# An Introduction to the Anatomy Trains Myofascial Meridians

# 8

I am pleased to offer this addendum to Chris Jarmey's careful, concise, and beautifully illustrated survey of our structural anatomy. The following essay first outlines several metaphors helpful to a holistic approach to structural and movement therapies, and goes on to describe one map of larger functioning continuities within the musculo-skeletal system. These continuities, termed *myofascial meridians*, wind longitudinally through the soft tissues. These ideas are unfolded in greater detail in the book *Anatomy Trains* (Elsevier, 2001), and at www.AnatomyTrains.net.

Anatomy Trains provides a traceable basis for effective treatment at some distance from the site of dysfunction or pain. This new view of structural patterning also has far-reaching implications for treatment strategies, especially for long-standing postural imbalances, unsound body usage, and sequelae from injury or insult.

## Practical Holism

The very structure of our language, and its cause-and-effect epistemology, requires that we understand any system by dividing it into its constituent parts, in order to define the contribution of each identifiable bit to the whole. A tree has roots, trunk, branches and leaves, each with an essential function. The leaves have stomata, mesophyll, and veins. The veins have xylem and phloem bundled in a sheath. And so on down the line of smaller and smaller building blocks: cells, macromolecules, atoms, and quantum forces. This analytical process is fundamental to our Western comprehension of the world. But this way of thinking presents one significant danger when we apply it to living systems such as trees and ourselves: the tree did not glue a root system to a trunk and bolt on branches with leaves wired to them. It sprang from a single seed, and is ever and always a co-evolving unitary set of system interactions from root to leaf. In reality, the parts are never separated, and are always codependent.

Humans are not assembled out of parts like a car or a computer. 'Body as machine' is a useful metaphor, but like any poetic trope, it does not tell the whole story. In our modern perception of human movement anatomy, however, we are in danger of making this metaphor into the be all and end all. In actual fact, our bodies are conceived as a whole, and grow, live, and die as a whole – but our mind is a knife (*see* figure 8.1).

Figure 8.1: The Anatomy Trains map of myofascial connections.

The medical idea that we are assembled from pieces – an easily-swallowed idea in this age of surgical 'spare parts', both mechanical and human – stems from Aristotle's premises, but really took hold in the study of humans when the body was first anatomized by Andreas Vesalius, Albinus, and other courageous explorers of the late Renaissance. The tool of choice, as implied in the very word anatomy, was a blade. From the flint cleaver to the laser scalpel, the animal and human body has been divided along finer and finer lines. Later, Cartesian dualism described the body as a 'soft machine, and students of anatomy and physiology used reductionistic mechanism to go about explaining the role of each identifiable part. The various physical laws of Isaac Newton further cemented our place within the mechanical universe. What were glorious and liberating ideas in their own time, however, have become imprisoning, restrictive concepts in ours (*see* figure 8.2).

Figure 8.2: Vesalius's woodcuts from 1548 show both the origami layering and the directional 'grain' of the myofascial system.

How do our 'parts' arise? The human body stems from a single fertilized human ovum, which proliferates wildly. The daughter cells then specialize as outlined in Chapter 2. Each tissue cell exaggerates some function of the ovum and cells in general – e.g. a muscle specializes in contraction, a neuron in conduction, epithelia in secretion, etc. – and conversely other functions diminish. A nerve cell conducts extraordinarily well, but as a result of that specialization cannot easily reproduce itself. Epithelia do very well at creating enzymes, but lose the ability to significantly contract. Yet each cell still partakes of the unique individual whole in its constant communication with its neighbors, near and far, and in the similarities of chemical structure, from glucose as a universal fuel right on down to the tangled helix of DNA (*see* figure 8.3).

Before specific cuts are made, what we are pleased to call 'the brain' never exists as an entity separate from its connective tissue surroundings, its blood supply, and the peripheral and autonomic nerves that extend the brain throughout the body. The 'biceps brachii' can only exist as a separate structure with a knife's intervention to divide its ends from various attachments, its connections with surrounding myofascial units such as the brachialis, as well as its nerve and blood supply, without which it simply could not function. The idea that there are separate parts – a liver, a brain, a biceps – may be the way that we think, but it is not the way physiology 'thinks'.

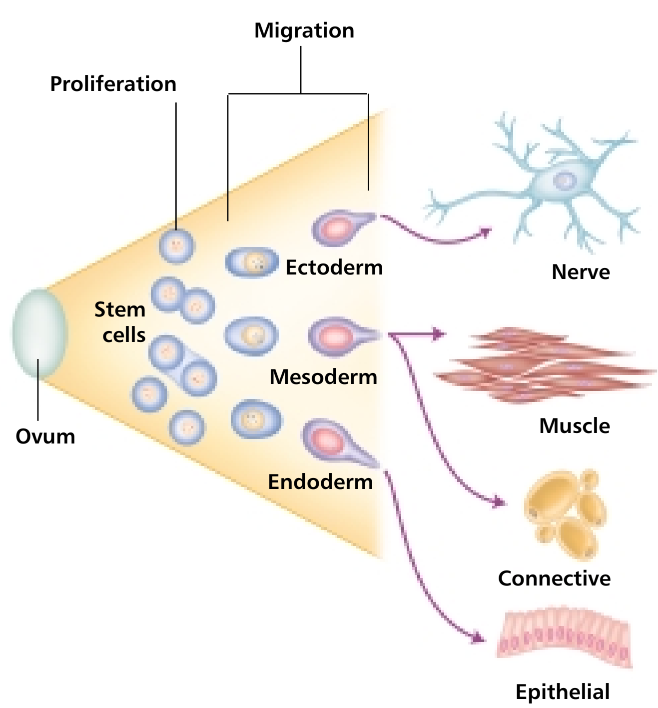


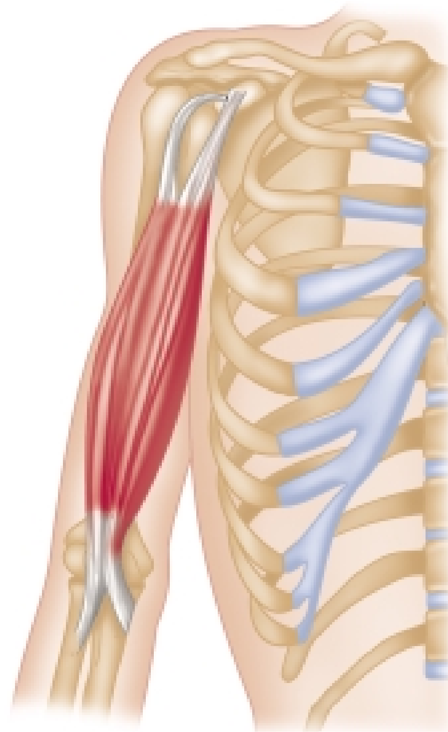

Figure 8.3: From the generalized ovum, cells proliferate, migrate, and differentiate into functionally specialized tissues.

## The Single Muscle Theory

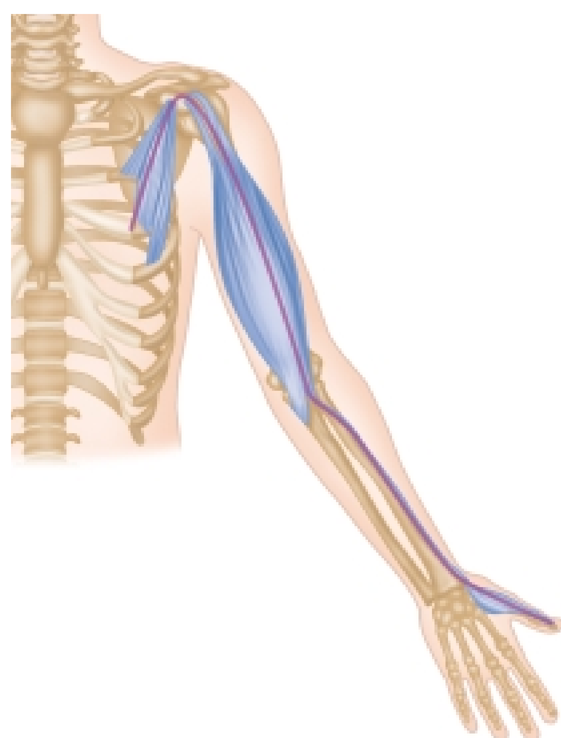
This image of 'separate' muscles – muscles as parts – leads to the prevalent method of analyzing muscle action, which is employed frequently (and to good purpose) throughout this and most other atlases: "Imagine that the skeleton were denuded of all but the given muscle; what would that single muscle do to the skeleton acting on its own?" Call this the 'single muscle' theory.

