Body as a Movement System

A Premise for Structural Integration

By Kevin Frank, Certified Advanced Rolfer™

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Abstract: *Ida P. Rolf formulated structural integration (SI) based on premises regarding the biochemical and biomechanical properties of fascia, and regarding the relationship of the Earth's gravity field and the capacity of human beings to find normal posture. Neuro-scientific research and clinical observations of SI practitioners suggest that the logical explanations for why and how SI works will benefit from a shift in conceptual emphasis: SI is a system-oriented approach for reviving natural coordination, and for working with the now broadly adopted concepts of body image and body schema. The author explores how this shift of thinking changes both the way SI is taught to students and clients, and the way Rolf's message is presented to the world.*

We are not stuff that abides, but patterns that perpetuate themselves.
Norbert Wiener[1]

PREMISES AND CONCLUSIONS

In an archival film, Ida Rolf says that if you wish to reach different conclusions you must start with a different premise. How do premises affect what we do as SI practitioners?

The manner in which one conceptualizes a field of inquiry shapes the manner in which one operates, the questions one asks, the models one constructs, and the identity of the profession. For example, the idea that germs cause disease builds a medical system that looks different from one built on the idea that evil spirits inhabit bodies and cause illness. Each premise reaches different conclusions. Ida Rolf started with several premises that were new at the time: that the body is plastic and fascia can be reshaped, and that posture can be provoked so that the body regains a healthy relationship with gravity and functions harmoniously. Her thinking derived from her practice of yoga, the study of biochemistry, and treatments and training from pioneer osteopaths. Rolf's premises birthed the SI field and a concept of what SI is.

How we conceptualize SI has practical consequences. This article looks at an information-based model of SI, meaning a mode of SI in which it is posited that the body responds well when it gets appropriate information. This way of thinking provides opportunity for the field of SI to further develop its potential.

How do we conceive our work?

AN INFORMATION-BASED MODEL: THE MOVEMENT BRAIN

The author finds it helpful, in teaching groups and working with clients, to propose a specific premise for SI work. The concept itself is simple: SI addresses communication to and with a system, something that can be called "movement brain." The movement brain idea is a different starting point for considering posture and structural bodywork than the premise that the body is something plastic to be reshaped. If one starts with this system idea – the movement brain – the SI story unfolds in a particular direction. Rolf's legacy is still served, but the SI model has broader congruence.

System vs. Mechanics

The movement brain idea emphasizes system phenomena in contrast to mechanical "parts" such as muscles, fascia, nerves, restrictions, mechanism of injury, and failures of "structure." The movement brain point of view steers our attention to something that is not a thing, something we must imagine. We don't know what the movement brain is. In that sense it fulfills the role of a black box that, unseen, must be learned about through direct experience, by building a sense of what it is. We learn how to speak to/hear from the movement brain and thereby get to know its personality. We learn how to see movement as choreographed by the movement brain.

Holding Maps Lightly

The movement brain model embraces but doesn't fully explain the complexities of human motor control. The movement brain point of view benefits from a broad outline that traces control pathways in neurological terms. We know that movement control involves the cerebellum and sensory and motor cortex, plus the system of reflexes that operate using the stretch reflex. To describe movement control in this way, however, one makes no less a fiction than by describing it as movement brain. Such a story is incomplete and quickly out of date. The purposely vague image of a movement brain confronts our impulse to control it, or to use the anatomy terms in false ways. We need a map. To focus on the map is to lose touch with the intelligence with which we wish to work. (To appreciate the complexity of the movement brain, the reader is directed to Blakeslee and Blakeslee's book *The Body Has a Mind of its Own.*[2])

The movement brain isn't a central computer. It's the way in which the body acts as a system in relation to context. System activity involves interrelated complex networks, and often there is no anatomical structure on which we can pin the complexity. As a system event, coordination cannot be locally defined. Continual refinements emerge in the science that explains motor control. We benefit as research validates and refines the model of our work, but the term "movement brain" doesn't require frequent updates.

Body therapists and educators need anatomical knowledge to understand and see how the body is constructed. When we habitually think anatomically or biomechanically, though, it can interfere with movement. Some forms of anatomical awareness facilitate flow and ease in function, and we will cover these later in the article.

The movement brain concept reduces focus on the fascia as something to reshape. Fascia

becomes, among other things, a portal of communication.[3]

State change in fascia as an explanation for what is occurring in SI, while having provided fifty years of marketing for Rolf's work, may need reconsideration. At present, a change in emphasis revitalizes thinking about research, education, and marketing – it changes how we think as we work.

Scientific research supports an information-based system approach to modeling SI, and assists in the evolution of Rolf's work. And, the movement brain model dovetails well with examples of successful research within the SI community that are mentioned later in this article.

BODY SCHEMA, POSTURAL SCHEMA, AND BODY IMAGE

In neurological language, "movement brain" aligns with the term "body schema." Body schema was first proposed in 1911 by two British neurologists, Head and Holmes. Their model states that the body has two levels of coordinative control, one that is largely automatic and beyond our conscious awareness, body schema, and the other, an overlay that can influence but also interrupt the functioning of the former, body image.[4] Postural schema, a subcategory of body schema, refers to that part of automatic coordination that governs gravity orientation.

Over the past hundred years, this model has been used by neurophysiologists to untangle the various issues that cause motor and perceptual dysfunctions in patients. Gallagher and Cole also write about the body schema and body image concept.[5] They describe a patient who lacks afferent proprioception. He must do with conscious control what a normal person does through automatic reflexes and coordinative patterns. The patient is an extreme example of the human dilemma, in which we substitute voluntary control (body image) for the schema that in Gallagher's patient is no longer available, but the rest of us take for granted.

What does this have to do with SI?

