

Structure, Movement, Proprioception

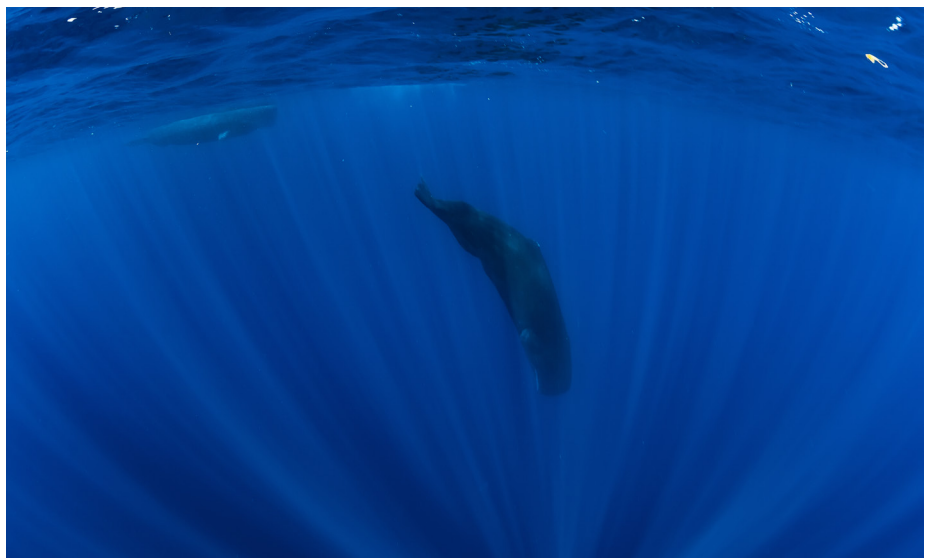
A New Paradigm for Structural Integration

By Szaja Gottlieb, Certified Advanced Rolfer®



Szaja Gottlieb

ABSTRACT *The discovery of Piezo channels, mechanosensitive proteins that transduce physical pressure into cellular signals, formally validated the relationship between touch and proprioception. It is now clear that the manual therapist's touch directly engages the same mechanosensitive pathways that mediate spatial awareness. For structural integration, this finding holds special significance, as it establishes proprioception as equal in importance to structure and movement. This new scientific understanding reveals how proprioception in structural integration through touch, combined with body-wide spatial awareness, forms a powerful combination. Given the complexity of spatial processing in relation to balance, systematic spatial awareness training may help optimize balance. To that end, the novel concept of propriosphere is introduced as a three-dimensional visual model around a client to establish spatial reference points for sensing balance. The author also develops the concept of propriosomatics, exercises and movements specifically aimed at improving proprioception. Using balance as the fundamental organizing principle, the Rolfing® Ten Series thus becomes a progression of spatial and neurological information that transforms postural organization, movement patterns, and sensory awareness.*



Buoyancy and balance, thus relating optimum adaptation to gravity on both land and sea. (Photo by Nurture on istockphoto.com.)

To help our clients become aware and achieve optimal balance, the approach of structural integration practitioners needs to incorporate proprioception. While structural and movement aspects are emphasized within Rolf's ten-session series process, proprioception has not been explicitly positioned as a co-equal foundational element alongside structure and movement – a theoretical gap that this paper aims to address.

Section 1: Balance

Why Are Bodies Out of Balance?

Structural integration practitioners are peacemakers, seeking out restrictions and resolving conflicts so that the body moves more freely. Often, clients are introduced to new spatial awareness of the physical world: discoveries about living in 1 g gravity on planet Earth that are so basic, they are in disbelief that these fundamental capacities have been missed. In structural integration, balance – what may be termed neutrality or equilibrium in the gravitational field – is the pivot of this new awareness. The goal of structural integration is to create balance, because when a body is in structural equilibrium, there is an even distribution of weight and stress, allowing ease and efficiency.

The difficulty most people experience in achieving balance deserves careful investigation. Balance itself is not the problem; optimal balance is. Like oxygen, gravity is another constant of everyday life, and it is rarely considered unless there is a dysfunction. The idea that there might be a better way to stand upright, or walk, is almost completely foreign to the average citizen. Moreover, the popular conception of balance is that of an innate sense, rather than a skill that can

be, or needs to be, developed. A sense that structural integration practitioners are in a perfect position to augment. There is also the hidden obstruction to balance, rarely considered, of functional imbalances in the human sensorium that make attaining optimal balance more difficult than expected.

To help our clients become aware and achieve optimal balance, the approach of structural integration practitioners needs to incorporate proprioception. While structural and movement aspects are emphasized within Rolf's ten-session series process, proprioception has not been explicitly positioned as a co-equal foundational element alongside structure and movement – a theoretical gap that this paper aims to address. But before proceeding to a discussion of how proprioception and structural integration intersect, the importance of balance and the role it played in Dr. Rolf's conceptual framework needs to be investigated.

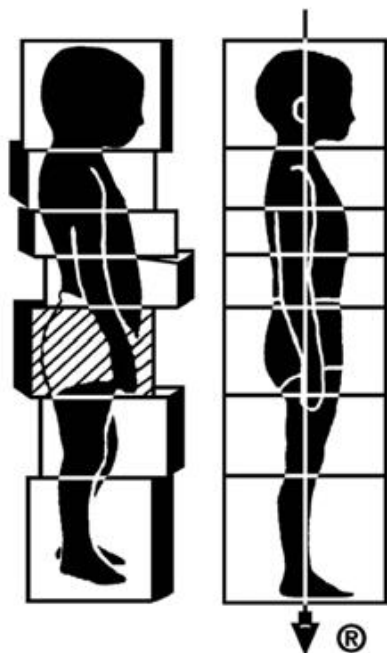
Random versus Organized

Due to the work of Ida P. Rolf, PhD (1896-1979) fifty years ago in the development of the profession of structural integration and the Rolfing Ten Series, there is now welcome acceptance of the role of the fascial system in human health – including seven iterations of the International Fascia Research Congress, a steady stream of peer-reviewed research by such luminaries as Dr. Robert Schleip, Dr. Carla Stecco, and Dr. Antonio Stecco,

and even two films [*The Secret Life of Fascia: Part 1* (Schonfeld 2019) and *Ida Rolf – Mother of Fascia* (Urbanczik 2024)] – fascia was not Rolf's first love. In her book, *Rolfing: The Integration of Human Structures* (1977a), the subject of fascia is not taken up until page 37 in Chapter 3. What dominates the first 37 pages and the first two chapters is a focus on gravity and structure, and the healthy response to that challenge: balance.