In this single muscle theory, the biceps gets defined as a radio-ulnar supinator, an elbow flexor, and a weak flexor of the shoulder (*see* figure 8.4a). In the Anatomy Trains view, additional information is added to this: "The biceps brachii is an element in a continuous fascial plane or myofascial meridian which runs from the outside of the thumb to the 4th rib and beyond." The second statement does not negate the first, but it adds a context for understanding the biceps' role in stabilizing the thumb (down the myofascial line), and keeping the chest open and the breath full (up the line) (*see* figure 8.4b).

This 'body as assembled machine' idea is so pervasive – and as in this book, the maps based on this perspective are so understandable and useful – that it is difficult to think outside its parameters. Thinking in 'wholes', attractive as it is to contemporary holistic therapists, simply has yet to lead to useful maps. The 'everything is connected to everything else' philosophy expounded in our opening paragraphs, while actually technically accurate, leaves the practitioner adrift in this sea of connections, unsure as to whether that frozen shoulder will respond to work in the elbow, the contralateral hip, or to a reflex point on the ipsilateral foot. While any of these might work, useful maps are necessary to organize our therapeutic choices into something better than a guess.



a)



b)

Figure 8.4: a) the biceps brachii considered as a separate muscle, b) the biceps brachii is also part of a longitudinal myofascial continuity.

In short, we know the body is interconnected on many levels, but we need better treatment strategies than 'press and pray'. What can we learn when we shift from a 'symptom-oriented' view of the body to a 'system-oriented' one?

This myofascial meridians concept provides such a map of the structural body, a map that provides a practical transition between the individual 'parts' that the authors have so brilliantly catalogued herein, and the 'whole' of a human being, a gestalt of physics, physiology, stored experience, and current awareness which defies mapping. This intermediate map of the body's locomotor fabric opens up new avenues of treatment consideration, particularly for stubborn chronic conditions and global postural effects.

## Whole Body Communicating Networks

Central to this new 'Anatomy Trains' map is the functional unity of the connective tissue system. There are exactly three networks within the body which, magically extracted intact, would show us the shape of the whole body, inside and out: the neural net, the vascular system, and the extracellular fibrous web created by the connective tissue cells (*see* figure 8.5).

Large communities of cells need vast infrastructure to survive in crowded conditions, especially out of the water, resting on land, and surrounded by air. It is an astounding feat of engineering we take for granted every day: a community of 70 trillion diverse, humming and semi-autonomous cells, each built for undersea living, organizes itself to get up and walk around, while simultaneously providing each cell with a mechanically stable environment, oceanic conditions of chemical exchange, and the information it needs to participate meaningfully in the day's work.

Every living cell needs to be within four cell layers or so of the fluid exchange provided by the vascular system. Without the ability to deliver chemistry to, and suck waste from, every single body region, the underserved area becomes stressed, then distressed, and will finally shrivel or burst and die, as happens in necrotic or gangrenous tissue. Secondly, every cell needs to be within reach of the nervous system to regulate its

Figure 8.5: The Anatomy Trains map (posterior view).

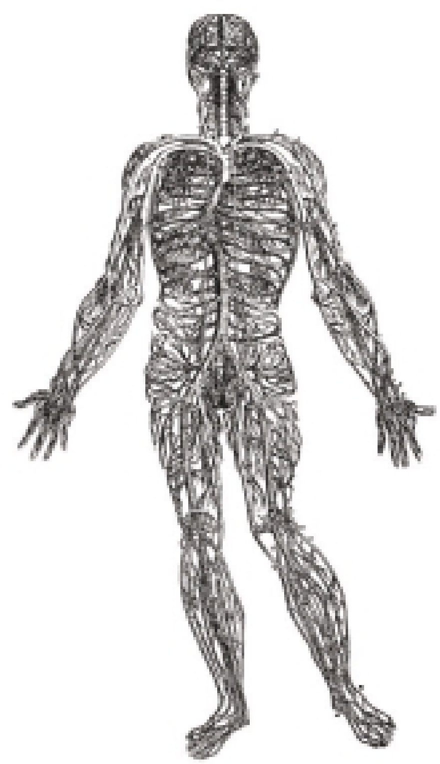


Figure 8.6: Vesalius's version of the neural net.

activity with other cells in other areas of the body. And every cell needs to be structurally held in place (or directed in a flow, in the case of blood and other mobile cells) by the connective tissue net. Any given single cubic centimeter – let alone Shylock's pound of flesh – taken from the body would contain elements of all three of these nets – neural, vascular, and fascial. Seen in such a systemic way, the idea of the body as simply a collection of parts begins to lose its luster. We all survive because we are an interwoven set of systems (*see* figures 8.6 & 8.7).

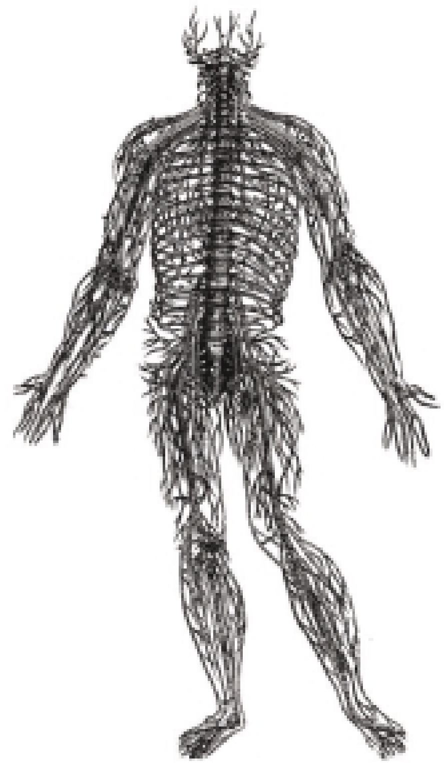


Figure 8.7: Vesalius's version of the vascular net.

Each of these nets is networked across the entire body from central organizing structures. From its central spinal cord with the bulbous brain plexus at one end, the nervous system spreads throughout the body in the familiar radiating pattern seen here, all to form a simulation of our inner and outer world and a coordinated behavioral response. The circulatory system, from the axis of the aorta and the muscular heart, links the thousands of miles of capillaries and lymphatics in a circle that serves the chemical needs of the cellular community. And from the central armature of the notocord (the embryological form of the vertebral bodies and discs), connective tissue spreads out to create protective sacs and nets around all the cells, structures, and systems of the body, organizing stable mechanical relationships, allowing certain movements and discouraging others.

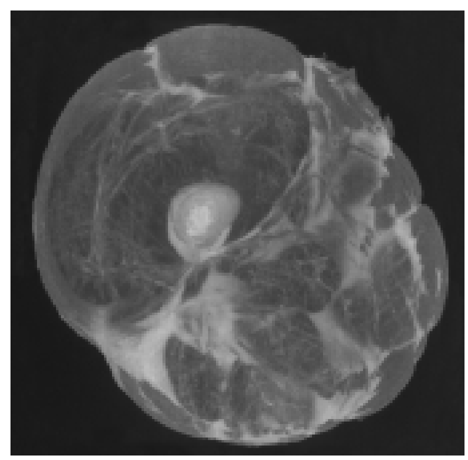


Figure 8.8: A section of the thigh, viewed from above, with all other tissues but the connective tissues removed. Courtesy of Jeff Linn derived from the Visible Human Data Project.

All three networks communicate throughout the body. The nerves carry sensory data in, construct a second-to-second picture of the world, and send signals out to the muscles and glands, at speeds between 7 and 170 miles per hour. The fluid systems circulate chemistry around the body every few minutes, though many chemical rhythms fluctuate in hourly, daily, or as women know, monthly cycles. The fibrous system communicates mechanical information – tension and compression – via the intercellular matrix of fascia, tendon, ligament, and bone. This information is a vibration that travels at the speed of sound, about 700 mph – slower than light, but definitely faster than the nervous system. The speed of plastic deformation and compensation in the connective tissue system, however, is measured in weeks, months, and years. Thus the fibrous system is both the fastest (in communicating) and the slowest (in responding) of the three.

Unlike the neural and vascular systems, this connective tissue net has yet to be well mapped, because it is considered to be the 'dead' material that we need to remove to see the 'interesting' neural, vascular, muscular, and other local systems. Because the connective tissue provides the divisions along which the scalpel runs to parse out other systems, the connective tissue has also been studied less as a system than other more familiar systems.