Coordinative Intelligence

In SI, we seek long term improvements in posture, movement, and integration of coordinative change with the psychological sense of living in a body: not modest goals. To what, in terms of body schema (including postural schema) and body image, do the SI goals translate?

When clients make lasting shifts in postural coordination, the schema (automatic pattern of coordinative control) has shifted; in some instances we could also say that the schema has received permission to express itself. Why permission? Because the schema part of body attempts optimum efficiency and stability in response to the demands made upon it. The body is challenged and schema responds. (It is important to note that a demand must be made on the system in order for it to perform. More will be said about demand later.) This occurs so long as body image does not interrupt the process.

Slip on the ice, or catch sight of something in the street as we drive, and the deepest parts of our "movement brain" react, at speeds faster than our cognitive brain makes choice. It is after our instant reaction that thinking evaluates what it was that happened or what object we avoided. Schema reacts, then the "what" part of the brain catches up with the event.

What and Where Distinction in Function of Vision

A "what and where" model of vision helps us understand more about body schema and body image. This model is described in terms of how our vision has separate pathways, linked to schema and image function.

Paillard, a body schema/body image neurologist, summarizes and diagrams the "what" and "where" functions as two sets of pathways that are connected with vision.[6] The "what and where" vision-model provides distinction between movement brain and object recognition brain. Livingstone, a Harvard neuroscientist, notes the difference in evolutionary age for the "where" and "what" connections in the brain.[7] The "where "part of vision belongs to earlier function in the development of the brain, ones more concerned with survival. The "what" part of vision belongs to the more cortical and more recent brain development and is a large part of modern life.

"Where"-oriented vision is also called peripheral vision.[8] It notices outline, contrast, movement, directionality, and sees in black and white. "What"-oriented vision is also called focused or fauvial. It notices color, texture, detail and, as noted above, matches what is seen with that stored in memory.

Body Schema and Body Image Function

In a social context (and with no imminent danger), we have the dubious luxury of choice about how we move (or express posture). Our mind may then be more concerned with "what" (or "who") questions. In these contexts, we often express less coordinative intelligence than in the earlier examples. Instead, body image intervenes and biases or interrupts body schema's function. For example, when a client is observed walking in front of his or her SI practitioner, he or she may try to "look good" and amplify the improvements that the practitioner apparently likes to see. How do we meet this challenge?

As SI practitioners we have tools to help individuals meet the social context, and other practical contexts, with a more adaptive body schema. We also offer tools for using body image to revive schema function when we notice that it is missing.

Body Schema is not Personal

Body schema means the coordinative intelligence that underlies optimum movement. The schema part of body isn't personal. In fact, schema doesn't differentiate body from the peri-personal space around body.[9,10] Schema looks for movement potential based on knowledge of body and space around it.

Our genetic body plan and our human ancestry endow us with the ability to react automatically and skillfully. If a body part is damaged or lost, or if there is disease or a neurological failure, the schema will adapt as best it can. The "hardware" part of us belongs to the schema and is part of any movement equation the body composes. But a damaged body part is also registered in our body image, and it may or may not allow the body schema to function.[11]

Tools, body prostheses or extensions, if not rejected by body image, are quickly added to body schema. A tall hat worn in a room with low beams will become, effectively, the top of head after a little time. A rake or an automobile will become a temporary extension of body schema if body image is willing.

Body Image

In contrast to schema, body image is personal. It is patterned by our development and circumstance. Body image is a potential filter through which coordination often has to pass – much coordination happens without interference but in SI we are particularly concerned with those places where interference has occurred.

Body image represents aspects of posture and movement control that are within the reach of conscious awareness. However, although we can be conscious of body image, certain parts of it can be out of awareness or may be repressed.

Body image is acquired through personal history.[12] We build a representation of ourselves, including a body map (which is an overlay to the implicit body map at the level of body schema).

Imitation and Mirror Neuron Theory

For example, we imitate the posture of our family. We empathize with the movements and posture of those we see. This is another documented aspect of brain function, of movement brain. Our brain triggers a motor control pattern when we observe another in movement, as if we are doing the movement or posture ourselves. This phenomenon is part of what is called the "mirror neuron" theory. Research by Umilta, Rizolatti, and others document that we have this capacity to learn movement by seeing it and empathizing with the motor activity of another.[13,14] In essence one's brain activity imitates that of another, as though the observed motor activity is one's own.

Self-Image

We imitate. As we develop we also attempt to relate the sensations of our inner experience into something we are told is our "self." We acquire a sense that what is inside "me" is seen from outside as someone with a name, a shape, and what will become a collection of stored memories about how I am seen. We build our movements from the others in our environment. And we build a representation of our movements and of our body shape and size from others as well. Our learned movement patterns are partly schema adapted to circumstance, and partly image as we copy images of others and as we build a social self.

Our vocabulary of movements is separable, artificially but usefully, into body schema and body image. Schema, again, refers to the aspect of movement that responds as necessary to changing circumstance that call for movement. Image refers to the overlay –the sense of our self and the way in which our movement responses may be filtered. Image reflects our history: how we are held, touched, instructed, encouraged, punished, and inspired, and so on. Our body image also reflects the culture we grow up in, including the structure of language and mythology. We could refer to the body image as the social input and schema as the movement brain component.

What are examples of how SI works implicitly with the body image and body schema?

Postural Schema

Postural schema is central. Rolf spoke about gravity constantly. Godard's tonic function model describes gravity orientation as the fundamental piece of the movement brain with which we, as practitioners, wish to communicate.[15] Before we move, before we build a perception, the background to all our actions is gravity orientation. Gravity orientation, the way in which we locate ourselves in space and on the Earth, is necessary to organize the movement of the senses and the movement of our body. Rolf referred to gravity as, "the most potent physical influence in any human life."[16] When SI assists a body to recover postural schema integrity, and to integrate a person's life with his or her postural orientation settings, change occurs at a deep level of movement intelligence.