"Balance," Rolf writes, "reveals the flow of gravitational energy through the body. Asymmetry and randomness betray lack of support by the gravitational field. All these considerations are inherent in the word structure as it is applied to any three-dimensional system, be it human, vegetable, or inorganic" (1977a, 30). The primacy of the physical world was undoubtedly the driver of her vision often encapsulated in such aphoristic statements as, "All this metaphysics is fine but be mighty sure that you got physics under the metaphysics" (Rolf 1978, 206) or, "The aim of Rolfing is to integrate the small gravitational field that is man [sic] with the larger gravitational field that is the earth [sic]" (Rolf 1977a, 30).

Undoubtedly, fascia was, for Rolf, a critical and dynamic factor in the reshaping and remodeling the physical reality of the body. However, in the early days of Rolfing Structural Integration, her vision rested on the clear distinction she made between what she referred to as "random" and "organized" bodies, a distinction embodied in the Little Boy Logo drawn



Little boy logo® based on a child client Rolf treated; a demonstration of Rolf's block model of alignment.

by Rolfer, artist, and actor, John Lodge (1922-2008). Lodge illustrated Rolf's seminal textbook, *Rolfing: Reestablishing the Natural Alignment and Structural Integration of the Human Body for Vitality and Well-Being* (1977b). Lodge, in fact, did many drawings of random and organized bodies, many of which have been recently published (European Guild for Structural Integration 2021).

In simple terms, Rolf referred to the client's relationship to gravity before receiving a series of structural integration sessions as 'random', and the relationship to gravity during and after structural integration sessions as 'organized'. In other words, before structural integration, the choices made by the client in response to gravity were arbitrary, based on personal preferences or habits, while choices after being 'processed' (i.e., experiencing Rolf's ten-session series) involved a change in the relationships between segments so that the body exemplified an integrated structure aligned with the field of gravity. Importantly, this change involved a shift in awareness, which might be deemed proprioception, but also could be so transformative that it suggested to Rolf a potentially evolutionary jump in human consciousness and potential.

Balance Is a Skill and Not a Sense

Quintessentially, balance is the body's homeostatic response to challenges posed by gravitational forces to maintain physical stability. In the case of gravity, awareness of balance results from a trip or fall. Unless a human is trained to develop this awareness, the complexity of the balance function is, as time passes, neglected and forgotten. By middle age, this natural gift of childhood degrades with physical maturity and ageing.

What is especially problematic is that, although balance often is termed a sense, it would be more accurate to describe it as a skill. Unlike the eyes that see or ears that hear or nose that smells, there is no singular sensory apparatus that maintains balance. Rather, balance relies on three different systems: vision for orientation, the vestibular system for detecting motion, and proprioceptive sensors for body position (Freidhoff and Paganini 2019). An important distinction to be made is that the vestibular system in the inner ear helps maintain balance by detecting head motion, while the proprioceptive system gathers spatial information from the joints and limbs, regardless of movement. In short, balance is a multifaceted process involving various and different information systems.

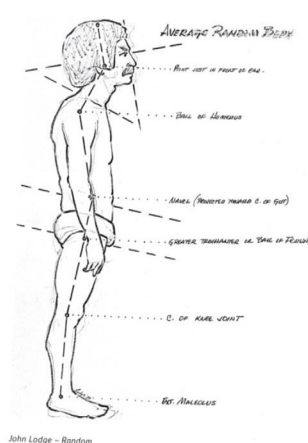
While the delineations of interoception, exteroception, and proprioception are an intellectually handy way to discuss the systems informing balance, recent scientific discoveries of a new class of proteins, Piezo1 and Piezo2, challenge these neat categorizations. These mechanically sensitive proteins are integral not only for interoceptive functions including heart and bladder responses (Hamed, Ghosh, and Marshall 2024), but also for proprioceptive functions, particularly through Piezo2 ion channels that mediate touch sensations (Brazil 2017). *Piezo* in Greek means pressure.

While balance is a key ingredient in everyday existence, it is one of those concepts that has many definitions and applications, such as the metaphorical "being balanced in life." Even within the Rolfing® Structural Integration universe, the word balance contains ambiguity. For many Rolfers®, balance, as represented by the Little Boy Logo, is identified with the internal organization of the segments of the body by a vertical line. Dissatisfaction with the static aspect of the vertical line epitomized by the logo has historically been a source of consternation (Maupin 2014). Though balance can be described as having a variety of qualities – such as external/ internal or static/dynamic – concepts useful in educating a client, the logo communicates an internal balance model. This may serve to accentuate

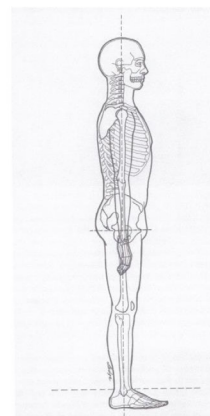
Average Random Body.

vs

Organized Body



John Lodge - Random



John Lodge - 3rd hour Line

(pictures courtesy of the European Guild for Structural Integration)

Average random body (L) vs organized body (R) showing Third-Hour line. Images by John Lodge courtesy of the European Guild for Structural Integration (2021, 80 and 63).

Hundreds of millions of years ago, life moved from sea to land, one might say from buoyancy in water to balance on land. This development led to new adaptations to gravity within the same species.

the structural goals of the structural integration ten-session series, but it neglects the sensory awareness aspects.