So, as a thought experiment: what if, instead of dividing the body into individual identifiable structures, we were to dip it into a solvent that stripped away all the cellular material but left the entire extracellular matrix intact (*see* figure 8.8)?

## The Connective Tissue System

This system of the connective tissue matrix can be seen as our 'organ of form'. From the moment of the first division of the ovum, the intercellular matrix of the connective tissue exists as a secreted glycoaminoglycans (mucous) gel that acts to glue the cells together. Around the end of the second week of embryological development, the first fibrous version of this net appears, a web of fine reticulin spun by specialized mesodermal cells on either side of the developing notocord (spine). This net is the origin of our fascial web – our 'metamembrane' – the singular container that shapes our form and directs the flow of all our biochemical processes (*see* figure 8.9). The ability of the connective tissue cells to alter and mix the three elements of the intercellular space – the water, the fibers, and the gluey ground substance gel of glycoaminoglycans – produces on demand the wide spectrum of familiar building materials in the body – bone, cartilage, ligament, tendon, areolar and adipose networks – all the varieties of biological fabric. The body's joints, the 'organ system of movement', are almost entirely composed of extracellular matrix constructed by the various connective tissue cells.

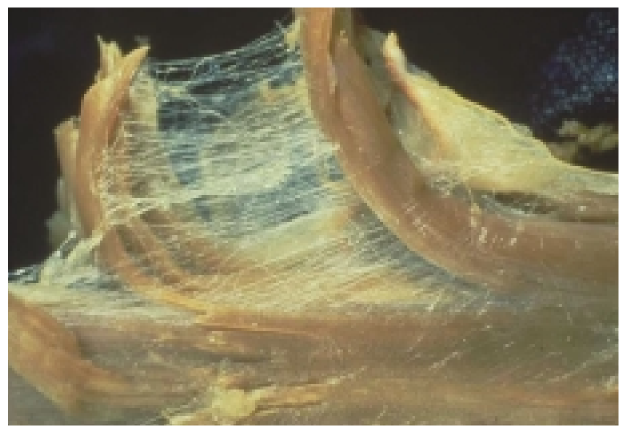


Figure 8.9: A magnification of myofascial tissue – individual muscle fibers within the cotton floss of the endomysial fascia. Photograph courtesy of Ron Thompson.

The predominant scientific view is that this extracellular matrix material is '*non-living*', but is this in fact an accurate description? The hydrophobic fibrous network of collagen, elastin, and reticulin, and the hydrophilic gelatinous ground substance is clearly extracellular, in that it is all manufactured inside a connective tissue cell and then extruded out into the intercellular space, where it may lose all contact with its original producing cell. The fiber-gel matrix remains, however, an immediate part of the environment of every cell, like cellulose in plants, or the coral's limestone apartment building.

Given, however, that the animal (and human) extracellular matrix is so responsive to change – some in passive response to outside forces, some in active cellular response to damage or need – and given that it is a liquid crystal capable of storing and transmitting information, and finally given that it is so intimately married to the lives of our cells, I choose to think of it as living. It is part of our adaptive response to the needs of practical continuance; it is part of the very fabric of our consciousness. Of course the point is debatable, but for the rest of this essay we take a mildly vitalistic stance that includes this extracellular matrix as belonging in and partaking of the field of the living being.

This extracellular matrix, taken as a whole, not only unites the various elements of the body; in large part it unites the many branches of medicine. We leave the description of its physiology and biochemistry to others more familiar with it. Here we concentrate on two of aspects of the matrix's spatial configuration: its 'double bagging' arrangement and seeing the interplay of its elements in terms of tensegrity geometry.

## The Double-Bag Theory

If we move through embryology from the initial development of the connective tissue metamembrane to watch its further elaboration, what we see is a fabulous demonstration of origami. The involution of gastrulation and the subsequent lateral and sagittal folds are followed by literally thousands of others, taking the original simple 3-dimensional spider-web of surrounding and investing fascia and folding it into more than a thousand compartments and divisions that we subsequently cut out and identify as separate 'parts'. Initial folds create the dorsal cavity for the brain, and ventral cavity for the organs, and surround each organ with a double-layered fascial sac. One of the final folds brings the two halves of the palate together, which explains why a cleft palate is such a common birth defect.

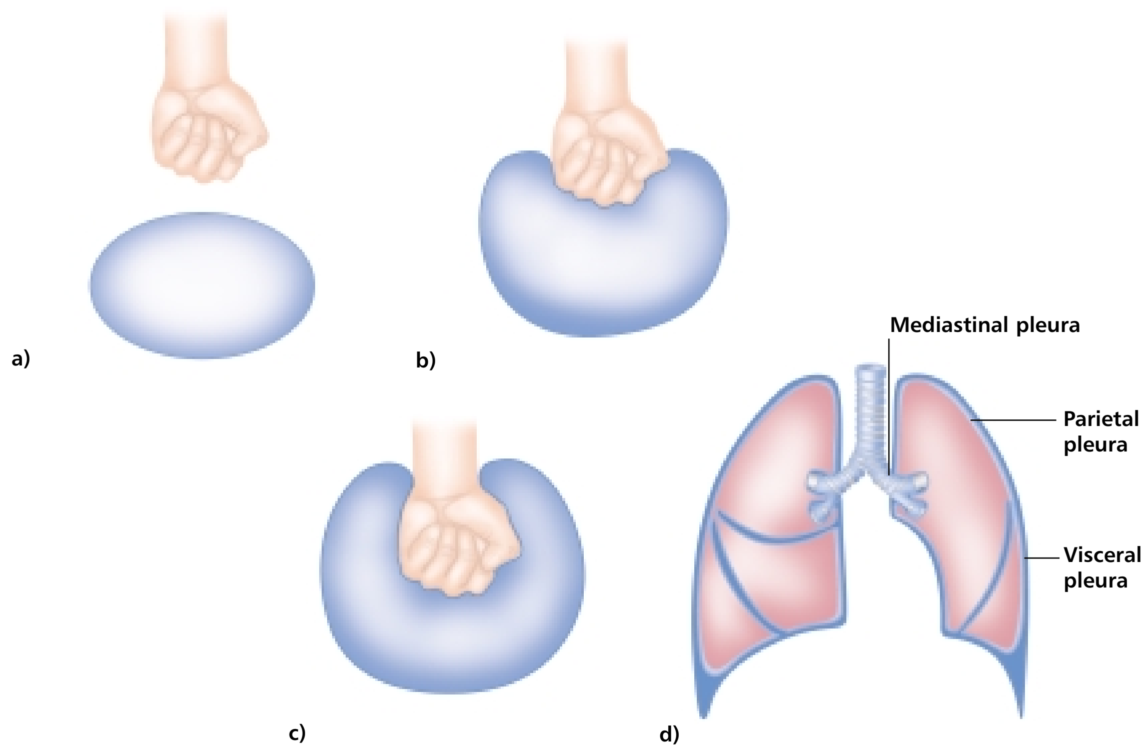



Figure 8.10: Pushing something into a water balloon surrounds that object in a 'double-bag', with lubrication in between the two layers.

Pushing a fist into a water balloon produces a doubled bag around the hand. It is actually one sac, but pressure gradients push into the sac, involuting on itself like a sock turned halfway inside-out. When organ tissue cells are similarly 'pushed' by the forces of embryological growth into a connective tissue bag like the coelom, this likewise creates the appearance of two sacs separated by lubricating fluid: an inner one closely adherent to the organ (usually softer), and another (usually tougher) around the outside (*see* figure 8.10). This method of biological double-bagging surrounds the heart with a soft connective tissue endocardium and a tough outer pericardium. Similarly, the lungs have the visceral pleura and parietal pleura, and the intestines lie in the mesentery and the peritoneum, and the brain has the pia and duramater. Our thesis here: the musculo-skeletal system is similarly organized within a fascial 'double-bag'.

Imagine a water balloon half-filled with an electrically-sensitive jelly (muscle). Put a couple of cylindrical objects on it, like short dowels or marker pens (bones), end to end. Now push the cylinders into the balloon until it comes up around them and encloses them (*see* figure 8.11).

Your musculo-skeletal system, seen as a whole, is wrapped up something like this. The part adhering to the cylinders is like the periosteum around the bones. In the space between the 'bones', this part of the balloon is like the ligamentous capsule of the joints, which thickens into specific ligaments as required by the forces acting on it. The outer part of the balloon is like the superficial fascial leotard (or, in medical parlance, the deep investing fascia). The part of the balloon where the two ends of the balloon meet (as in the right side of figure 8.11b) represents the intermuscular septa, which are similarly double layered walls that run from the superficial fascia to the periosteum.

