the system, when movement predictions remain calibrated to an old injury, when the body continues to protect against a threat that no longer exists, or when several weak signals converge into one significant protective output. None of this makes pain imaginary. It means pain is real as an experience even when its generating cause is distributed, historical, predictive, or regulatory rather than visible as a single lesion. The stored neural patterns and the persistence of dysfunction after the original trigger has resolved, described in Section VI, are exactly the machinery the model requires.

The same reasoning dissolves much of the mystery of idiopathic disease. Idiopathic means the cause has not been established; it does not mean the condition has no cause. The standard diagnostic model works beautifully where a single dominant cause exists: one pathogen, one infection; one mutation, one protein disorder; one occluded vessel, one infarction. But many chronic conditions are not built that way. They arise from a network in which no single factor is sufficient, and the condition emerges from the interaction of many: genetic susceptibility, epigenetic history, prior immune activation, environmental exposure, nutrition, sleep loss,

chronic psychological demand, mechanical injury, altered movement, autonomic dysregulation, endocrine state, microbiome changes, medication history, social conditions, and ordinary biological variation. Together these reshape the system's tonal landscape until a new pathological state becomes stable[226]. That last word is the key one, because a disease can become an attractor, a state toward which the system repeatedly returns and which, once established, maintains itself[181]. Pain drives guarding, which reduces movement, which weakens tissue capacity, which makes movement more threatening, which produces more pain. Stress activation degrades sleep, which drives inflammation, which worsens regulation, which increases stress sensitivity. Immune activation produces neural sensitization, which alters autonomic output, which alters immune regulation, which sustains the activation. In each loop the original trigger may vanish while the pattern persists. Nonlinear physics supplies the reason a pattern can hold itself up with nothing holding it. A solitary wave persists because two opposing tendencies cancel exactly: the spreading that would disperse it and the steepening that would collapse it. Nothing external maintains the form. The balance is the form. A pathological tonal state is stable on the same terms, and the loops above are the opposing tendencies that hold it in place. Some idiopathic diseases, then, are not caused by a hidden object waiting to be found but maintained by a hidden organization, a self-reinforcing relationship among systems. That is a different kind of thing to look for and a different kind of thing to treat. This is stated as a claim with consequences that can be checked. A condition held in place by a self-reinforcing organization should behave the way stable states behave. It should show hysteresis, meaning the perturbation required to leave the state exceeds the one that produced it, and the path out does not retrace the path in. That follows directly from a self-maintaining balance: dismantling one takes more than entering one did. It should resist correction of any single variable while responding to several changed together. And it should improve in steps rather than in proportion to the input. A chronic condition that shows hysteresis, resists single-variable correction, and improves in steps rather than in proportion counts as evidence for the attractor account.

This also separates the source of a dysregulation from the site where it becomes visible. The same systemic tonal disturbance can express as migraine in one person, gut symptoms in another, muscle guarding in a third, panic in a fourth, hormonal disruption in a fifth, inflammatory skin disease in a sixth, and fatigue in a seventh. Each organism has a different constraint landscape, and the disturbance surfaces wherever that particular body is least able to absorb it. Disease tends to localize where there is inherited vulnerability, prior injury, reduced vascular supply, altered receptor density, previous infection, scar tissue, mechanical stress, weak metabolic reserve, immune memory, developmental difference, or heavily used circuitry. The place where a system expresses disease is therefore not necessarily the place where the disease process began; the symptomatic organ may simply be the one with the least remaining capacity to compensate. This is a major clinical principle, and it is one more reason the symptomatic site and the critical leverage point are so often different.

The same logic governs treatment as governs disease. The most symptomatic site is frequently a compensation splinting a primary distortion elsewhere, so that the loudest tissue is the weakest link rather than the origin. Input delivered to the compensation reinforces the brace, while input delivered to the primary driver releases it. Much of the clinical art lies in telling the two apart and declining to chase the symptom in pursuit of the higher-leverage node. This is the same distinction between source and site, now seen from the side of the clinician rather than the disease.