This paper focuses on proprioception because the question proprioception addresses is identical to the question that is posed in structural integration: “Where is my body in space?” The word ‘proprioception’ derives from the Latin words *proprius*, meaning “one’s own” or “individual,” and *capere*, “to take or grasp.” Without proprioception, the somatic improvements of a Rolfing Ten Series would be suspect, and maintenance of skills such as balance beyond the series and beyond our offices would be unthinkable. The researcher who first published about the Piezo ion channels and Nobel Prize winner Ardem Patapoutian argued that, “At the most basic level, a physical aspect of consciousness requires proprioception” (Resnick 2021, online). His comment reinforces Rolf’s insight that moving a body from a random to an organized state involves a change in consciousness.

Historically, the movement aspects of Rolfing Structural Integration, known as Rolf Movement® Integration, were developed subsequent to structural work to create a more dynamic approach to the human body in motion. Deepening somatic changes by incorporating the proprioceptive dimension can further enhance the transformation that Rolfing Structural Integration promises. But before taking up the topic of proprioception directly, there is one more obstacle to the ‘organized’ body to consider: how the human body’s shape and neurological organization can themselves obstruct optimal balance.

Section 2: Gravity, Evolution, and Shape

Mechanotransduction

Life in 1 g gravity is our evolutionary heritage, and like all Earth organisms, the human body’s primary response to gravity is shape. “Gravity,” write the authors of “Gravity Sensing in Plant and Animal Cells” (Takahashi et al. 2021, online), “defines the morphology of life on Earth.” At the microcosmic scale, this occurs at the cellular level as mechanotransduction, the conversion of mechanical force to electrochemical activity. In a research paper entitled “Appreciating Force and Shape—the Rise of Mechanotransduction in Cell Biology,” the abstract reads, “Although the shapes of organisms are encoded in their genome, the developmental processes that lead to the final form of vertebrates involve constant feedback between dynamic mechanical forces, and cell growth and motility” (Iskratsch et al. 2014, 825). Current research confirms the intuitions of earlier physicalist theorists, such as D’Arcy Thompson (1860-1948), who wrote *On Growth and Form* (1917), and validates the physicalist premise underlying structural integration: that shape emerges from the body’s mechanical relationship with gravity.

Hundreds of millions of years ago, life moved from sea to land, one might say from buoyancy in water to balance on land. This development led to new adaptations to gravity within the same species.

Land snakes, for example, that live on the horizontal axis, are gravity-tolerant compared to their seagoing relatives, who faint with increased gravitational pressure of being out of water. Evolution affected the internal organs as well. The tree snake’s heart, for example, is closer to its brain, for blood transfer to the brain, compared to that of a sea snake (Lillywhite et al. 2012). Though a different geometry, a similar coherence of shape and function for survival becomes even clearer when considering the spatial organization of another sea creature, the octopus. Its eight tentacles form a sensory circle of space to detect any threats, even while asleep (Sima 2021).

When considering human shape, the emphasis is on an evolutionary bipedal vertical structure organized around centralized sensing. According to scientific thought, the general principle of organizing shape in 1 g gravity is polarity, but particularly so in relation to the vertical structure of human beings. The Russian authors of a paper called *The Evolutionary Role of Gravity* write, “The major feature of organism structure determined by gravitation is the polarity of organisms. It is expressed in morphology, embryology, development, and growth. The basis of the polarizing role of gravity is the gravitational dependence of physical and chemical processes on the earth [sic]. All earth organisms from unicellular organisms to man [sic] have upper, lower, front, back, and lateral sides” (Dubinin and Vaulina 1976, 47). Thus, to achieve balance, the shape of every earthly organism is organized by directionality – up/down, north pole/south pole – seeking equilibrium in the gravitational field, an integral principle of structural integration.

Spatial Biases

Though gravitational response is primary for every organism, neurology is also shaped by the struggle for survival. This includes not only spotting predators and prey but also critical social interactions, such as recognizing a member of the same tribe and more complex social relationships. When examining how sensory awareness is organized, the observer might be struck by what ostensibly seem like spatial biases, omissions and accentuations in the sensory field result in a favoritism towards the upper pole and the frontal plane, neglecting the lower pole and the



Photo by PicturePartners on istockphoto.com.

back plane. These spatial biases reflect functional priorities – the body’s sensory system emphasizes areas critical for threat detection and social interaction (the upper pole and frontal plane), while areas less critical for immediate survival receive less neural representation. While adaptive, this organization can compromise optimal gravitational balance – a key goal of structural integration.

This threat-response pattern is so fundamental that even the threat of gravitational perturbation – the risk of falling – triggers the same defensive response as the danger of a predator. Research shows that subjects standing at an elevated height exhibited significantly increased postural stiffness, a defensive response that deteriorated their balance control (Carpenter et al. 2001). The eyes are a case in point: eye positioning alone – without any visual input – influences postural sway, demonstrating how these threat-oriented sensory systems fundamentally affect balance control (Tamaru and Matsugi 2022).

Studies confirm that the human neurological system is organized to meet threats even at unconscious levels. In a 2023 study, “Attentional Bias to Threat Is Modulated by Stimulus Content: An fNIRS Study” (Liu et al. 2024), subjects with brain-imaging sensors were shown a series of pictures of animals like spiders

and snakes, and pictures of humans depicting violence and injury, as potential threats. Consistently the response to humans was the strongest, even greater than dangerous animals. Sensory cues were then introduced to see whether these neural responses could be modified. The results showed that neutral cues aided in response to possibly violent animals but were less effective against human threat. In other words, at a deep unconscious level, the central nervous system is geared to protect against threat, especially a human one.