Seen in this way, the periosteum-joint capsule 'inner bag' is filled with hard bone alternating very soft joint tissues and fluid. The outer bag is filled with muscle and varying densities of fascia. In order to make the two bags interact successfully to move us around, we simply come along with a soldering iron and heat seal the outer bag down onto the inner in specific places, making what we call a muscle attachment. With this image, we get away from the shibboleth that there are some six hundred muscles in the body. There is, in fact, only one muscle. One mind, and one muscle – it just hangs around in six hundred pockets within the unitary fascial bag. It is a struggle, I know, to rise above this concept of individual muscles, but the view from the mountain of wholeness is breathtaking.

Seen through this lens, the myofascial meridians simply track the warp and weft through this outer bag of myofascial webbing. Where does this webbing continue in straight lines, lines that can transmit forces which travel out from their local areas to create global effects via the interconnectedness of this overall double bag? The answer to this question provides a map for tracking strain transmission throughout this system. How we move and are moved during our lives shapes this web; the shape of the web in turn helps to determine our experience of living in our bodies.

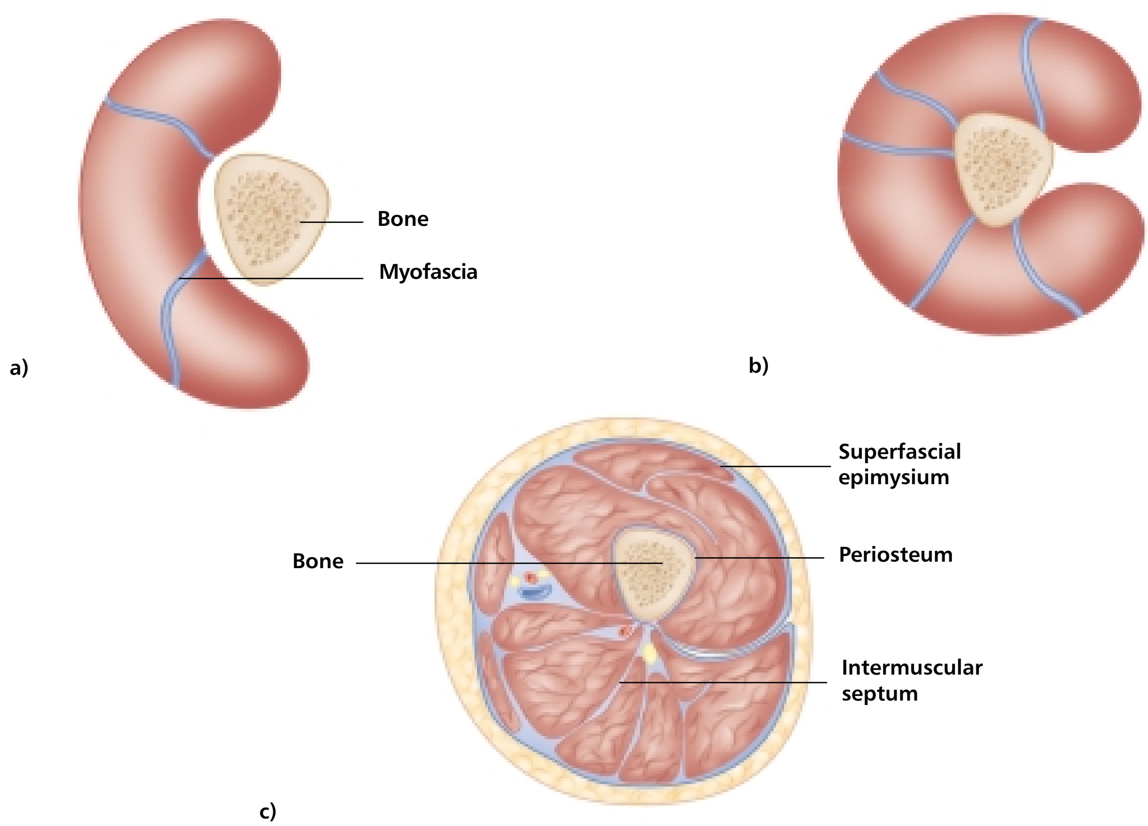



Figure 8.11: The relation between myofasciae and bone seen as another of the body's fondness for the double-bag form.

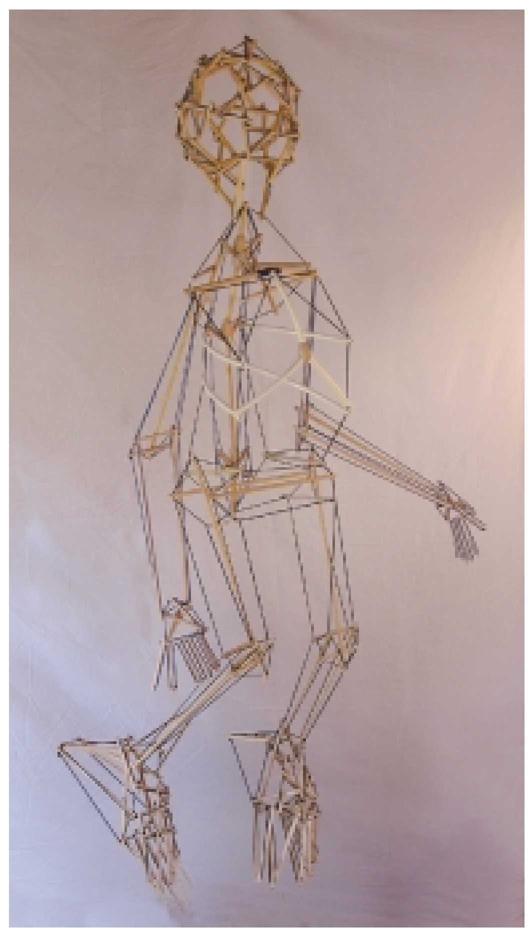
## Tensegrity

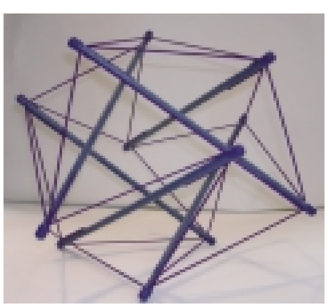
One other holistic image is necessary to jump out of this ‘machine made out of parts’ image so ingrained in our systems – tensegrity geometry. The normal geometric picture of our anatomy is that the skeleton is a continuous compression framework, like a crane or a stack of blocks, and the muscles hang from it like the cables. This leads to the single muscle theory again – the skeleton is stable but moveable, and we parse out what each muscle does to that framework on its own, adding them together to analyze the movement. A little thought, however, soon puts this idea out to pasture. Take the muscles away, and the skeleton is anything but stable; take all the soft-tissue away and the bones would clatter to the floor, as they do not interlock or stack in any kind of stable way.

If we can get away from the idea that bones are like girders and muscles are the cables that move the girders, we are led to a class of structures called ‘tensegrity’ (the integrity lies in the balance of tension) (*see* figure 8.12). Originated by Kenneth Snelson and developed by Buckminster Fuller, tensegrity geometry more closely approximates the body as we live and feel it than does the old ‘crane’ model. In the dance of stability and mobility that is a human moving, the bones and cartilage are clearly compression-resisting struts that push outward against the myofascial net. The net, in turn, is always tensional, always trying to pull inward toward the center. Both elements are necessary for stability, and both contribute to practical mobility.

In this new orthopedic model, the boney struts ‘float’ within the sea of tension provided by the soft tissues. The position of the bones is thus dependent on the tensional balance among these soft-tissue elements. This model is of great importance in seeing the larger potential of soft-tissue approaches to structure, in that boney position and posture is far more dependent on soft-tissue balance than on any high-velocity thrusting of bones back into ‘alignment’.

In this view, much expanded in our other writings, the Anatomy Trains Myofascial Meridians map the global lines of tension that traverse the entire body’s muscular surface, acting to keep the skeleton in shape, guide the available tracks for movement, and coordinate global postural patterns. Research supports the idea of tensegrity geometry ruling mechanical transmission from the cellular level on up, and macro-level models, such as the one pictured here, are becoming more anatomically accurate.





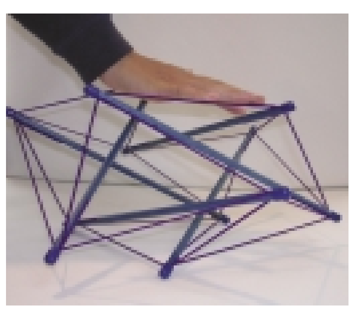


Figure 8.12: Tensegrity structures, when stressed, tend to distribute rather than concentrate strain. The body does the same, with the result that local injuries soon become global strain patterns.