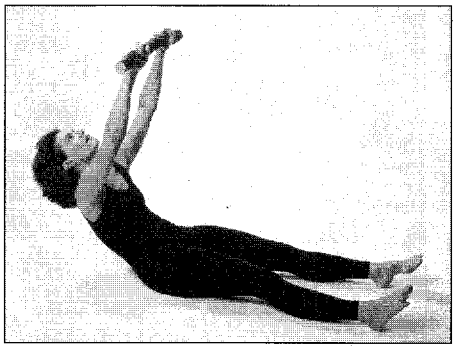
MOVEMENT INTELLIGENCE – SCHEMA REVEALED

The postural schema is part of what is here being called body schema. What are other examples of body schema expression?

We have alluded already to the function that keeps us upright when we slip on the ice or the brake pedal response before we know what's ahead. There are other dramatic examples: a mother who lifts an enormous object, such as a car when she sees her trapped child; a wheelchair-bound person who runs out of his home suddenly on fire – these examples involve schema but also a high level of arousal.

Other examples, less dramatic, are nonetheless compelling. Notice your own personal list. What are some ways the body's movement system miraculously responds to demands put upon it – what the author calls "happy accidents?" You might reflect on work, sports and art performance moments in which your body recalls noticeable grace, strength, or miraculous timing and accuracy of a movement.

One counterintuitive example of body schema is the exercise called, "Sitting Up with a Stick," illustrated in *How Life Moves, Explorations in Meaning and Body Awareness*.[17] In this exercise we have the movement brain story displayed. The mover lies supine and holds a substantial stick in both hands. He or she attends to orientation, to space and to weight, and to the sensory impression of the stick in the hands, and to the imagined power of the stick to lift the head and torso to sitting. To do this requires simultaneous and sustained perception of space, weight, the stick, and abstention from effort. The result is that the movement brain functions to allow antagonist muscles – the back muscles – to substantially release so a smaller quantity of agonists do the work to sit up.



Contrast this with conventional sit-ups that aim to exercise the rectus abdominus and external oblique muscles. Watching Sitting Up with a Stick, it looks as though the stick lifts the head and torso. We know physics dictates otherwise, so we are surprised. A conventional sit-up showcases the belly wall doing work. The contrast of Sitting Up with a Stick and a conventional sit-up is a contrast between body schema and body image.

This example illustrates how body schema functions liberated from body image. The body schema doesn't "think" about muscles. The movement brain only "knows" the body as a complex palette of motor units that it draws upon in nuanced combinations. It "knows" that release of antagonists is preferable to use of agonists. It "knows" that the agonists for the motion already express a baseline level of contraction and abstains from adding to it until the

moment it is necessary. This level of refined orchestration is beyond conscious control. From such an example, when experienced, we get a sense of the movement brain.

The movement brain isn't beguiled by anatomical descriptions of muscles, or instructor urgings to try harder, or the fashion-magazine invitations to acquire particular muscular shape. The movement brain uses the optimum (economical) coordination to, in this exercise, lift the torso.

Inhibiting the Inhibition

As mover, one must give the movement brain a chance to function. To do so, often requires one to inhibit the inhibition of the body image; to quiet down held images of body, conscious or unconscious, to quiet impulses to perform and act in some idealized way.

Our predisposition to effort comes, for most of us, effortlessly. It is a habit that overlays a more instinctual responsiveness that we call body schema. To undo body image inhibition what tools do we have?

As mentioned, we wish to give the movement brain information that helps it to function. Why do we need to give it help if it's supposed to be automatic? Because, we have "taught" it to be overruled by our body image, our effort, our attempts to "master" the movement, and we typically try to learn through effort. When we consciously attend to orientation and to sense perception and to felt potencies of mass and directions into space, we displace the impediments of body image and effort. We consciously choose image input that supports schema. This is the primary work of SI. How do the tools of this work feed the movement brain? What do structural integrators do? What are our tools?

STRUCTURAL INTEGRATORS' TOOLS

1. Embodied Presence, Kinesthetic Empathy and Body Reading

The primary tool of the structural integrator is embodied presence. Embodied presence allows us to demonstrate new coordinative possibilities. Embodied presence offers a safe container for the work and speaks directly to the movement brain of the client. Also, a practitioner's differentiated and articulated sensory awareness, and oriented presence, is the basis for the capacity to "see" the movement (or postural set) of another. Seeing allows SI work to have depth.

How does "seeing" work? Seeing is linked to mirror neuron theory, mentioned earlier. We watch a movement and our body has the capacity to know that movement from the inside, through the subtle but substantive motor activity that occurs in our body as it watches another person's movement. This is called kinesthetic empathy or empathic kinesthesia. What then allows us to discover our empathic kinesthesia with another? Which kind of brain do we wish to arouse and how?

The movement brain concept serves the discussion about what we do and learn in body reading. Although some students come to SI with strongly developed skills in kinesthetic empathy, many do not and this begs the question, "what helps one learn it?"

Body Reading and Sense Perception Linked to Orientation

To learn any movement, the challenge is usually unlearning that which prevents it. To revive, or begin to better notice, the body schema's capacity to body read, we want to attend to the simplest (least abstracted) order of consciousness. This deepest or lowest order of body image is at the level of sensation; sustained sense perception is already an interruption to that which blocks seeing.

To begin with, we can notice those expressions of the movement brain that work easily. Where is there flow in one's own system already? Can we notice something in our sensory experience that attracts our interest? What does that feel like?