These threat-oriented priorities are reflected in the brain’s sensory mapping itself. The image of the sensory homunculus figure, though not a precise rendering of sensory distribution and function according to its authors, Wilder Penfield and Edwin Boldrey, is instructive simply as a representation of human sensory schema, showing the concentration of sensors in certain locations and the lack of sensors in other areas. The homunculus, based on their 1937 article, “Somatic Motor and Sensory Representation in the Cerebral Cortex of Man as Studied by Electrical Stimulation” (Penfield and Boldrey 1937), has been a fixture in neuroscience. It is noteworthy that the homunculus was updated by a team of scientists at Washington

University School of Medicine in 2023, who identified three new areas that they theorize integrate networks linking motor control with cognitive planning and autonomic regulation (Gordon et al. 2023). However, the concentration of sensory awareness in various parts of the body mapped by Penfield and Boldrey remains unchanged. What is striking is the amount of neural space taken up by the face, hands, and lips – what might be called the upper pole – and the surprisingly small amount of neural activation in the lower legs and feet – the lower pole.

Visual dominance, while advantageous for survival, creates challenges for optimal balance function. Several studies have demonstrated this visual dominance over proprioception. In a 2021 study called “Visuo-Postural Dependency Index (VPDI) in Human Postural Control” (Danna-Dos-Santos et al. 2021), researchers found that though there were individual differences in using visual versus proprioception for balance, eyesight was increasingly chosen despite the degeneration of proprioceptive capacity with age and the superiority of proprioceptive function for balance. In another study, “The Contribution of Upper Body Movements to Dynamic Balance Regulation During Challenged Locomotion,” subjects recruited the upper pole when balance



Sensory homunculus figure.

Image licensed under the Creative Commons Attribution-Share Alike 4.0 International CC BY-SA 4.0, via Wikimedia Commons.

Available from [https://commons.wikimedia.org/wiki/File:Sensory_Homunculus_Figure_\(side_view,_black_background\).gif](https://commons.wikimedia.org/wiki/File:Sensory_Homunculus_Figure_(side_view,_black_background).gif)

When examining how sensory awareness is organized, the observer might be struck by what ostensibly seem like spatial biases, omissions and accentuations in the sensory field result in a favoritism towards the upper pole and the frontal plane, neglecting the lower pole and the back plane. These spatial biases reflect functional priorities – the body's sensory system emphasizes areas critical for threat detection and social interaction (the upper pole and frontal plane), while areas less critical for immediate survival receive less neural representation. While adaptive, this organization can compromise optimal gravitational balance – a key goal of structural integration.

Szaja Gottlieb

Rolf's genius lay in recognizing the primacy of gravity and balance. Working decades before mechanotransduction research and neuroplasticity studies, she intuitively understood that manual contact and movement education needed to be integral to create lasting change. What she couldn't have known was the precise neurological mechanisms underlying structural integration transformation.

was challenged. As the researchers note, "When humans try to maintain their equilibrium in a challenging balancing task, they unwittingly engage upper body parts including their trunk, arms, and head" (Boström, et al. 2018, 1). Significantly, when balance challenges were increased, there was even greater dependency on these same elements, which are inefficient for maintaining equilibrium in gravity.

The north pole sensory concentration of the homunculus is not the only noteworthy imbalance. There is the front/back plane imbalance as well. Bipedal survival demands vigilance for prey, predator, and social interactions, all oriented in the frontal plane. Researchers have noted that the concentration of sensors in the tongue, lips, and fingertips far outweighs those found in the trunk. Each fingertip has more than 3,000 touch receptors, many of which respond primarily to pressure. In comparison, the entire trunk of the human body has as many receptors as one hand (Hancock 1995). These 3,000 sensors are not for prehensile function; they are for spatial awareness.

Neuroplasticity

Fortunately, these functional biases are not fixed constraints. Recent research has demonstrated that systematic proprioceptive training can lead to measurable changes in how the central nervous system processes spatial information. Why is the issue of spatial imbalances important for our work?

Spatial biases create blind spots that affect how clients organize themselves in gravity, and by using proprioception, our work can shift, reorganize, and transform their patterns.

The ankle joint is a case in point. Study after study agree that if a body is attempting to find optimal balance, the ankle joint is critical, whether attempting to improve athletic performance or rehabilitation from a medical condition. As the authors of "The Role of Ankle Proprioception for Balance Control in Relation to Sports Performance and Injury" write (Han et al. 2015, online), "Balance control improvement is one of the most important goals in sports and exercise. Better balance is strongly positively associated with enhanced athletic performance and negatively associated with lower limb sports injuries. Proprioception plays an essential role in balance control and ankle proprioception is arguably the most important". When there is an injury to an ankle joint, the recommendations are usually soft-tissue mobilization and joint mobility, but most importantly proprioceptive engagement. The greater the proprioceptive aspect, the better the outcome. Significantly for this discussion of functional imbalances, proprioception has been linked to neural modification in the central nervous system. The authors of the same study write, "Central processing of ankle proprioceptive information with other sensory information, enables integration for postural and balance controls" (Han et al. 2015, online).

Perhaps the strongest evidence for the capacity of proprioception to create central nervous system changes comes from studies discussing medical conditions. A stroke rehabilitation study demonstrates that systematic proprioceptive training can restore motor function through neuroplastic reorganization (Kiper et al. 2015). Studies of aging populations reveal that balance training incorporating proprioceptive elements leads to structural brain changes (Rogge et al. 2018). Dystonia research provides particularly compelling evidence that systematic proprioceptive training protocols can create neurophysiological changes (Rosenkranz et al. 2008). The conclusion here is simply that proprioceptive engagement is not limited to local tissue but creates change in the central nervous system, which is usually referred to as neuroplasticity. This finding echoes an essential concept in structural integration: that local issues are often global in impact.

Rolf's genius lay in recognizing the primacy of gravity and balance. Working decades before mechanotransduction research and neuroplasticity studies, she intuitively understood that manual contact and movement education needed to be integral to create lasting change. What she couldn't have known was the precise neurological mechanisms underlying structural integration transformation. Or that, as Nobel Prize winner Patapoutian discovered, touch and proprioception use the same molecular sensor (Woo et al. 2015). Ironically, manual practitioners

have, to various degrees, been practicing proprioceptive approaches for the past fifty years. However, within the Rolfing universe of structure and movement, proprioception has been implicit. My contention is that it is time to make proprioception explicit and establish it as a third element equal to structure and movement.