Clinicians who disagree about a case are usually not disagreeing about the findings. They are locating the origin at different levels, and the level a clinician stops at is the level their training taught them to stop at. One locates it at the site of symptoms, a second at the segment or circuit whose regulation of that site has degraded. A third locates it one step further back, at whatever produced the compensation that degraded the regulation in the first place. All three levels are real, all three are treatable, and a case can genuinely live at any of them. Recurrence is the useful signal. When a well-executed input resolves a problem that then returns unchanged, the information is not that the input failed but that the origin sits one level further back than where it was delivered. This is a reasoning framework rather than a mechanism, and it carries its own warning. A clinician who insists that every symptom is secretly a neck, or secretly a mind, or secretly a gut, has not found the deepest level. They have merely relocated the first one and stopped. Accuracy here is not altitude. Accuracy is correspondence between the level of the intervention and the level at which this particular body's problem actually lives.

The principle explains, finally, why the same life experience produces different outcomes in different people, which is one of the oldest puzzles in all of medicine and psychology. Two people may undergo what looks externally like the same event. Internally it is never the same event, because it meets different developmental histories, prior traumas, degrees of social support, beliefs, expectations, body states, sleep reserves, hormonal conditions, meanings, and coping repertoires. One person integrates the event and gains capacity. Another protects briefly and then resolves. Another forms a persistent defensive state. Another collapses. Another shows no obvious effect until a later event pushes the system across a threshold. Trauma, in the model, is defined not solely by what happened but by the relationship between the demand and the system's capacity to integrate it. The impact of an event scales with its demand, its meaning, and its novelty, and inversely with the integrative capacity available at the moment it arrives. An experience is not stored according to its objective size but according to the system's capacity to integrate it at that moment. That is why something apparently minor can profoundly mark one person while another metabolizes a severe event without lasting dysfunction.

Individual sensitivity, in the model, is a property of coupling. People are not equally connected to every kind of input. One person is highly responsive to mechanical input, another to sound, another to medication, another to interpersonal conflict, another to an inflammatory food, another to sleep disruption, another to hormonal fluctuation, another to environmental chemicals or a change in routine, while the same input scarcely registers in someone else. Sensitivity depends on receptor availability, coupling strength, threshold, amplification, inhibition, prior sensitization, current state, and the number of systems connected to that input. A small input produces a large response when it enters a highly coupled node; a large input produces little response when the system is insensitive to it, when the input misses the relevant pathway, when the system buffers it, or when the receptors and transition pathways it would need are unavailable. This is the familiar nonlinear pattern seen throughout healthcare: the size of the response does not reveal the size of the input; it reveals the input's relationship to the receiving system.

The principle holds all the way down to the single cell. A neuron's response to an identical input is not fixed by the input; it is set by the neuron's own genetic disposition and by its present condition[227], whether the organism that houses it is fed, rested, and resourced or depleted, sleepless, and inflamed. The same signal arriving at the same synapse can be integrated calmly or

read as a threat and amplified down the line, depending on the state of the cell that receives it. What is true of the neuron is true of the organ and true of the whole person: the input does not carry the outcome. The system that meets it does.

Medication response is one of the most important instances of this law, because it is so often mistaken for a property of the drug alone. A medication has real pharmacological properties, but its effect is never produced by the molecule by itself. The molecule enters a particular organism with a particular receptor distribution, gene expression pattern, hepatic metabolism, renal clearance[223], gut microbiome[228], immune state, autonomic state, endocrine environment, nutritional status, concurrent medication load, expectation, disease stage, and prior exposure history[229]. The same molecule at the same dose can therefore produce benefit, no meaningful effect, a paradoxical effect, an excessive effect, side effects, tolerance, withdrawal, or changes that appear only over time. A medication is a structured chemical input that alters coupling, signaling, and transition probabilities within an existing tonal system. It does not simply do one thing; it changes the constraint landscape. Blocking a receptor may reduce one pathway while prompting the system to increase receptor expression[230], reroute signaling, alter transmitter production, change metabolism, or shift another regulatory axis, which is why the immediate effect and the long-term adaptation so often differ. And two patients with the same diagnosis may require different drugs because the diagnosis names the visible endpoint, not the pathway that produced it. A symptom such as hypertension, depression, inflammation, or pain can arise from several different underlying organizations, so the same diagnosis can contain several distinct tonal pathologies, and the same medication interacts differently with each. This is why treatment based on diagnostic category alone produces averages rather than certainties.[231]