We track sensation, which means staying present to it. We build an articulated internal sense of primary body image, a sense of weight and density, a sense of spaciousness, and the myriad movements that we can sense. For almost every person sensation is present. What may be new is the capacity to notice it and put it into words.

Then we build on this. We link felt sense/internal experience to the reception of sensory impression from the environment. This contradicts the body image belief that outer and inner senses are separate. We wish to connect our visual sense with the internal felt sense. By so doing, we are using the "where" or subcortical visual system referred to earlier.

We notice that the eyes can shift from a central, focused, and mostly cortical **"what"** function, to a peripheral subcortical **"where** function." As stated earlier, vision functions through two pathways, one that attempts to match objects with remembered identifiers, and another which helps us locate ourselves in space and builds a sense of the space we occupy. The movement brain draws from gaze that is peripheral.

Inter-Sensoriality

As we practice using peripheral vision we notice that this kind of vision is inter-sensorial (having a quality of synthesesia), and elicits an inter-sensorial experience of our world. When we observe movement with peripheral vision, we see it and we feel it. We may also hear it or possibly even smell it or taste it. The movement brain doesn't separate the senses.

Structural integrators cultivate this type of seeing, seeing that is inter-sensorial and kinesthetically empathic. This seeing allows us to know the movement of another from our own body's sensory experience, and to make interventions informed by internal information.

Pre-Movement

This form of seeing is quick enough to enable us to notice movement preparation in another – to see the manner in which a body organizes itself before it moves. Contained within pre-movement is information about the postural schema and information about the perceptual orientation of the other.

Body reading is one important part of embodied presence. What else does a structural integrator draw on?

2. Rolf's Recipe

Rolf proposed that SI requires a series of ten sessions, a sequence of interventions that built on each other. This is a strategy for doing SI work as well as teaching it.

Caspari describes the functional rationale for this recipe in the *2005 IASI Yearbook*.[18] The notion that each session builds on the one before can be interpreted mechanically, like a machine assembled in a certain order, or from an information or coordinative point of view, like a piece of music or a computer program. Restoration of function requires seeing that the body has

a developmental and coordinative logic. Without, for example, an improvement in upper gravity center mobility in session one, there is less profit from more adaptive support and the potency of the foot to propel the spine forward in session two.

In SI, multi-session, sequenced protocols imply that body image can shift and schema can improve in steps, first easy and then more advanced; some steps becoming more possible with the accomplishment of earlier ones. One can interpret this sequence idea as an organization of parts or a progression of coordinative challenges. Which best fits the SI series model?

To answer this question one can ask another: At any point in the "recipe" is it possible for one detail of the work to reveal a systemic change in coordination that reflects the point of the entire series? Can we see integration emerge in any session? The author asserts that it is possible, and we all see it happen. Therefore, unlike assembly of a car or a clock, the "assembly" process is in fact not about mechanics but more about reawakening a system, a system that is never really "apart." This brings us to the question, "What tells us the movement system has awakened?"

3. Rolf's Templates of Normal Structure

A part of the SI approach is Rolf's notion that there is such a thing as normal posture and coordination. Rolf's insistence on normal posture sets her work apart. Manual therapies that offer to palliate bodily complaints, or psychological therapies that assist changes in behavior or emotional well-being, while serving a useful function, do not fulfill the unusual role of SI.

"For most people in the real world, the pattern body has been lost or is no longer visible. Therefore, in our culture, there is little or no recognition of what this ideal pattern looks like."[19] Rolf's words are bold, and sound dogmatic. She asserts that for each individual there is an ideal pattern. Might Rolf's ideal be more palatable expressed as body schema?

SI presumes to say that postural analysis speaks to something more important than body complaints and body neurosis. Rather than focus on palliating distress, SI posits happy accidents of body schema, meaning happy accidents where we observe hallmarks of integrative function in gravity. (A shift in coordination may lead to physical and emotional benefits, but as side-effects to the expression of natural function.)

What do hallmarks look like? Two examples follow.

Contralateral Gait

One hallmark is contralateral gait.[20] When we observe an emergence of enhanced contralateral gait, we know we are seeing schema manifest. We see the movement brain express healthy function. Image fails if it attempts to produce contralateral gait.

Rolf's Sky Hook

A second hallmark of integration helps remind us of the movement system point of view. It is Rolf's picture of the sky hook holding up the head.[21] What is that holds up the head? We may have felt it but have we wondered what it implies about our movement brain? What allows pleasant buoyancy of the head following successful intervention? Examples of perceptual interventions include lessons that clarify the location of the occipital condyles[22] or that arouse in the imagination an extension of the sense of head into the space above one such as the cone head exercise.[23] These belong to the realm of something called ideokinesis. We mention it because it is not something new. In fact, one of Rolf's inspirations, Mabel Todd, was a movement brain pioneer.

Idiokinesis

Ideokinetic tools release the body image's hold on face (mask) and head posture, through perception, so the natural buoyancy of the head (body schema) expresses itself. Imagination, the perceptive activity of ideokinesis, releases inhibition by speaking to the movement brain. The vestibular system, part of body schema, is stimulated and freed to orient the head.

Ideokinetic imagery, as passed down from Todd[24], Sweigard[25] and, more recently Franklin,[26] is a potent tool for liberating movement brain to function more normally in the manner Rolf indicated. Ideokinesis is the use of imagination to stimulate the movement brain. Ideokinesis, is an example of perceptual intervention – one that can give us a feeling of Rolf's hook. It reminds us that evolution required all mammals' heads to move freely. Rolf was pointing out that head buoyancy is our birthright, not a modern improvement, but one that most people have lost.