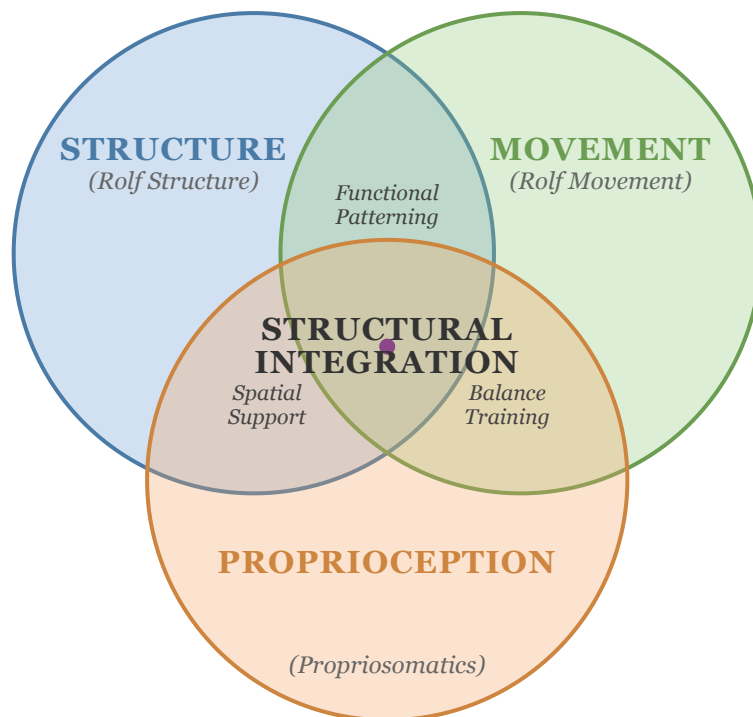
Section 3: Enter the Propriosphere

Proprioception is integral to structural integration. As my three-circle Venn diagram illustrates, proprioception forms a third domain alongside Rolfing Structural Integration and Rolf Movement Integration work, each informing the others. The three domains can be considered this way: structure reveals organization in space. Movement reveals organization in motion and in time. Proprioception reveals organizational integration on a sensory level.

Researchers Helene Langevin, PhD and Robert Schleip, PhD, who is also a Rolfing Instructor, have both published articles linking proprioception to fascia, the staple of structural integration. Specifically, Schleip (2015) relates fascia to proprioceptive communication, while Langevin (2021) researched the effect of shortened and painful fascia tissue as related to diminished proprioception. Proprioception is ever-present in structural integration. When a client after a first session says, “I feel different, but I am not sure how,” what he or she is communicating is not only

Structure, Movement, Proprioception

A New Paradigm for Structural Integration



Relationship of proprioception to structure and movement. Image created by Szaja Gottlieb.

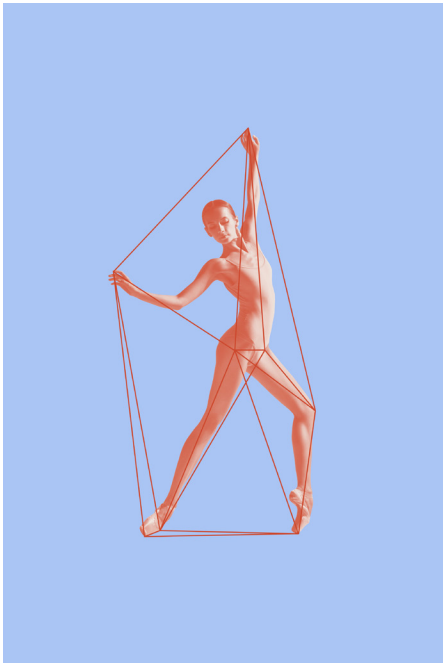
a structural change resulting from soft-tissue manipulation, but a change in how she or he senses space. Within the universe of Rolfing Structural Integration, proprioception is usually embodied as movement. However, recent discoveries related to Piezo channels imply that manual therapy used by the practitioner to

initiate structural change is proprioception beginning at the point of touch. The claim, in fact, could be made that all the work done in a structural integration session is proprioceptive – and that would be hard to refute. Consider this syllogism: if structural integration is essentially about balance, and balance is essentially about

[I]t is time to make proprioception explicit and establish it as a third element equal to structure and movement . . . structure reveals organization in space. Movement reveals organization in motion and in time. Proprioception reveals organizational integration on a sensory level.

proprioception, then structural integration is essentially about proprioception. However, there is an intrinsic problem with this position: there is no agreement on exactly what proprioception is.

Proprioception, as a term, is especially fraught with issues. In Rolfing training, the space around the individual in motion is often described as the “kinesphere,” a concept derived from Rudolph Laban, a dance teacher, who introduced it in 1926. Unfortunately, this movement-based definition runs into a methodological challenge that proprioceptive researchers have long grappled with: *movement simultaneously activates visual and vestibular systems, making it difficult to isolate and study proprioceptive contributions*. Researchers address this by studying proprioception in stillness, where visual and vestibular ‘noise’ can be minimized (Han et al. 2016). Though proprioception is often associated with body position during movement, proprioception, sensory awareness of the body in space, remains operational even when the body is still and the posture static. The good news for structural integration practitioners is that balance – practically synonymous with proprioception and a keystone of our work – applies equally well to both static and dynamic posture. Moreover, when proprioceptive strategies are considered,



Kinesphere.
Image by master1305 on istockphoto.com.