*For more on tensegrity:www.kennethsnelson.net, http://web1.tch.harvard.edu/research/ingber/Tensegrity.html, www.intensiondesigns.com, www.biotensegrity.com*

## The Anatomy Trains: Rules of the Road

Let us now step down to intermediate level, somewhere between these overarching global considerations and the useful detailed anatomy that comprises the rest of this book. The concept is very simple: if we follow the grain of the fascial fabric, we can see where muscles are linked up longitudinally. When this is done, there are 12 or so major myofascial meridians that appear, forming clear lines, or tracks, that traverse the body. A few rules and terminological considerations apply to their construction.

### 1. Myofascial continuities must run in straight lines.

Since an Anatomy Train is a line of tensional pull, not compressional push, it must therefore travel in a more or less straight line. So the first and major rule is that adjacent myofascial structures must 'line up' in the fascia, without major changes of direction or depth. While the hamstrings and gluteus maximus might be functionally connected in running or climbing stairs, the change in direction and change of level between the two prevent them from being a fascial continuity. The hamstrings and erector spinae, however, are clearly connected in a straight-ish line via the sacrotuberous ligament.

### 2. Fascia is continuous while muscles are discrete – 'tracks' and 'stations'.

The stripes of muscles and fascia are termed 'tracks', and what are commonly known as muscles attachments are termed 'stations', to emphasize the continuous nature of the fascial fabric. Muscles themselves may be discrete, but the fascia that contains them is continuous, and communicates to the next structure up or down the line. The external oblique muscle and the serratus anterior muscle may be separate and have separate functions, but the sinew that envelops each of them is part of the same fascial plane, which communicates across their attachment points and beyond.

### 3. Fascial planes can divide or blend – 'switches' and 'roundhouses'.

Fascial planes sometime split into two planes, or conversely, two planes blend into one. We call these dividing places 'swtiches" (UK: points); and the physics of the situation will determine which plane takes how much of the force involved. The rhomboids thus communicate fascially with both the serratus anterior and/or the rotator cuff, depending on the position, load, and orientation of these and surrounding structures.

Places where many muscles meet and provide competitive directions for where a bony structure might be pulled – the ASIS for instance, or the scapula – are termed 'roundhouses'.

### 4. Deeper, single-joint muscles hold posture – 'expresses' and 'locals'.

Monoarticular, or one-joint, muscles are termed 'locals', whereas multiarticular muscles are termed 'expresses'. Our finding is that posture is more often held in the deeper single-joint locals, and not in the coordinating expresses which often overlie them. Thus, one looks to relieve a chronically flexed hip via the iliacus or pectineus myofascia, more often than the rectus femoris or sartorius, both of which also cross the knee.

### 5. When the rules get bent – 'derailments'.

And finally, we sometimes encounter 'derailments', where the myofascial meridian does not utterly conform to the above rules, but works under particular conditions or positions. For instance, the line of fascia along the back of the body is a continuous string of fascia when the knee is straight, but 'de-links' into two pieces – one above and one below, when the knee is significantly flexed. This explains why nearly every classic yoga stretch for the Superficial Back Line, as we term it, has the knees in the extended position, and why it is easier to pick up your dropped keys with even slightly flexed knees than with straight legs.

Individual myofascial meridians can be viewed as one-dimensional tensional lines that pass from attachment point to attachment point from one end to the other. They can be viewed as two-dimensional fascial planes that encompass larger areas of superficial fasciae. Or they can be seen, as they are here as three-dimensional set of muscles and connective tissues, which, taken together, comprise the entire volume of the musculo-skeletal system.

## Summary of the Lines

With these rules in mind, we can construct 12 myofascial meridians in common use in human stance and movement:

• Superficial Front Line
• Superficial Back Line
• Lateral Line (2 sides)
• Spiral Line
• Arm Lines (4)
• Functional Lines (2–front and back)
• Deep Front Line

The first three lines are termed the 'cardinal' lines, in that they run more or less straight up and down the body in the four cardinal directions – front, back, and left and right sides.

### Superficial Front Line

The Superficial Front Line (SFL) runs on both the right and left sides of the body from the top of the foot to the skull, including the muscles and associated fascia of the anterior compartment of the shin, the quadriceps, the rectus abdominis, sternal fascia, and sternocleidomastoideus muscle up onto the galea aponeurotica of the skull. In terms of muscles and tensional forces, the SFL runs in two pieces – toes to pelvis, and pelvis to head, which function as one piece when the hip is extended, as in standing (*see* figure 8.13).

In the SFL, fast-twitch muscle fibers predominate. The SFL functions in movement to flex the trunk and hips, to extend the knee, and to dorsiflex the foot. In standing posture, the SFL flexes the lower neck but hyperextends the upper neck. Posturally, the SFL also maintains knee and ankle extension, protects the soft organs of the ventral cavity, and provides tensile support to lift those parts of the skeleton which extend forward of the gravity line – the pubes, the ribcage, and the face. And, of course, it provides a balance to the pull of the superficial back line.

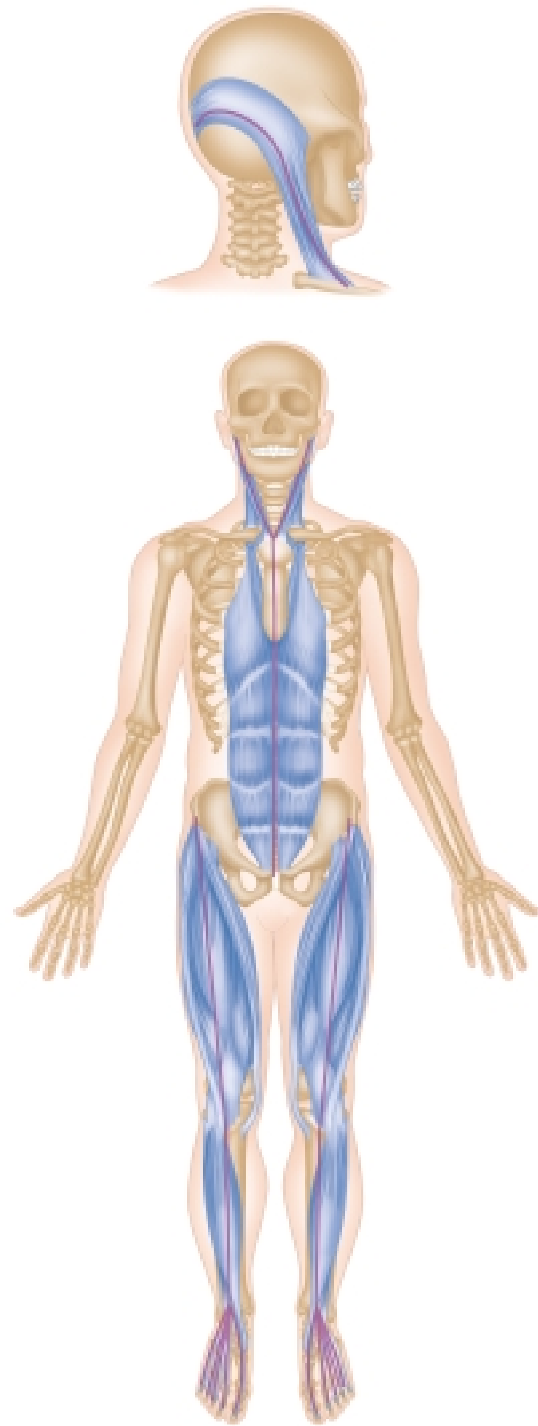


Figure 8.13: The Superficial Front Line (SFL).

A common human response to shock or attack, the startle response, can be seen as a shortening of the SFL. Chronic contraction of this line – common after trauma, for example – creates many postural pain patterns, pulling the front down and straining the back.

## Superficial Back Line

The Superficial Back Line (SBL) runs from the bottom of the toes around the heel and up the back of the body, crossing over the head to its terminus at the frontal ridge at the eyebrows. Like the SFL, it also has two pieces, toes to knees and knees to head, which function as one when the knee is extended. It includes the plantar tissues, the triceps surae, the hamstrings and sacrotuberous ligament, the erector spinae, and the epicranial fascia.

The SBL functions in movement to extend the spine and hips, but to flex the knee and ankle. The SBL lifts the baby's eyes from primary embryological flexion, progressively lifting the body to standing (*see* figure 8.14).