Rolf's functional templates, both explicit and implicit, are documented in her book on integrating structure.[27] Within these templates we infer an aesthetic, a set of values about what constitutes normal. SI practitioners learn to feel what normal is like in the course of receiving the work, and in training.

Emphasis on normal makes Rolf's assertions bold and at the same time begs for further substantiation – what concept can take normal out of the realm of good and bad? How do we explain normal as something we can't make happen, that isn't just more mischief from body image? The movement brain idea fills this gap and the body schema/body image concept links it to contemporary neurophysiologic motor control research.

4. Imagery, Attention to Orientation, Sensory Skill, Tracking Skills, Experiential Anatomy

Imagery, orientation, sensory skills, and tracking skills, as noted above, are tools used within the perceptual realm of SI. The tonic function model proposes tools and logic for how we negotiate perceptive habits so that clients achieve shifts in coordination. How does anatomy work into this logic? How is development of anatomical awareness useful in this model?

Anatomical Awareness (through Body Image) Can Inform Body Schema

SI practitioners have the opportunity to use anatomy to assist movement. When we show people the body plan, through models or diagrams, and have a person find the body parts of the body plan inside themselves. When we palpate skeletal geometry, the movement brain is informed. Sensing the mass of the bones, sensing the articulations between bones (spaces) is helpful information and coordination shifts accordingly. And, we will also speak about muscles and explain their locations. Generally it's not helpful to ask people to consciously think about muscles when they move, however. Body image is least helpful for direct control of muscles. For example, we wish people to know about the transverses abdominus. At the same time, it is counterproductive to ask someone to voluntarily contract it. Body image is good for perception and rather clumsy at coordinative control.

We also speak about, and touch, the fascia. The fascia reflects the manner in which body

image has exerted effort, but it belongs to body schema. We educate clients about its function in support and its responsiveness to life's challenges. Fascia is part of the movement brain. We can talk to it and through it, but we can't "do" it.

Our touch, through the fascia, can shift how the fascia feels under our hands. What is going on? What about that aspect of SI most linked to its public image: deep pressure in fascia?

5. The Role of Fascial "Manipulation" in Speaking to the Movement Brain

What is it that structural integrators are known for doing, classically, in the service of postural health? A percentage of the SI work, at times the majority, involves touch on the body surface with the intention of moving or releasing fascia. Why? Traditional explanations advance the notion that SI is a form of deep massage, or a version of myofascial release, or a soft-tissue version of osteopathy. Here the reader is invited to consider the different premises and the conclusions.

Do we know what effect deep slow touch has on the biochemistry of the fascia? We have speculation. We have fifty years in which the posited state change within the connective-tissue matrix has been a central explanation for why SI works. The author is agnostic on this point. There may be an effect similar to the one modeled by Rolf in which muscles get unglued from each other, or there may not. Fascial researchers find the hypothesized "gel to sol" action elusive in work with cadavers but cadavers are different from live clients. At best, we are on shaky ground to claim this as the foundation for Rolf's most imitated technique.

If we change the question to, "Do we know what effect touch in the fascia has on the movement brain?", we can answer definitively. We observe immediate shifts in coordination from brief moments of touch in the fascia. We don't need sophisticated research to demonstrate this point. Gentle moving pressure on the chest in a first session of SI reveals an immediate shift in the movement of inspiration. A stroke of touch to the intermuscular septa in the calf on a standing client, while he or she executes slight knee bend, shifts coordination of walking instantly. Pressure on the talus bone during knee flexion also shifts coordination of walking instantly.

Imagine fascial work as a way to speak to the movement brain: to "say" to the body for example, "Update your knowledge – notice these layers of dry, fused and confused fascia in the location I am pressing on. These motor units I am outlining as separate are, in fact, separate motor units"; or to say, "This bone is, in fact, a separate bone from this other bone"; and "This bone, (the radius) has a greater articulation with the carpal bones than its neighbor (the ulna) – feel that!" Here words stand in for the nonverbal language of touch that speaks to proprioception.

Or what if we thought about pressure in the fascia as a specific demand on the movement system for coordinative change? If the demand is not overwhelming and we have started gradually, the client finds that he or she gains skill in allowing demand to precipitate organization – coordinative organization in motor control and body mapping. If we think about fascial work this way, how does it shift the meaning of SI? It shifts the focus for the client. He or she doesn't "receive" softening of connective tissue ground substance. He or she attends to new information in the service of coordination. His or her movement brain is empowered to regain primacy.

For the practitioner, does this change the way we think about and apply touch? We might not only think differently but the way we touch might feel quite different, to the client and to the practitioner. Does it change how we monitor the effect of our touch? We might define a successful moment of contact quite differently if we look for coordinative change.

This shift in meaning generates a coherent framework for the various tools we use in SI. Movement brain logic is an umbrella term for the different things we do. We embody, we speak, we show, we imagine, we direct attention, we stay present, and we touch, all in the service of empowering body schema through better information.

It is attractive to picture fascial ground substance literally melting under our hands, because it feels like it does. We may discover this is a true picture. It may also be that the neural control of fascial tissue is responsive to energy applied in the form of strong pressure and that when we feel softening we are feeling how quickly the movement brain can respond to new information.

THEORETICAL AND PRACTICAL EXAMPLES OF MOVEMENT BRAIN THINKING

The following examples show how this conceptual shift to movement brain thinking supports Rolf's vision of integration: the concept of core, and the concept of the vertical axis in gravity.

Body Schema and Core

One of Rolf's templates is the sense of strength and power in standing and walking that is often described as demonstrating "core". SI authors, as well as other professionals, debate the question, "What is core?" Answers include but are not limited to: muscles that lie close to the front of the spine; intrinsic muscles; the viscera; the spine itself; the transverses abdominus and multifidi muscles, the "Line"; and on and on.