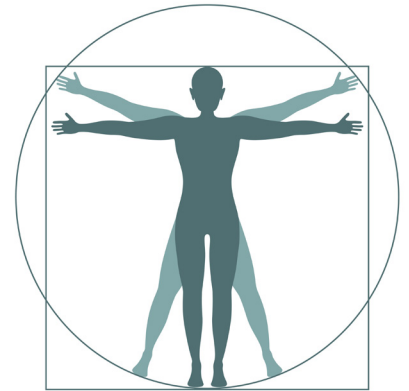
**In this newly defined approach,
the Rolfing Ten Series serves
as a neurological scaffolding of
spatial awareness, based on the
proprioception of balance.**

balance training appears to be the most effective (Winter et al. 2022). What stands in the way is a reconsideration of balance as a formal category within the structural integration hierarchy.

Propriosphere

Following the same methodological logic that researchers use, “propriosphere” establishes proprioceptive awareness in stillness before introducing the complexity of movement. The limitations of the concept of kinesphere have already been noted. Laban defined kinesphere as, “the sphere around the body whose periphery can be reached by easily extended limbs without stepping away from that place, which is the point of *support* when standing on one foot” (Space and Relationship undated, online). Laban’s definition can be modified to apply to a stationary position as well: the sphere of space around the body with limbs extended which can be felt without stepping away from that place, which is the point of *balance* when standing on one or both feet. This concept can be referred to as the “propriosphere,” a term also derived from the dance world.

Balance requires spatial reference points. Without a clear orientation – a felt sense of north, south, east, west, up, down – proprioception lacks the coordinates needed to locate one’s body in space. The propriosphere provides these landmarks as an imagined spatial framework that clients can reference proprioceptively, facilitating sensory reweighting from visual-vestibular dominance toward proprioceptively-grounded balance. It is a simple tool, but effective. The argument here is that propriosphere should be incorporated as a formal element for



Propriosphere.
Image by igorshi on istockphoto.com.

**Our work is
thus not only
structural, nor
just movement,
but also
propriosomatic,
amplifying
the goal of
somatic spatial
awareness.**

structural integrators in Rolf's ten-session series, to establish these spatial reference points for clients. Indeed, the static position that propriosphere presents may be an advantage in the very first hour when balance is introduced, involving movement that requires dynamic visual and vestibular information. The proprioception of balance is not simply an aspect of structural integration; it is essential to how the work functions. In this newly defined approach, the Rolfing Ten Series serves as a neurological scaffolding of spatial awareness, based on the proprioception of balance.

In truth, this paper builds upon Rolf Movement Instructor Monica Caspari's (1953-2019) brilliant essay, "The Functional Rationale of the Recipe" (2005), in which she describes how structure and movement need to be integrated to get improved functional results. Recognizing proprioception as an essential aspect of structural integration similarly serves to accentuate and amplify function. Our work is thus not only structural, nor just movement, but also propriosomatic, amplifying the goal of somatic spatial awareness.

If the structural integration ten-session series were reimagined through a proprioceptive lens, balance would be the ongoing dynamic, and the propriosphere would be the spatial reference points for that dynamic. Using polarity as our mainstay, the series is a progression of stages of balance and spatial awareness on the pathway to higher levels of structural integration. In a sense, the series becomes like a remodeling job, where the crew comes in to make space for structural changes, but also to alter how the space itself is perceived.

The first stage of the Rolfing Ten Series, usually referred to as the sleeve sessions (Sessions 1 to 3), represents what might be called the 'external model of balance'. In this first stage, the client begins a reorganization of spatial awareness of the first north pole, then the south pole, and finally the circumference and volume the body occupies.

The second stage of the Rolfing Ten Series, usually referred to as the core sessions (Sessions 4 to 7), is what might be referred to as the 'internal model of balance'. This stage reorganizes the relationships between segments from the ground up, beginning with the insertion of a central gravity line, epitomized by

the Little Boy Logo. These core sessions often are embodied as movement. In movement, propriosphere translates to kinesphere.

The last stage of the Rolfing Ten Series, Sessions 8 to 10, is the culmination of the series, climaxing in what practitioner Ed Maupin (2014) refers to as *expansional balance* or *dynamic polarity*.

A poetic way to think of the ten-session series is as a symphony in three parts, with the theme of polarity and integration being introduced and reintroduced in each of the three stages – sleeve, core, and integration – each time at a higher level of organization in Sessions 3, 7, and 10. The focus here, however, is not just structure but systematically developing and scaffolding new areas of spatial awareness using balance as the organizing principle and the practitioner's intent as creative fulcrum.

Propriosomatics

Though the drama and the climax of the structural aspect of a structural integration ten-session series is often related to the later sessions, particularly the Seventh Hour, the First Hour, can be both groundbreaking and transformative proprioceptively. Experienced proprioceptively, a client may discover polarity along with gravity and support, resulting in an inversion of previously felt spatial values such as 'up' and 'down'. Such interruptions to the accepted spatial order initiate a complete reconstruction of structural, spatial, and sensory relationships of the body, within and without.

If the structural integration ten-session series is approached proprioceptively, then the subject of balance and spatial awareness can be presented by the practitioner in the First Hour, even before the client lies horizontally on the table. With the client standing, the Rolfer can engage them in an exercise I call *the seesaw* or *the sway* (described in the next session). As you will read, the client goes from a rocking back to a point of rest that is in alignment with gravity. What is accomplished immediately is critical: the client now knows what balance feels like. Most importantly, she or he is invited to participate in their own spatial awareness.

This introduction and engagement with balance will sustain thematically throughout the Rolfing Ten Series. Though

complex, balance is not unknown or forgotten. Like a buried childhood memory, it can be reawakened, and balance can be reintroduced as a delight rather than a chore. The confidence of the client can be reassured: "You are out of balance, and it's not your fault. You knew balance as a child, and it's something that you can easily relearn, and that's why I'm here." The concept of propriosphere, in fact, may translate for many clients as ownership of their own space, with potentially profound psychological benefits.