This exposes a distinction the input-and-tone principle makes unavoidable, and states one of the model's sharpest and most testable predictions: the difference Section VII drew between masking a value and restoring the regulator that governs it. A medication that lowers blood pressure lowers it regardless of where the patient began, because it acts on a single mechanism in a single direction. An input that restores the tone of the regulatory loop should instead move the value toward the body's own homeostatic midpoint from whichever side it was displaced, so that the same intervention brings a high value down and a low value up. This bidirectional return, lowering what is high and raising what is low rather than pushing in one direction regardless of starting point, is the signature the model predicts will distinguish tonal restoration from pharmacological masking. Stating the test makes the stake concrete. Assemble two groups on the same variable, one whose measure sits above its healthy window and one whose measure sits below it. The variable can be blood pressure, heart rate variability, resting muscle tone, or any quantity with a defined healthy range. Specify the input and the site in advance, by a tone measure taken before the outcome is known, so that matching cannot be judged after the fact. Deliver it to half of each group and give the other half a sham matched for force, contact time, and attention. The sham arm is not optional, because stratifying by starting side produces some convergence from regression to the mean alone[232]. The model predicts convergence in the treated arms that exceeds the sham arms: the two groups move toward each other and toward the middle of the range, and the variance of the treated cohort narrows around the midpoint. It predicts further that a single well placed input can do this for every displaced measure in that person, however many of them there are, which no account assembled from independent set points expects. The body is a nonlinear system, and its changes are nonlinear too: compensation decides how far each displaced

measure moves on any one response, so some travel at once while others are held until the reserve carrying them is released. What the model stakes itself on is the shared direction, not a uniform distance. The measures that were already sitting inside their range should stay there, since there is nothing for a restored regulator to correct. Convergence from both directions, each group moving toward the middle from the side it began on, confirms the prediction. So does convergence in the treated arms that exceeds what the sham produces. The direction of the expected result is fixed before the data arrive, which is what makes this a prediction rather than an interpretation.

The lineage of this prediction is older than the model. Wilder documented in 1958 that the response to a stimulus depends on the level from which the stimulus starts, and called it the law of initial value[9]. What the model adds is not the dependence but the convergence, and not in one variable but across all of them. A restored regulator can carry every displaced measure in the same person toward its own midline, however many measures are displaced and whichever side each one left from. It does not carry them in step. A nonlinear system answers nonlinearly, so compensation decides which measures move on a given response and which are held, and over a course of care the model expects the majority to return to their healthy ranges. No assembly of independent set points predicts even the shared direction, and Wilder's law alone does not predict it either. The multi-measure convergence, read across a course of care and exceeding sham, is the signature that belongs to this model.

The same reasoning explains why so much intervention research underestimates what it studies. The outcome depends on the correspondence between an input and each individual's constraint structure. A trial that delivers the same predetermined input to everyone, such as a standardized manipulation of a fixed segment or a single drug at a single dose, averages a well-matched intervention and a mismatched one across a sample that was never stratified by tone[233]. The responders for whom the input fit and the non-responders for whom it did not are collapsed into a modest mean that describes neither, and a genuinely large effect reads as weak. The model states this as a prediction rather than a complaint. Stratify a sample by a tone measure recorded before any input is given, and specify each person's leverage point from that measure. Then randomize between an input delivered there and the identical input delivered to a site the measure did not select. The model predicts a substantially larger effect in the matched arm and a modest one in the mismatched arm, and it predicts that pooling the two reproduces the small average the literature keeps reporting. A larger effect in the matched arm confirms it, and confirms with it the claim that correspondence rather than force is the active ingredient. Fixing the site in advance is what keeps this a prediction. A leverage point identified after the result is known explains everything and forecasts nothing, and the model does not claim that privilege. The field does not lack evidence so much as it lacks evidence organized around the correct variable.