What happens if we speak about core as a function of body schema? What if we reframe our image of the core from body parts or location, to system event – a system event that denotes optimum coordinative response to a demand?

What does core look like? Push on someone who is standing and "core" responds by finding ground and space orientation and the application of selected and properly sequenced motor units throughout the system. The pushed body adapts and remains stable, without effort. A person walks and we see articulation and differentiation, a sense of strength, a sense of global breath, a bidirectional sense of spine – what Maitland terms palintonus.[28] Any exercise or task involves a form; core is an expression of flow in execution of the form.

How do we evoke core? We provide perceptual information and then we put a demand on the system (at first, preferably, a small demand). Without demand the core is not called forth. Demand means any coordinative challenge and covers a spectrum of possibilities. Demand means a slight posterior reach with the tip of one's coccyx bone. Demand means raising the straight leg from supine without disturbing the pelvis and spine. Demand means the system has a challenge and core means the system is free to respond in a way Rolf might have termed "normal."

Demand includes things that leave no time for slow, careful execution: Someone is

asked to run and jump over a bench. If she or he focuses on the bench, the movement fails to show core – the subject hesitates as he or she approaches the bench. If the perception is directed peripherally to another person adjacent to the bench or to a target in the distance, the schema organizes the jump successfully – no hesitation and flow from run to jump. A trial of each version reveals that the schema can respond to the demand better when body image is directed to orientation and perceptual information.

Inhibition versus Lesion[29]

We show, we touch, we invite sensory awareness. These elements come together in many combinations in the work, as we envision speaking to the movement brain, as we think about inhibiting body image so body schema is free to function.

A central part of the SI template is the sense of two directions in the spine. Orientation of our axis to ground and space, the sense of bi-directionality of the spine speaks especially loudly to the movement brain. Tonic function theory suggests every successful movement begins with a lengthening in the spine, with particular attention to the front of the spine.

Body Image as Potential Inhibitor to the Lengthening of the Spine

Does the front of the spine present bi-directionality in the initiation of breath and other movement? If you watch someone during inhalation you see one or more parts of the spine that do not participate in lengthening. On closer observation, palpation reveals that at one or more segments of the spine, the spinous process pushes back against touch as inhalation starts. Testing this observation, one finds that when the person pushes against resistance (with the hand) the same posterior movement of the spine occurs, at the same segment.

Godard has referred to this aspect of body image as "character knot," meaning a place that, in our attempt to master situations, we (habitually) attempt to add stability by contraction in the front line.[30] Godard asserts that all of us demonstrate this tendency and it's a matter of where we express it rather than if. Some people show character knots more strongly and others more subtly. It is a symptom of the body looking for a hedge against failure, and it adds to each person's kinetic "fingerprint." To be human is to experience failure and to want to avoid its repetition. And, clearly a character knot does nothing to improve the ease of our movement.

One can work with a client around issues of character knot standing or supine, inviting the client to imagine the vertebral segment shifting slightly anterior in the moment before inhalation. Sometimes this takes negotiation, and involves exaggerating the pattern or finding greater support for change.

In the course of SI work, a character knot-like issue may manifest as noticeable reductions in range of motion in backward bending in segments of the spine. If reduced range of motion is caused by body image, this is spinal inhibition in contrast to spinal lesion (or subluxation), which is an articular fixation in body schema.

SI examines the possibility of inhibition before attempting to solve lesion because the movement brain is our province, our more unique attribute. How might this be done?

Bench Work for Spinal Inhibition

The figures below illustrate one setup to work with inhibition in the spine. The client sits on a bench that allows the hips to be slightly higher than knees, with feet on the floor and hands on the soft edge of a bodywork table that is fixed so it cannot move. The practitioner shows the client a model of the skeleton and explains what it means to allow length to occur on the front of the spine. Also, the practitioner invites the client to bring attention to the sensory experience in the hands and feet so the skin of both extremities has good contact with each surface. The client is asked to stay aware of surface contact with the skin of the hands and feet. Also, the client is invited to notice an imagined vector from the top of the head toward the ceiling and from the tail toward the floor and slightly posterior. Additionally, the client is invited to feel weight in the tissue anterior to the ischial tuberosities. The client is invited to find a peripheral gaze that brings a spatial awareness to the body. The total situation is about parameters that demand that the movement system stabilize the trunk (including spine) from hands, feet, and

orientation.

After setup, the practitioner presses on the spinous process of a vertebra that he or she feels needs information. The pressure can be strong in some instances in order to help the client register the new possibility of movement, and the sense of the segment having articulation from its neighbors. Because of stability brought through orientation and sensory channels, and because the client has been informed about potential release of the vertebral segment to slide slightly more anterior, the segment is likely to move at least a little through its inhibitory barrier. The client is then requested to push the segment back against the practitioner's hand, using the hands and feet, staying present to his context with eyes and a sense of bi-directionality in the spine. The sequence of anterior and posterior movement of the segment may be repeated, and with each instance some further release of inhibition may occur. This is segmental stabilization. This part of a session may address several segments.

The client is then observed walking. If we see a change in gait, an increase in the contralateral action of the spine, we see the body-schema response to better information, or, put another way, the displacing of body-image inhibition with information that speaks to the movement brain.

The movement brain or system concept makes it possible to understand how sagittal movement or, similarly, the sagittal aspect in the Flight of the Eagle exercise[31] leads to a change in coordination as an improvement in contralateral gait. How does a sagittal exercise lead to improved torsion in movement? The particular form, or figure, of the exercise is trivial compared to the activation of the system. Only by positing that the movement brain already knows how to do contralateral gait, and in fact prefers this movement, does the cause and effect make sense. The movement brain expresses optimum coordination when unhelpful aspects of body image are displaced with better information.