The educational aspect of structural integration is ever-present. As the client undergoes a structural change each session, he or she also undergoes a proprioceptive change. The question for the practitioner then becomes not only, "How can I improve the client's structural support?" But also, "How do I simultaneously affect their spatial sense to enable self-correction during and after the series?" Using weight and direction, both in our touch on the table and patterning off the table, there may be opportunities to fill in holes or gaps in their propriosphere. As I stated previously, considerable movement education suggests that proprioception already exists in Rolfing Structural Integration. This paper attempts to move proprioception from implicit to explicit.

Exercises

The following exercises or movements are specifically aimed at proprioceptive education, which can be categorized as propriosomatics.

The Seesaw or The Sway

The seesaw or *the sway* is a propriosomatic exercise with the intention of teaching our client while standing, simple balance, we encourage weight shifting in the feet. The practitioner stands to the side of the client with one hand on his or her upper back and the other on the upper chest. The client is then asked to rock their weight from heel to toe in progressively smaller oscillations. Under the guidance of the practitioner, subtly providing support and at the same time affecting the client's weight back and forth between the frontal and back planes, the client is then asked to find and feel the point of neutrality – that spot midfoot where she or he feels completely supported by their feet. (It is important that the client keep their eyes horizontal rather than downward during

Practitioners should use everything in their arsenal to help clients embody the work, especially after completing Rolf's ten-session series. This requires educating clients to the message of structural integration: balance accessed through proprioception.

this process.) This is the balance point. At this time, the practitioner removes his or her hands, and the client will feel a new sense of support, freedom, and connection to the ground. This sense of self-support and independence is often accompanied by a deep, relaxed breath. Other spatial cues, such as addressing head position or the back plane, can then follow.

Locked On Neutral

Locked on neutral is a propriosomatic exercise meant to teach the client to connect the head to the support of the back plane, particularly the heel. With the client standing, the practitioner places his or her right elbow between the shoulder blades and holds the back of the client's head with their right hand. Simultaneously, the practitioner places his or her left hand on the client's forehead, helping them position their head in alignment with the spine. The goal is to have the client feel their head supported as part of the continuity of the back plane. The client can then be asked to take a few slow steps while the practitioner maintains these positions with light, supportive contact. This exercise can be combined with the seesaw.

Taking the Wall with You

Taking the wall with you is a propriosomatic exercise with the intention of helping the client sense the back plane necessary to achieve balance with the frontal plane. The client stands with his or her back to a wall and presses the back of

their body and the palms of their hands against the wall (to take advantage of spatial sensory input of the hands). The head should not be tilted back, but rather have the chin tucked. If the head does not touch the wall, that is not a problem; the key is to keep the eyes horizontal. The client is then asked to walk away as if taking the wall with them. Clients report that this exercise serves them well as a proprioceptive reminder during the day of their back plane.

Conclusion

It is in the structural integration oral tradition that Rolf, in her teaching, often quoted Robert Frost's words from a 1954 news conference. Asked what freedom was, he replied, "being easy in your harness" (Quote Investigator 2015). For Rolf, the metaphor certainly speaks of the harness of gravity. Recent scientific research suggests that the deep evolutionary imprint of threat on the neurological system makes maintaining balance in the gravity field problematic. The sensory homunculus reveals our spatial biases: upper pole dominance, visual system primacy, neglect of lower limbs, and the back plane. These functional imbalances create obstacles that require more than structural change.

Current neuroscience reveals something remarkable about Rolf's work: she was engaging both structural and neurological systems simultaneously, though only the structural aspect was explicitly

recognized and taught. Since touch inherently activates proprioception, as we know from Patapoutian's work, and proprioceptive engagement creates neuroplastic changes in the central nervous system, every manual intervention in structural integration has always worked on two levels: tissue reorganization and neurological reorganization. The profound, lasting transformations Rolf observed resulted from this dual engagement, not from structural changes alone. This doesn't diminish the importance of structural work – it explains why it's so effective and why the changes persist.

Practitioners should use everything in their arsenal to help clients embody the work, especially after completing Rolf's ten-session series. This requires educating clients to the message of structural integration: balance accessed through proprioception. Since educating our clients is central to structural integration for lasting transformation, this paper argues that proprioception should be considered equally essential with structure and movement as tools of structural integration practice. The framework introduced here – the propriosphere as a spatial reference system, the three balance models (external, internal, expansional) as a systematic progression, and propriosomatic as the term for integrated spatial awareness work – intends to make proprioception explicit rather than implicit.

Many practitioners have undoubtedly incorporated proprioceptive approaches intuitively. Making proprioception explicit doesn't add something new to structural integration – it names and leverages what has been happening all along. When clients internalize these proprioceptive lessons, they become, in a sense, their own continuing practitioners, maintaining and extending transformation beyond their Rolfing Ten Series and outside the confines of our offices. A proprioceptive approach also opens new vistas to the potential of structural integration, particularly in regard to therapies addressing balance issues in senior adult populations, but also the general population in regard to everyday and athletic performance.

Szaja Gottlieb first received Rolfing sessions in 1978, which resulted in him becoming a stone sculptor, which, in turn, led to his becoming a Rolfer in 2001. He lives with his wife, Ko, and practices in San Luis Obispo, California.

He believes in the transformational potency of structural integration.

Author's Note, Dedication, and Acknowledgments

This article is the third in a series, which includes my 2017 article, "The Art of Rolfing and the Art of Sculpture," and my 2018 article, "The Earthbound Metaphysic," both explorations of spatial concepts derived from my experience as a sculptor and a structural integration practitioner.

This article is dedicated to my brother, Dr. Philip Gottlieb (1953-2023), a well-known biophysicist and researcher, who passed away in 2023. His field of interest was proprioception, and he was the editor of a book titled *Piezo Channels* (Gottlieb 2017). It remains ironic that, although we took very different paths – his in science and mine in art – we both arrived at this common interest of proprioception.

I would also like to thank Mary Bond, Mark Donahue, and Kevin Frank for their support, as well as Michael and Georgette Salveson for their valuable input. I especially want to thank my wife, Myung-Bun (Ko) Gottlieb, for her reading and feedback during this more than yearlong effort. Special thanks to Anne Hoff for editing the final draft and to John Schewe for the initial edit. I acknowledge the use of Claude AI during research, discussion, and writing of this paper.