The same framework gives placebo and nocebo effects a real causal home instead of dismissing them as imaginary. Expectation, trust, ritual, meaning, the practitioner relationship, the environmental context, and the perceived safety of a situation[234] all change the organism's tone, and through it attention, threat interpretation, autonomic state, muscular guarding, pain modulation, motivation, behavior, sleep, adherence, and physiological regulation. The total effect of any intervention is therefore the sum of three things: its specific physical or chemical effect, the contextual regulatory effect of the meaning around it[235], and the system's own response. Inside a living person these cannot always be cleanly separated. Nocebo is the same mechanism inverted:

expectation and context can move the system toward threat, sensitization, guarding, and adverse interpretation[234]. Meaning is not outside biology. Meaning is a high-order tonal input that changes lower-order regulation through the body's recursive architecture. This does not mean expectation cures every disease; it means expectation participates in the final state that treatment produces.

Spontaneous remission and sudden deterioration[236], which appear inexplicable under a linear model, are natural under a tonal one. A system can cross back out of a pathological state when enough of its constraints change at once: sleep improves, threat decreases, a relationship changes, inflammation resolves, movement returns, a hormonal cycle shifts, an infection clears, nutrition improves, a high-leverage intervention lands, or several small changes accumulate. The remission may look sudden, but the system may have been approaching a transition threshold for some time, the way water stays liquid as it cools and then freezes abruptly once it crosses a critical boundary. Nonlinear systems can change gradually beneath the surface and reorganize sharply at the point of transition[180]. The same principle explains why a person who has compensated for years can appear to fall apart after one small stressor: the final stressor is not the primary cause but the last input needed to cross the boundary. The clinical corollary is that many chronic illnesses do not sit in a simple binary of healthy or diseased but move among relatively stable configurations[181]: low symptom and high capacity, moderate compensation, inflammatory flare, exhaustion, partial recovery, and renewed flare. Each state changes the likelihood of entering the next. This is why a patient may tolerate a food, a workout, a medication, or a stressful event on one day and not on another. The input is similar; the baseline tone is different. Tolerance is not a fixed property of the input but a relationship between the input and the system's current reserve.

Comorbidity, so often parceled out among separate specialists, is frequently one dysregulation expressing through several systems. Pain, sleep disruption, anxiety, digestive symptoms, fatigue, headaches, and inflammatory complaints travel together so reliably[237] because a single loss of adaptive regulation, such as an autonomic rigidity, can simultaneously alter digestion, degrade sleep, drive muscle guarding, amplify sensory processing, change vascular tone, dysregulate immune activity, and reduce emotional flexibility[5]. This does not mean every comorbidity shares one cause, and it does not mean a shared loss of regulation must surface in every system it reaches. It means interconnected systems can express a shared loss of regulation through several diagnostic categories at once, and that they do so when compensation can no longer keep those categories quiet. Section VI named four such conditions and the shared state beneath them. Comorbidity, seen this way, is the convergence this paper set out to describe.

The same structure explains why several completely different treatments can help the same condition, and why a treatment sometimes makes things worse before it makes them better. A chronic condition maintained by a loop with multiple access points can be interrupted at any of them: an adjustment changes sensory and mechanical input, a medication reduces inflammatory or neural amplification, psychotherapy changes threat interpretation, exercise changes capacity and prediction, nutrition changes metabolic and inflammatory conditions, sleep restoration rebuilds regulatory reserve, surgery changes a structural constraint, and social support changes the perception of safety and available resources. The treatments are not identical, and they are not interchangeable, but each can work because each perturbs a different component of the same self-reinforcing organization. As for initial worsening, a system organized around compensation can experience change as destabilization. A protective pattern that is costly but still serving a

purpose can, when removed before another strategy is in place, temporarily increase pain, fatigue, emotional intensity, instability, or sensory awareness. This does not automatically prove that worsening is healing, because worsening can equally mean the intervention was inappropriate, excessive, mistimed, or harmful. The disciplined interpretation is that a good intervention expands adaptive possibilities while a poor one either fails to change the relevant constraints or narrows the system further. Response must therefore be judged through function, durability, physiological stability, adverse effects, and the person's expanding or narrowing capacity, not through the drama of an immediate reaction.