Posturally, the SBL maintains the body in standing, spanning the series of primary and secondary curves of the skeleton (including the cranium and heel in the catalogue of primary curves, and knee and foot arches in the list of secondary curves). This results in a more densely fascial line than the SFL, with strong bands in the legs and spine, and a predominance of slow-twitch fibers in the muscular portion.

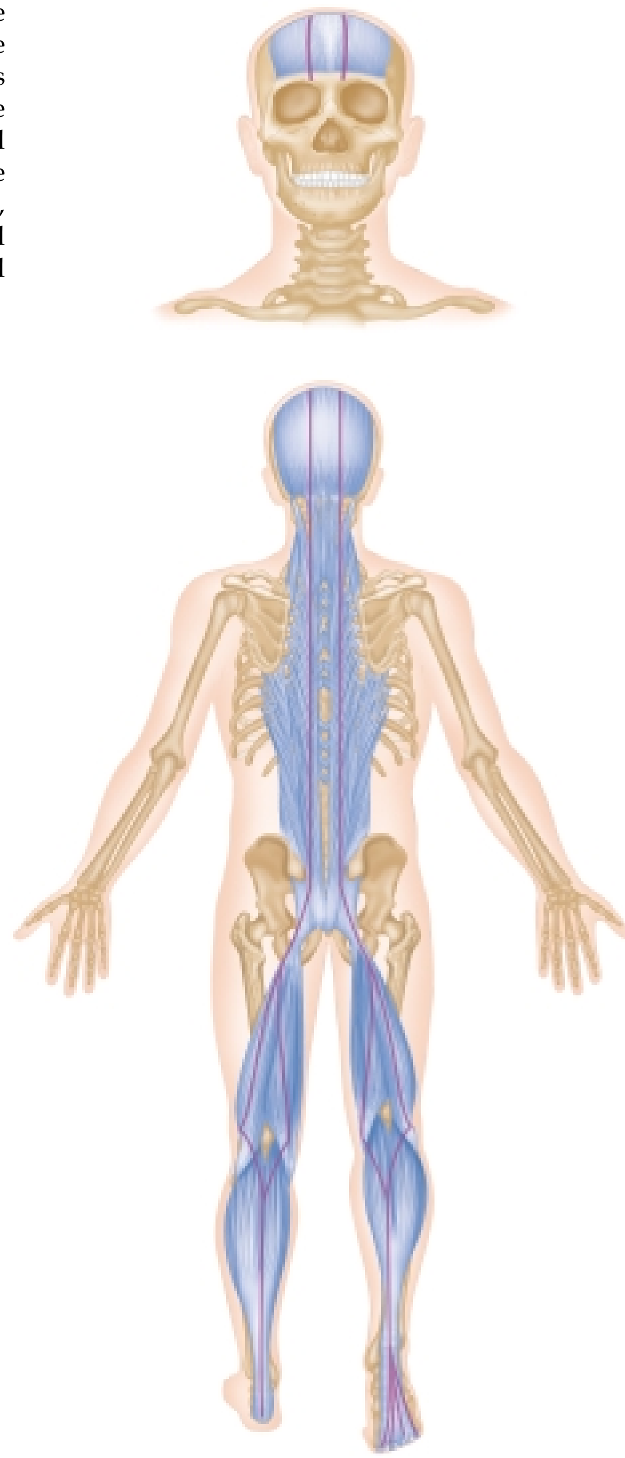


Figure 8.14: The Superficial Back Line (SBL).

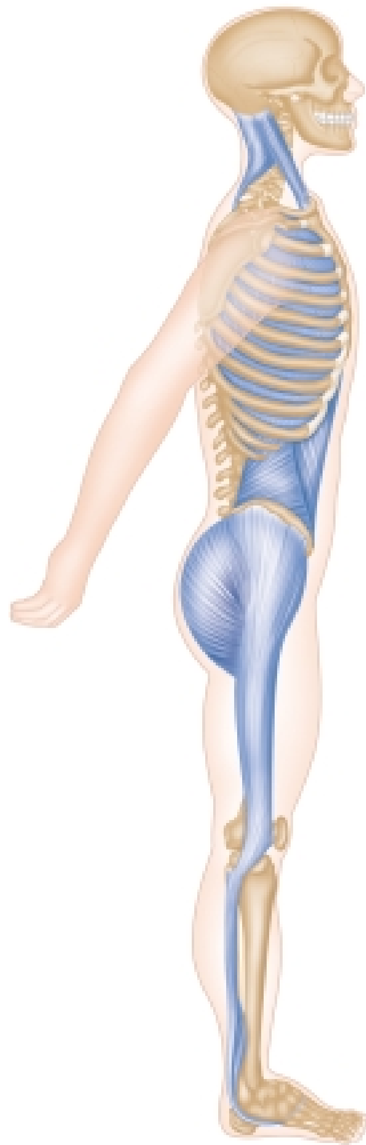


Figure 8.15: The Lateral Line (LL).

## Lateral Line

The Lateral Line (LL) traverses each side of the body from the medial and lateral midpoints of the foot around the fibular malleolus and up the lateral aspects of the leg and thigh, passing along the trunk in a woven pattern that extends to the skull's mastoid process (*see* figure 8.15).

In movement, the LL creates lateral flexion in the spine, abduction at the hip, and eversion at the foot, and also operates as an adjustable 'brake' for lateral and rotational movements of the trunk.

The LL acts posturally like tent guy-wires to balance the left and right sides of the body. Also, the LL contains more than creates movement in the human, directing the flexion-extension that characterizes our direction through the world, restricting side-to-side movement that would otherwise be energetically wasteful.

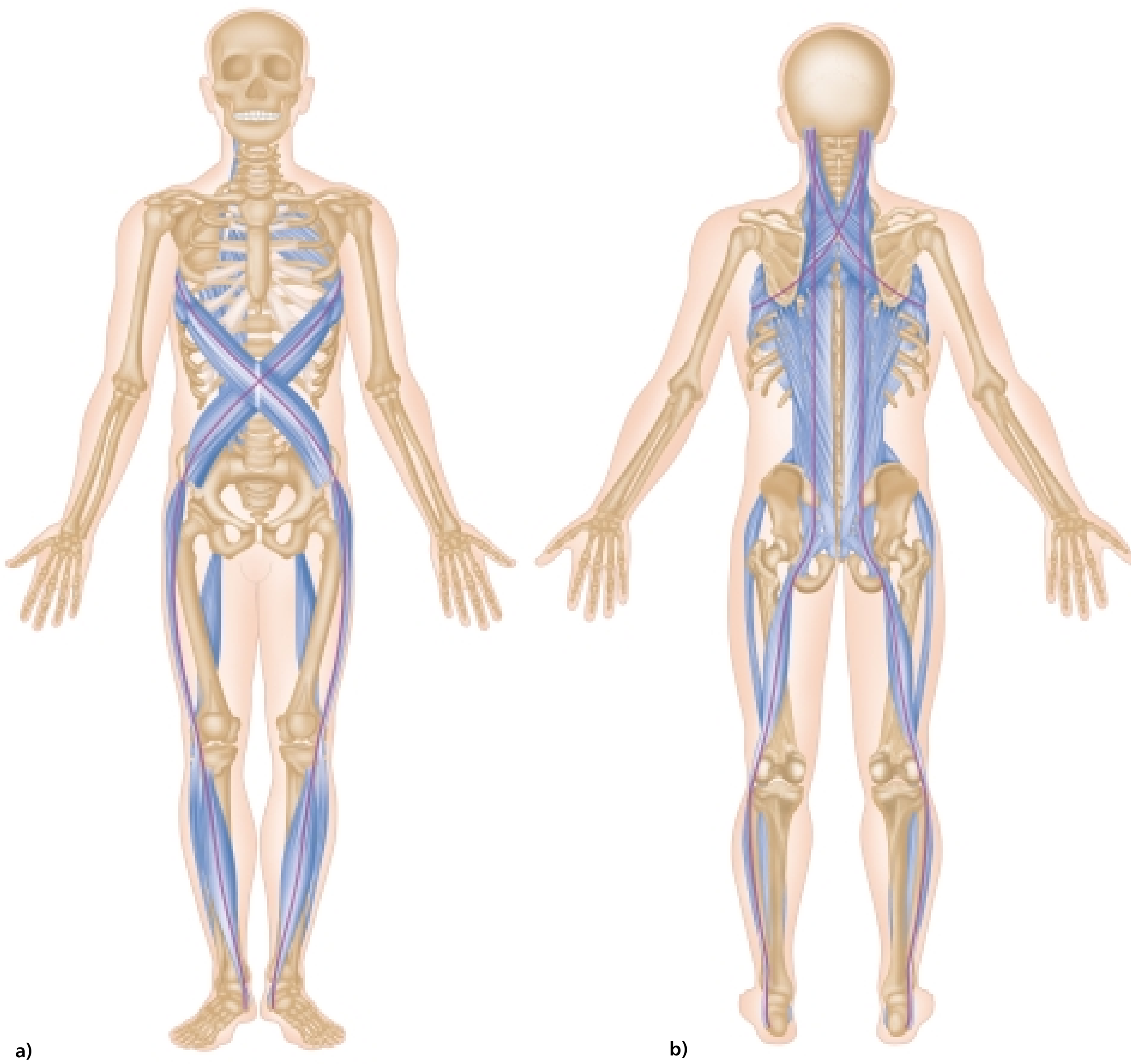



Figure 8.16: The Spiral Line (SL); a) anterior view, b) posterior view.