In both of these examples, symptoms that have little directly to do with the form of the movement challenge may abate because the movement brain, the system, the schema, is operating more robustly in the absence of messages (from body image) that previously had been causing difficulty. For example, a knee issue or a shoulder issue may suddenly organize and improve function following a release of inhibition in trunk stability.

Renegotiations with Body Image

Practitioners who assist clients with shifts in coordination may notice that small shifts of coordination can precipitate emotional or psychological shifts that feel large to the client. All admonitions to take care and titrate apply here. Additionally, what about the body image? It has been interrupted. The body is suddenly moving in a manner that body image normally blocks. In the context of the session this may be all right, but what about after? And, even within the session the body image may suddenly resume, effectively saying "no." Then what?

While each practitioner discovers his or her own approach, some fundamental guidelines include: have the client shift from the new coordination back to the old and find the benefit to that inhibition and acknowledge it. Work with sensation to find the felt sense behind the meaning in the former movement. Bring body-image awareness to sensation, to the vocabulary of primary security. See if it is possible to find the felt sense of security in the new coordination. See if it is possible to imagine the new coordination in a context outside the container of the session, something the client notices and explores with curiosity.

PORTALS TO THE MOVEMENT BRAIN, SUMMARY OF TOOLS

There is no formula for evoking coordinative change. Though it is risky to imply any kind of formula, is it possible to summarize some of the major opportunities for speaking to the movement brain? What works, so that we speak to schema and inhibit image? Here is a partial list of qualities that speak to the movement brain:

1. The sense of weight and the sense of space.
2. Imagined directions into space, imagined vectors.
3. Sensing distance or proximity between objects or between one's self and objects in space.
4. Sensory impression from hands and feet.
5. Imagined bi-directionality along the long axis of bones and in adjacent paired bones; bi-directionality in the long axis of the spine and in the anterior/posterior axis of the spine.
6. Sensing the mass of, and articulation between, bones.
7. Sensing skin and movement of skin.
8. Touch that draws the attention of the fascia, to sense differentiation and articulation, sometimes very deep touch in fascia.
9. Peripheral gaze, a gaze that links to inter-sensoriality
10. Inter-sensory use of any senses
11. Change of gravity orientation of senses. Weight and space orientation to sight,

hearing, smelling, kinesthesia.[32]

12. Micromovement of joints.
13. Slow motion.
14. Use of imagination that interrupts customary body image and provides proprioceptive information to schema.
15. Imagination that shifts the meaning of the context.
16. A new demand, or a slightly dangerous demand.
17. A demand for acceleration in movement
18. Triangulation – adding the perception of an additional oblique or lateral object while responding to a situation.

Imagination and Sense Perception – Not Separate

From a phenomenological point of view and from a neurological point of view, imagination and perception are not two separate things. What we perceive through our senses and what we perceive by imagining our senses both create identical activity in the sensory cortex. If you look at the list of opportunities for conveying information to the movement brain, much of the work is about imagination and perception. The capacity to select what we imagine or perceive, and the capacity to sustain several perceptions at one time, turn out to be the skills most useful in releasing body schema from body image.

RESEARCH AND SI PAST AND PRESENT

Two notable research achievements for our field involve using perception to change coordination.

Three members of the SI community have investigated how perceptual and coordinative interventions lead to measurable changes. Godard uses conventional EMG equipment and he participates in experiments that use motion-capture technology. Motion capture uses pressure sensitive plates under the feet and joint angle receptors to pinpoint shifts in coordination and delivers "real time" biofeedback to client and practitioner. To make these changes Godard uses perceptual intervention.[33]

Cottingham and Maitland show how shifting pre-movement in neck posture facilitates lasting change in coordination in a patient for which SI manipulative techniques had failed after a number of sessions to change the subject's symptoms. This shift in coordination has repercussions at the autonomic level as demonstrated by changes in the measurements of vagal tone.[34]

WHAT CONCLUSION DOES THIS PREMISE LEAD TO?

If we think of the body as a movement system, we conclude that SI involves a spectrum of practitioner skills for restoring body schema by speaking to the movement system of the human body, and we find that current research validates these methods and this conceptual model.

Fascia is probably the most enduring legacy of Rolf's work. Talk about fascia, dysfunctions of fascia, and release of fascia is now ubiquitous. But some considerations of fascia rise to a different level of thinking. James Oschman is one author who researches and writes about fascia; he was specifically requested to do so by Rolf and he faithfully performs this task. Readers of his work come away with at least one profound impression: Fascia is an organ of communication.[35] Signals travel through the body's fascia at the speed of light, and the fascia acts as a biological semiconductor. When we think of fascia this way, we amplify the sense that SI work in the fascia may be more about communication and information than about mechanical/biochemical shifts.

Llinas, in *I of the Vortex, From Neurons to Self,* paints a picture of brain evolution as the means by which life made prediction of movement possible. The brain is life's answer to the question, "How can I predict what movement will occur?"[36]

What movement will occur in this moment? We don't have to ask. Our movement brain has already done so.

The author acknowledges, and expresses appreciation for, collaboration with Hubert Godard on this and other projects.

NOTES

1 Quoted in Rolf, I.P., *Rolfing®, The Integration of Human Structures.* New York: Harper and Row, 1977, p. 15.

2 Blakeslee, S., and Blakeslee, M., *The Body Has a Mind of Its Own.* New York: Random House, 2007.

3 Proceedings of the October 2007 First International Fascial Research Congress in Boston, available in book or DVD format, are a source for many perspectives on fascia as an organ of response and information.