Dose-response relationships are nonlinear for the same reason. In a simple system, twice the dose produces roughly twice the effect; living systems rarely oblige. A dose may fall below the threshold of registration and do nothing, land within an effective integration window and produce useful reorganization, exceed a tolerance threshold and provoke defense[238], or rise high enough to trigger destabilization and injury. Too little input is not registered; matched input is integrated; excessive input becomes defense, noise, or damage. This holds, in its own units, for medications, exercise, manual force, sensory exposure, psychotherapy, fasting, temperature, and training alike. More is not inherently better. The correct dose is the amount the system can actually use to enter a more adaptive state.

The principle even revises what a normal laboratory value means. Reference ranges describe populations, and a person can sit comfortably inside a population range while having drifted far from their own functional baseline[239]. Beyond that, most standard tests measure quantity rather than organization: an average level rather than its variability[25], a resting value rather than a response capacity, an isolated molecule rather than a network relationship, a structure rather than its regulation, a single moment rather than a temporal pattern. The model predicts that early disease announces itself in the dynamics before it appears in the values: in variability, coupling, recovery time, responsiveness, temporal coordination, threshold, and transition capacity, while every static number still sits inside its reference range. The test is a longitudinal cohort measured on both panels at once, a standard laboratory panel and a battery of dynamic measures, followed until a fraction of it becomes ill. The model predicts that the dynamic measures move first and predict who converts. If the dynamic measures move first and carry predictive information the static ones lack, the prediction is confirmed. The future of tonal assessment therefore lies less in static measurement and more in dynamic challenge-and-response testing: how heart rate responds and recovers, how glucose moves after a demand and returns, how the nervous system adapts during learning, how movement variability changes under load, how inflammation resolves, how sleep restores capacity, how a person responds to and recovers from an intervention. The most informative variable is frequently not the starting number but the system's ability to change appropriately and return. Endpoints that read tone directly would measure the variable itself rather than its downstream shadow: heart rate variability and baroreflex sensitivity[218], resting-state EEG coherence, default-mode[240] and salience-network connectivity[241], interoceptive accuracy[242], and autonomic phenotype.

These threads gather into a single account of how dysfunction develops, which can be laid out as a sequence of stages without ever leaving the tonal frame. First comes demand, when the person meets a mechanical, chemical, infectious, metabolic, emotional, cognitive, or social challenge. Then registration, as the organism detects and interprets that challenge through its existing tone.

Then response, as neural, immune, endocrine, metabolic, mechanical, and behavioral systems reorganize to meet it. Then either integration or incomplete resolution, in which the system either incorporates the event and returns with expanded capacity or retains a protective pattern. Then compensation, as other systems reorganize to preserve immediate function around the unresolved pattern. Then stabilization, as the compensatory pattern becomes an attractor and begins reproducing itself through feedback. And finally expression, as the pattern surfaces as symptoms, functional loss, measurable pathology, or a named disease. Seen through these stages, disease is not merely damaged structure. Disease is the persistence of an organization that no longer serves the present needs of the whole.

What all of this answers, in the end, is the deepest recurring mystery in health: why two people with the same diagnosis, the same exposure, the same injury, the same treatment, and apparently the same anatomy can have radically different outcomes. The model answers that they do not have the same system. They have different accumulated histories, different present organizations, different compensations, different vulnerabilities, different meanings, different coupling relationships, different reserves, different transition thresholds, and different possible futures. Disease does not emerge from cause alone; it emerges from the interaction between cause and organization. Healing does not emerge from treatment alone; it emerges from the interaction between treatment and organization. Tone is the hidden variable between input and outcome, and the same input passing through a different tone becomes a different biological event. The body is not a passive object upon which causes act. It is an active, historical, self-organizing system that transforms every cause according to its existing tone. And therefore a symptom is not simply what has happened to the body. It is what the whole organism is currently doing with what has happened to it.