## Spiral Line

The Spiral Line (SL) winds through the three cardinal lines, looping around the trunk in a helix, with another loop in the legs from hip to arch and back again. It joins one side of the skull across the midline of the back to the opposite shoulder, and then across the front of the torso to the same side hip, knee and foot arch returning up the back of the body to the head (*see* figure 8.16).

In movement, the SL creates and mediates rotations in the body. The SL interacts with the other cardinal lines in a multiplicity of functions.

In posture, the SL wraps the torso in a double helix that helps to maintain spinal length and balance in all planes. The SL connects the foot arches with tracking of the knee and pelvic position. The SL often compensates for deeper rotations in the spine or pelvic core.

## Arm Lines

- Superficial Front Arm Line
- Deep Front Arm Line
- Superficial Back Arm Line
- Deep Back Arm Line

The four Arm Lines run from the front and back of the axial torso to the tips of the fingers. They are named for their planar relation in the composition of the shoulder, and roughly parallel the four lines in the leg. These lines connect seamlessly into the other lines particularly the Lateral, Functional, Spiral, and Superficial Front Lines (*see* figure 8.17).

In movement the arm lines place the hand in appropriate positions for the task before us – examining, manipulating, or responding to the environment. The Arm Lines act across 10 or so joints in the arm to bring things to us or to push them away, to push, pull, or stabilize our own bodies, or simply to hold some part of the world still for our perusal or modification.

The Arm Lines affect posture indirectly, since they are not part of the structural column. Given the weight of the shoulders and arms, however, displacement of the shoulders in stillness or in movement will affect other lines. Conversely, structural displacement of the trunk in turn affects the arms' effectiveness in specific tasks and may predispose them to injury.

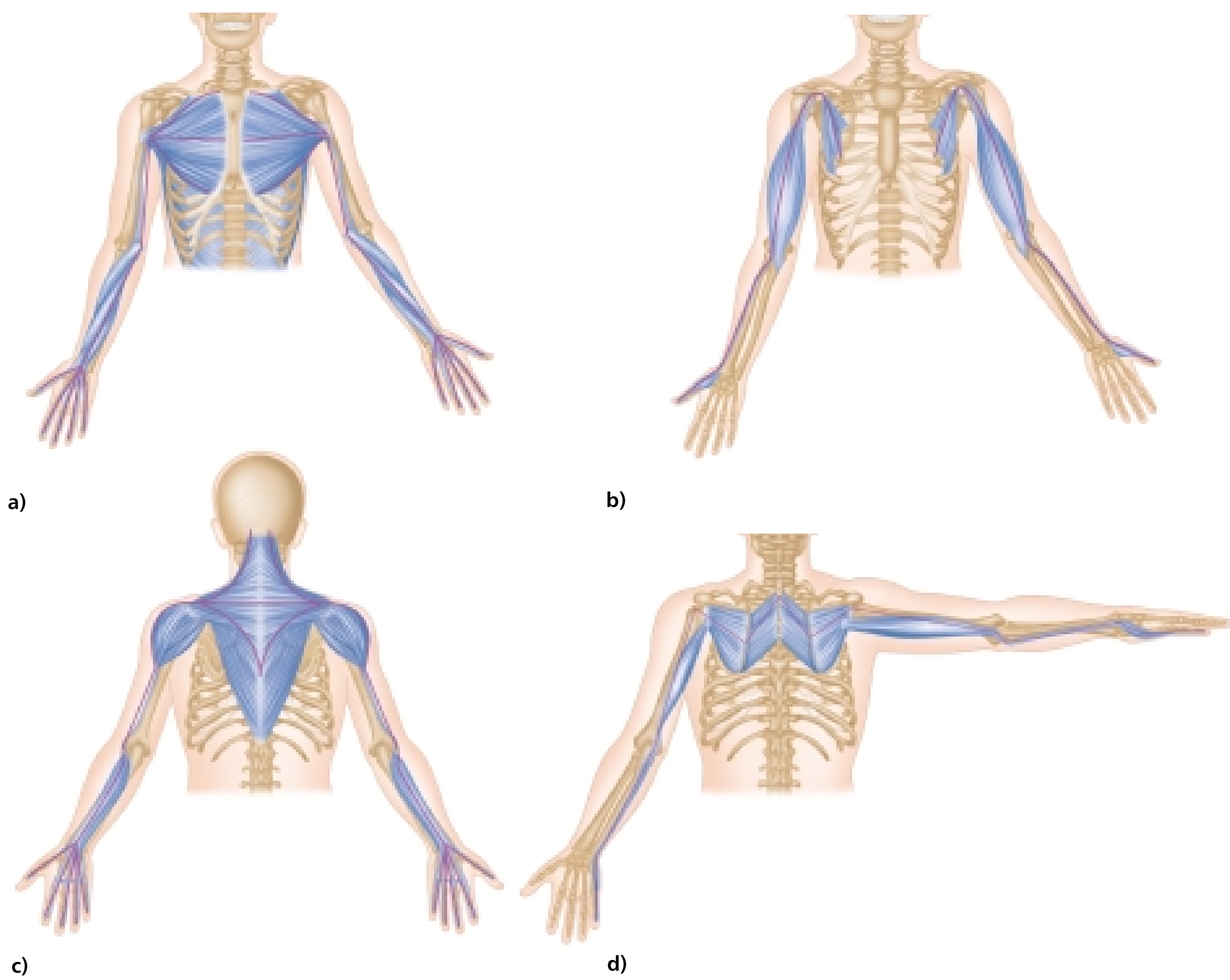



Figure 8.17: The four Arm Lines;
a) Superficial Front Arm Line, b) Deep Front Arm Line, c) Superficial Back Arm Line, d) Deep Back Arm Line.

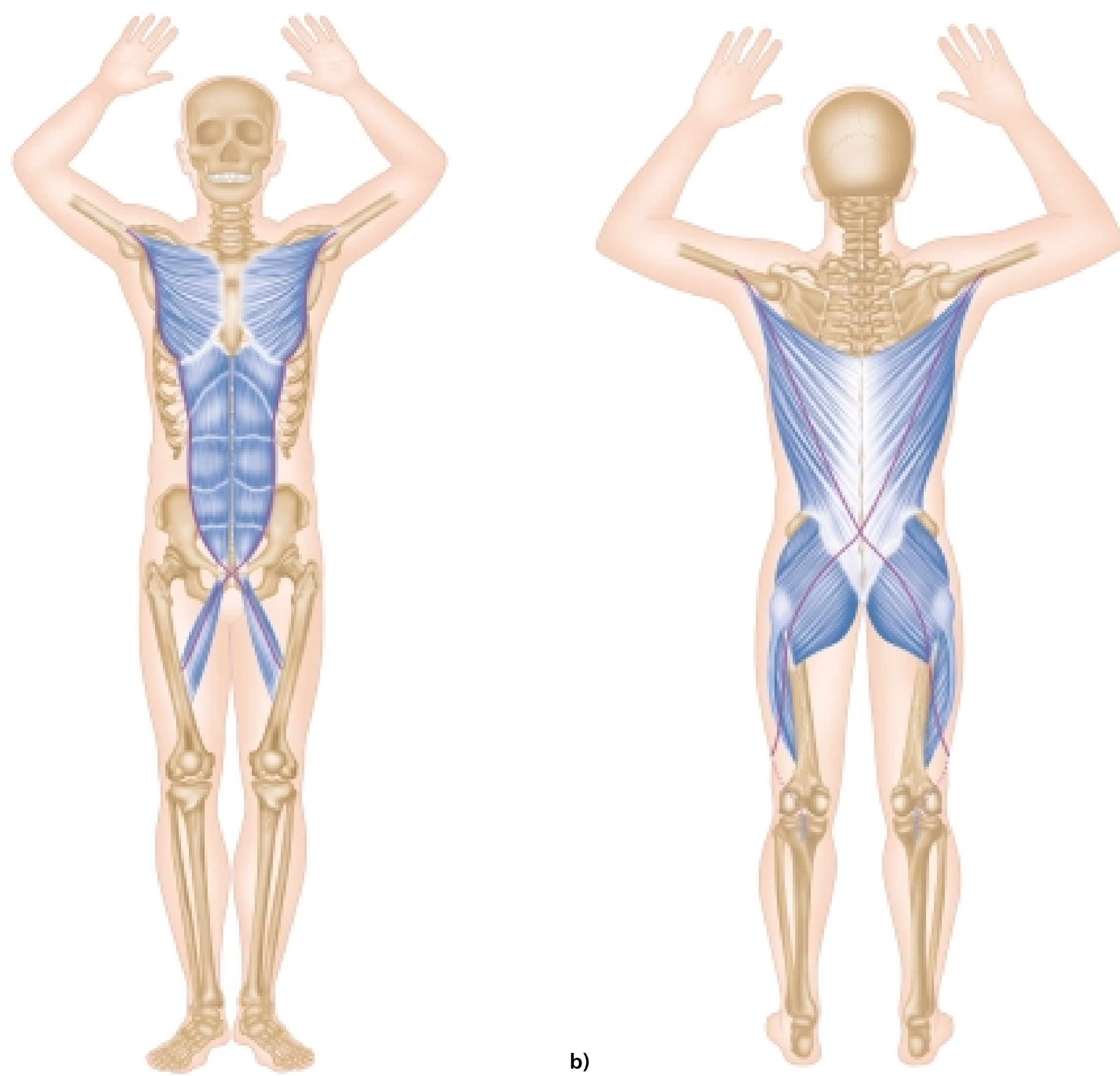
Beyond the straightforward progression of the meridians from the trunk to the four corners of the hands, there are many 'crossover' muscles that link these lines to ether, providing additional support and stability for the extra mobility the arms have relative to the legs.