4 Head H, Holmes HG. "Sensory Disturbances from Cerebral Lesions." *Brain,* 1911–1912;34:102–254.

5 Gallagher, S., & Cole, J. (1995) "Body Image and Body Schema in a Deafferented Subject." *J. Mind and Behav,* 16,369-389.

6 Paillard, J., "Sensorimotor versus Representational Framing of Body Space, A Neural Basis for Distinction between Body Schema and Body Image." *Body Image and Body Schema: Interdisciplinary Perspectives,* Amsterdam: John Benjamin, 2004.

7 Livingstone, M., *Vision and Art: The Biology of Seeing.* New York: Harry N. Abrams, Inc., 2002.

8 Peripheral vision is not exclusively responsive to phenomena to the sides or out of the corners of one's eyes. Peripheral vision, although not focused, can receive information in the entire visual field. Also, peripheral and focused vision can work together, back and forth. For body therapists, it is, however, typically more challenging to learn to voluntarily shift to a stronger sense of peripheral or "where" vision.

9 Blakeslee, S., and Blakeslee, M., *op. cit.*

10 Holmes N. P., and Spence C., "The Body Schema and the Multisensory Representation(s) of Peripersonal Space," *Cogn Process,* 2004 June; 5(2): 94–105.

11 Godard has reported unpublished case studies in which a person receiving a prosthetic limb rejects the prosthesis at a body image level and when the body image issue is renegotiated the body schema is completely able to adapt quickly to the prosthesis.

12 Godard posits a model partially derived from French psychoanalyst Lacan, that we have in fact three distinct body images. The primary body image is made up of sensations of density and mass and of spaciousness. It is built through the sensation opportunities including how we are touched and held in early childhood. The second body image, what Lacan calls the "mirror self", is the body image at the level of how we see ourselves and are seen by others. The third body image is symbolic body image, at the level of language and

culture mythology. It is useful to remember that change at the image or schema level is facilitated through resource building at the sensation – primary body image – level.

13 Rizzolatti, G., et al, "Neurophysiological Mechanisms Underlying the Understanding and Imitation of Action." *Nature Reviews/ Neuroscience*, Vol. 2, 2001, 661-671.

14 Umilta, M.A., et al, "I Know What You Are Doing: A Neurophysiological Study." *Neuron*, Vol 31, July 19, 2001, pp. 155-165.

15 Frank, K. "Tonic Function - A Gravity Response Model for Rolfing® Structural and Movement Integration." *Rolf Lines*. Boulder, CO: Rolf Institute, March 1995.

16 Rolf, I.P., *op. cit.*, p. 30.

17 McHose, C., and Frank, K., *How Life Moves, Explorations in Meaning and Body Awareness*. Berkeley: North Atlantic Books, 2006, p. 121-122.

18 Caspari , M., "The Functional Rationale of the Recipe." *2005 IASI Yearbook*. Missoula, MT: IASI, 2005, pp. 51-78.

19 Rolf, I.P., *op. cit.*, p. 16.

20 Frank, K. "The Relationship of Contralateral Gait and the Tonic Function Model of Structural Integration." *Structural Integration: The Journal of the Rolf Institute*. Boulder, CO: Rolf Institute of Structural Integration®, Dec. 2003.

21 Rolf, I.P., *op. cit.*, p. 33.

22 Sweigard, L., *Human Movement Potential, Its Ideokinetic Facilitation*. Dodd, Mead and Company, Inc., 1974.

23 McHose, C. & Frank, K., *op. cit.*, p. 54.

24 Todd, M.E. *The Thinking Body; A Study of the Balancing Forces of Dynamic Man*. New York: Dance Horizons, 1937.

25 Sweigard, L., *op. cit.*

26 Franklin, E. *Dynamic Alignment Through Imagery*. Champaign, Il: Human Kinetics, 1996.

27 Rolf, I.P., *op. cit.*

28 Maitland, J., "The Palintonic Lines of Rolfing." *Rolf Lines*, Boulder: Rolf Institute of Structural Integration®, January / February, 1991, pp. 43-49.

29 Caspari, M., "The Functional Rationale of the Recipe." *2005 IASI Yearbook*. Missoula, MT: IASI, 2005, p. 51.

30 Lecture notes of the author.

31 McHose, C., and Frank, K., *op.cit.*, pp. 107-111. Also, Frank, K. "Flight of the Eagle – Self Care for Structural Integration Clients." *2005 IASI Yearbook*. Missoula, MT: IASI, 2005.

32 Frank, K. "Posture and Perception in the Context of the Tonic Function Model of Structural Integration." *2007 IASI Yearbook*. Missoula, MT: IASI, pp. 27-35.

33 Godard used EMG while performing the "unbendable arm experiment", in which a straight arm resists bending with greater strength and lower effort if the subject projects a sense of direction, a reach, from the end of his or her hand, compared with the intention to not let the arm bend. In this experiment the reach elicits a pure action of the triceps while the resistance to bending elicits triceps and biceps activation simultaneously. Using motion-capture technology, a subject can be monitored for, among other variables, the balance of weight pressing from different parts of each foot. The subject is given visual and auditory cues about the relative pressure in each part of both feet and as he or she modifies the pressure receives feedback on the change. After some use of the feedback, the subject can reproduce the change without the feedback.

34 Cottingham, J., & Maitland, J., "A Three-Paradigm Treatment Model Using Soft Tissue Mobilization and Guided Movement-Awareness Techniques for a Patient with Chronic Low Back Pain: A Case Study. *JOSPT*, Vol. 26, No. 5, Sept. 1997, pp. 155-167.

35 Oschman, J., *Energy Medicine in Therapeutics and Human Performance*. Edinburgh: Butterworth, Heinemann, 2003.

36 Llinas, R. R., *I of the Vortex, From Neuron to Self*, Cambridge: MIT Press, 2001.