IX. The Unifying Claim

All illness involves disconnection: loss of coherent nested oscillation, degraded interoception, frozen autonomic range, tension network distortion, metabolic inefficiency, cortical resource misallocation, and, in its most persistent form, cortical encoding of the dysfunctional pattern itself. The specific disease diagnoses, whether cardiovascular, musculoskeletal, psychiatric, autoimmune, or functional, are downstream expressions of the same underlying loss of integration between brain and body. Every disease has a tonal expression, and many are initiated, maintained, or amplified by failures of tonal regulation. Structural, genetic, infectious, toxic, and malignant causes are different forms of tone, and where they dominate they must be treated on their own terms. What the model shows is that even these causes are received, compensated for, contained, or amplified according to the tone of the system that meets them. That is why the same insult runs a different course in different people. Disconnection is the common tonal signature beneath the diagnostic categories, not a replacement for their distinct causes.

All healing involves connection: re-entrainment of nested rhythms, restored interoception, recovered autonomic flexibility, reorganized tension network, efficient metabolic allocation, freed cortical capacity, and the updating of stored neural patterns that were once adaptive and are no longer serving the present. The healing itself is always done by the body. The clinician's role, across every profession, is to change the conditions: to alter some dimension of the organism's

constraint landscape so that the body can find its own coherence. Restated in the model's sharpest terms, health is the capacity to maintain coherent organization while flexibly changing tone in response to internal and external demands. It is not one ideal tone but a wide, organized state-space: the ability to enter sympathetic activation when action is required and leave it when the demand ends, to inflame when repair is needed and resolve when the threat is gone[243], to stiffen a region when protection is necessary and remobilize it when protection is no longer useful, to spend energy on defense and later return it to repair, growth, reproduction, learning, and play. Disease is the narrowing of that space. Healing is the recovery of the capacity to update.

The model gives the old chiropractic concept of Innate Intelligence[244] a precise modern meaning, one that neither requires a hidden homunculus directing the body nor discards a genuine clinical insight. Innate Intelligence is the embodied capacity of the organism's distributed relationships to register their own condition, constrain one another, preserve the whole, and reorganize in response to change. It includes homeostasis, allostasis[1], immune surveillance, wound healing, tissue remodeling, predictive regulation[18], autonomic coordination, developmental organization, and learning. The body does not first build itself and then acquire intelligence; its intelligence is expressed through the very relational processes by which it continually constructs and maintains itself. Innate Intelligence is not located in one place. It is the organism's total tone recursively regulating itself, with the nervous system as the level at which that self-regulation is most densely integrated and, in consciousness, made partly available to experience. What the chiropractic literature once called innate intelligence is what contemporary neuroscience describes as homeostatic, allostatic, predictive, and self-organizing regulation across coupled biological systems[159]. The vocabulary has modernized but the underlying claim is the same.

This is the deepest reason so many different traditions arrive at the same clinical moment under different names. When a manual therapist feels the tissue soften under their hand, when a bodyworker watches a patient's breath finally drop, when an acupuncturist speaks of qi beginning to move, when a somatic therapist follows an involuntary tremor to its release, when a yogi describes prana flowing, and when a chiropractor watches the pelvis settle and the head reposition, they are naming the same event in their own vocabularies: the body's own regulatory intelligence coming online and reorganizing its tone once it has been handed accurate information about itself. No practitioner in any of these traditions produces the reorganization. Each creates the conditions under which the nervous system's embedded self-regulatory capacity can express itself, and the body does the rest, exactly as it regulates insulin, immunity, and sleep without instruction. The technique is the doorway. The reorganization is the body's.

The subluxation, rightly understood, describes a twenty-first-century unified concept of tone under a nineteenth-century name[245]. It names the persistent distortion of recursive self-registration that projects through the biotensegrity architecture and produces the clinical findings every healing profession has independently discovered. The term arrived a century before the science that could carry it, which is why it has been so easy to dismiss and so hard to replace. It belongs to every healing tradition that works on the living body, whether that tradition recognizes the shared object or not.