References

- Boström, Kim J., Tim Dirksen, Karen Zentgraf, and Heiko Wagner. 2018. The contribution of upper body movements to dynamic balance regulation during challenged locomotion. *Frontiers in Human Neuroscience* 12:8.
- Brazil, Rachel. 2017. Proteins get touchy under pressure. *Chemistry World*. London, UK: Royal Society of Chemistry. Available from <https://www.chemistryworld.com/features/the-proteins-of-touch/3007645.article>.
- Carpenter, Mark G., James S. Frank, Cathy P. Silcher, and Gary W. Peysar. 2001. The influence of postural threat on the control of upright stance. *Experimental Brain Research* 138:210-218.
- Caspari, Monica. 2005. The functional rationale of the recipe. *Structural Integration* 33(1):4-24.
- Danna-Dos-Santos, Alessandra, Maria M. Ribeiro Dos Santos, Alessandra T. Magalhaes, Vinicius S. Cardoso, Patricia Driusso, Luis Mochizuki, and Adriana M. Degani. 2021. Visuo-postural dependency index (VPDI) in human postural control. *BMC Sports Science, Medicine and Rehabilitation* 13, 7.
- Dubin, N.P. and E.N. Vaulina. 1976. The evolutionary role of gravity. *Life Sciences and Space Research* 14:47-55.
- European Guild for Structural Integration. 2021. *Structural integration, the basic series in all its abundance: An homage to Dr. Ida Rolf's work inspired by John Lodge*. Self-published. Poland.
- Freidhoff, Laura and Anthony Paganini. 2019. PLM: The proprioceptive, visual, and vestibular systems are mainstays for balance and equilibrium. Michigan State University. Available from <https://www.justintimemedicine.com/curriculum/2318>.
- Gordon, Evan M., Roselyne J. Chauvin, Andrew N. Van, Aishwaraya Rajest, Ashley Nielsen, Dillan J. Newbold, Charles J. Lynch, Nicole A. Seider, Samuel R. Krimmel, Kristen M. Scheidter, Julia Monk, Ryland L. Miller, Athanasia Metoki, David F. Montez, Annie Zheng, Immanuel Elbau, Thomas Madison, Tomoyuki Nishino, Michael J. Myers, Sydney Kaplan, Carolina Badke D'Andrea, Damion V. Demeter, Matthew Feigels, Julian S. B. Ramirez, Ting Xu, Deanna M. Barch, Christopher D. Smyser, Cynthia E. Rogers, Jan Zimmermann, Kelly N. Botteron, John R. Pruett, Jon T. Willie, Peter Brunner, Joshua S. Shimony, Benjamin P. Kay, Scott Marek, Scott A. Norris, Caterina Gratton, Chad M. Sylvester, Jonathan D. Power, Connor Liston, Deanna J. Greene, Jarod L. Roland, Steven E. Petersen, Marcus E. Raichle, Timothy O. Laumann, Damien A. Fair, and Nico U. F. Dosenback. 2023. A somato-cognitive action network alternates with effector regions in motor cortex. *Nature* 617, 351-359.
- Gottlieb, Philip A. 2017. *Piezo Channels* (editor). Cambridge: Academic Press.
- Gottlieb, Szaja. 2017. The art of Rolfing SI and the art of sculpture, Part 1. *Structural Integration* 45(1):28-31.
- _____. 2018. The earthbound metaphysic: The art of Rolfing SI and the art of sculpture, Part 2. *Structural Integration* 46(2):10-15.
- Hamed, Yasmeen M. F., Britya Ghosh, and Kara L. Marshall. 2024. PIEZO ion channels: Force sensors of the interoceptive nervous system. *The Journal of Physiology* 602(19):4777-4778.
- Han, Jia, Judith Anson, Gordon Waddington, and Roger Adams. 2015. The role of ankle proprioception for balance control in relation to sports performance and injury. *BioMed Research International* 1:842804.
- Han, Jia, Gordon Waddington, Roger Adams, Judith Anson, and Yu Liu. 2016. Assessing proprioception: A critical review of methods. *Journal of Sport and Health Science* 5(1):80-90.
- Hancock, Elise. 1995. The handy guide to touch. *John Hopkins Magazine*. Available from <https://pages.jh.edu/jhumag/495web/touch.html>.
- Iskratsch, Thomas, Haguy Wolfensen, and Michael P. Sheetz. 2014. Appreciating force and shape – the rise of mechanotransduction in biology. *National Review of Molecular Cell Biology* 15(12):825-33.
- Kiper, Pawel, Alfons Baba, Michela Agostini, and Andera Turolla. 2015. Proprioceptive based training for stroke recovery. Proposal of new treatment modality for rehabilitation of upper limb in neurological diseases. *Archives of Physiotherapy* 5(1).
- Langevin, Helen M. 2021. Fascia mobility, proprioception, and myofascial pain. *Life (Basel, Switzerland)* 11(7):668.
- Lillywhite, Harvey B., James S. Albert, Coleman M. Sheehy III, and Roger S. Seymour. 2012. Gravity and the evolution of cardiopulmonary morphology in snakes. *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* 161(2):230-242.
- Liu, Hejun, Qihan Zhang, Jon D. Elhai, Christian Montag, and Haibo Yang. 2024. Attentional bias to threat is modulated by stimulus content: An fNIRS study. *Frontiers in Human Neuroscience* 17:1308457.
- Maupin, Edward W. 2014. Expansional balance and the 'Line'. *Structural Integration: The Journal of the Rolf Institute* 42(1): 19-21.
- Penfield, Wilder and Edwin Boldrey. 1937. Somatic motor and sensory representation in the cerebral cortex of man as studied by electrical stimulation. *Brain* 60(4): 389-443.
- Quote Investigator. 2015. Quote origin: Definition of freedom: It's being easy in your harness. Available from <https://>