The healing professions have talked past each other for too long. They work on the same body, organized by the same nervous system, built on the same tensegrity architecture, oscillating at the same nested rhythms, and transforming every input they receive according to the same existing

tone. The differences in vocabulary are historical. The mechanism is shared. A unified model of tone integrates Sherrington's account of integration[52], Bernard's internal milieu[53], Cannon's homeostasis[1], and Selye's adaptive cost[54] with the systems grammar of Wiener's feedback[55], Prigogine's far-from-equilibrium order[246], and Kuramoto's coupled oscillators[56]. To that it adds Levin's biotensegrity[69], Breig's cord mechanics[112], Friston's predictive brain[159], Benarroch's Central Autonomic Network[2], Craig's interoceptive architecture[10], Thayer and Lane's neurovisceral integration[5], Sato's somatoautonomic reflex framework[247], Korr's facilitated segment[67], and Luz's dorsal horn convergence[248]. It gives the professions a common language without requiring any of them to abandon what their clinical traditions have learned. Each of those researchers established what their own work established, and the integration of their separate findings into one variable is the model's. If every mechanism in this paper were rebuilt the way two centuries rebuilt Galvani's[249], the claim it was written to make would remain: the healing professions are reading and moving one organized state, and its name is tone.

Tone is the shared object that every clinician in every tradition is reaching for, whatever their training taught them to call it. Whether we adjust, mobilize, manipulate, prescribe exercises, needle, breathe, hold, teach, medicate, or operate, we are all changing the tone of the body to move it toward the homeostatic midline it holds in health, restoring the most efficient possible conversation between the nervous system and the world. A body carrying as few asymmetries and obstacles as possible is a body that processes information and energy most efficiently, and that efficiency is what every tradition, in its own way, is trying to return to its patients. Recognizing this is the beginning of a healing paradigm that treats the body as the integrated, coupled, oscillating, tensioned, self-organizing system it has always been, rather than fragmenting it between professions.

And that recognition permits a final restatement of the model's central thesis, sharpened by everything the preceding sections have added. The original claim was that the body is regulated through tone. The fuller claim is that the body is tone becoming recursively capable of registering, organizing, regulating, and experiencing itself. Every input the body meets, whether a force, a molecule, a word, or a wound, is transformed by the tone that receives it. The outcome is written in the encounter rather than in the input. Chiropractic is the clinical art of identifying where the body's self-registration has become constrained and delivering the minimum specific input required for the organism to reorganize itself. It is one member of a family of professions doing the same work at different layers of the same recursive whole.

A final historical note belongs here. The Unified Model of Tone has been arrived at from two directions. One direction is contemporary neuroscience, which has over the past several decades produced the vocabulary of prediction error, neurovisceral integration, central pattern generation[250], interoception, immunoception[251], facilitated segmentation, and biotensegrity that the preceding sections synthesize. The other direction is the clinical traditions themselves, each of which, through generations of careful observation of what actually works in the human body, arrived at working descriptions of the same phenomena long before the neuroscience existed to explain them. Chiropractic, which named the nervous system as master regulator and the spine as its structural home in 1895[244], is one such tradition. Osteopathy, which formalized the facilitated segment concept in the middle of the last century[67], is another. Medicine, physical therapy, somatic healing, yoga, acupuncture, craniosacral therapy, and every hands-on tradition

that has produced durable clinical results have described, each in its own vocabulary, pieces of the same integrated picture. What contemporary neuroscience articulates in rigorous experimental terms, the clinical traditions have been doing in their consulting rooms for decades and in some cases centuries. Both directions describe the same phenomenon, real enough to have been discovered many times, from many angles, by people working carefully and separately. Repeated independent discovery is the strongest evidence available that there is something there to discover. What has not happened before is the joining. Each discovery stayed inside the vocabulary that produced it. No one has held that the neuroscientists and the healers were describing one regulatory system, then given that system a definition, a set of measurements and a way to be proven right. That is what this model does, and it is the whole of its claim to originality.

Tone is the organized state that determines what the body can do with what happens to it. It shapes how information is received, how disturbances move through the system, how tissues coordinate, and whether a response becomes adaptive or disruptive. When tone becomes rigid, the body loses its ability to change. When tone collapses, it loses the coherence required to sustain an organized response. Health exists in the range between those extremes, where the body can change without coming apart and remain stable without becoming fixed. However it is measured, that capacity reflects the same underlying organization. Tone is not simply what the body is doing. It is the condition that determines what the body can do next.

Tone is the expression of life.

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