## Functional Lines

- Front Functional Line
- Back Functional Line

The two Functional Lines join the contralateral girdles across the front and back of the body, running from one humerus to the opposite femur and vice versa (*see* figure 8.18).

The Functional Lines are used in innumerable movements, from walking to the most extreme sports. They act to extend the levers of the arms to the opposite leg as in a kayak paddle, a baseball throw or a cricket pitch (or vice versa in the case of a football kick). Like the Spiral Line, the Functional Lines are helical, and thus help create strong rotational movement. Their postural function is minimal.



a) b)

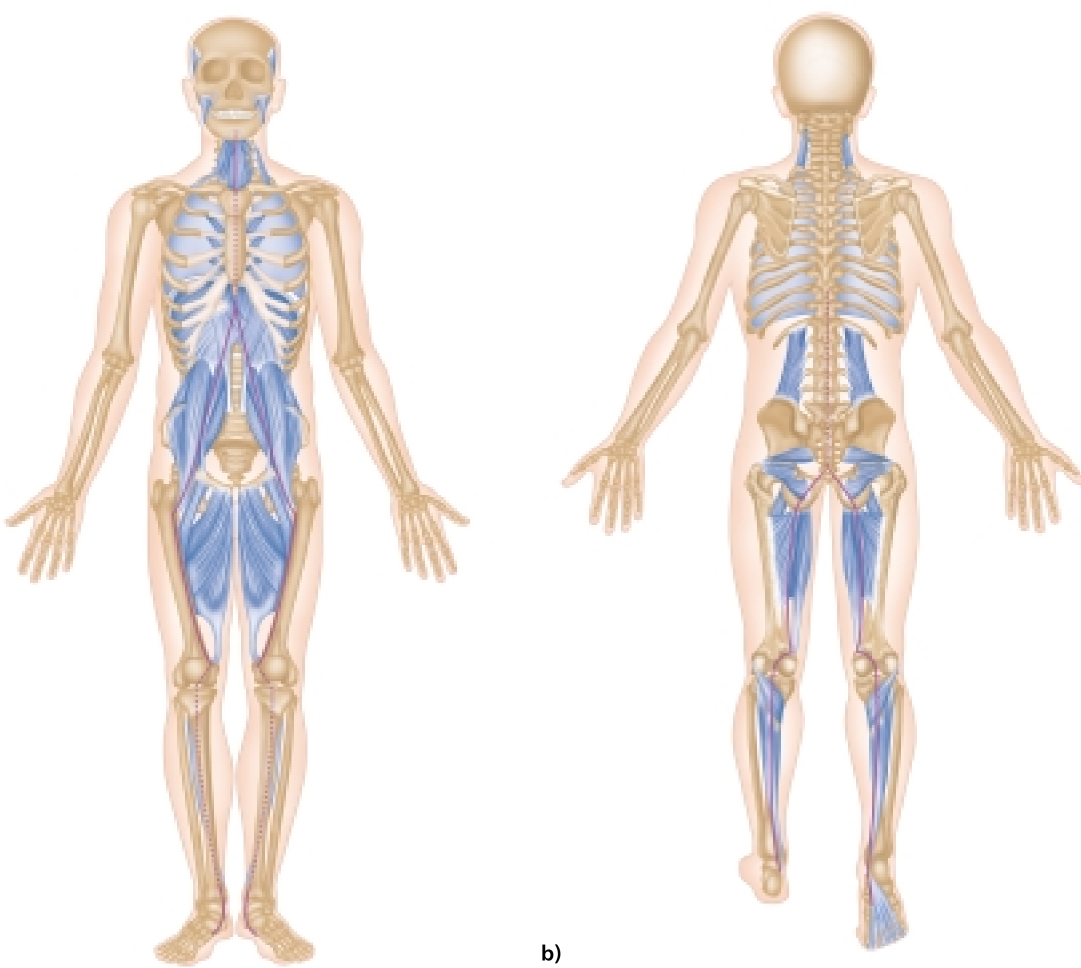
Figure 8.18: The two Functional Lines; a) Front Functional Line, b) Back Functional Line.

## Deep Front Line

The Deep Front Line (DFL) forms a complex core volume from the inner arch of the foot, up the inseam of the leg, into the pelvis and up the front of the spine to the bottom of the skull and the jaw. This 'core' line lies between the Front and Back Lines in the sagittal plane, between the two Lateral Lines coronally, and is wrapped circumferentially by the Spiral and Functional Lines. This line contains many of the more obscure supporting muscles of our anatomy, and because of its internal position has the greatest fascial density of any of the lines (*see* figure 8.19).

Structurally, this line has an intimate connection with the arches, the hip joint, lumbar support, and neck balance. Functionally, it connects the ebb and flow of breathing (dictated by the diaphragm) to the rhythm of walking (organized by the psoas). In the trunk, the DFL is intimately linked with the autonomic ganglia, and thus uniquely involved in the sympathetic / parasympathetic balance between our neuro-motor 'chassis' and the ancient organs of cell-support in the ventral cavity.

The importance of the DFL to posture, movement, and attitude cannot be over-emphasized. A dimensional understanding of the DFL is necessary for successful application of nearly any method of manual or movement therapy. Because many of the movement functions of the DFL are redundant to the superficial lines, dysfunction within the DFL can be barely visible in the outset, but these dysfunctions will gradually lead to larger problems. Restoration of proper DFL functioning is by far the best preventive measure for structural and movement therapies.



a) b)

Figure 8.19: The Deep Front Line (DFL); a) anterior view, b) posterior view.

## Practical Applications

How does this Anatomy Trains Myofascial Meridian idea add to our practical strategizing for manual therapy?

A look at the Superficial Front Line from the side reveals how useful work on the front of the shin can be to sorting out certain lower back problems and even forward head posture.

Knowing that the plantar fascia and soleus-gastrocnemius complex are joined around the periosteum of the heel allows us to see that in cases where the weight is shifted forward (the ubiquitous 'on your toes' posture), the heel – which should act as the 'kneecap of the ankle' – is instead forced by the tension along the Superficial Back Line into the subtalar joint, limiting movement and reducing support for the back of the body.

Understanding the connection between the lateral longitudinal arch and the hip abductors via the Lateral Line enables the practitioner to make the link between foot balance and pelvic balance, leading to successful soft-tissue strategies for genu varus and valgus. The Spiral Line shows the relation between pelvic tilt and inner arch support, or how to resolve a lateral head shift by working with the opposite shoulder.

Numerous other examples in clinical application are offered in *Anatomy Trains*, and the supporting video programs and courses. Every therapist has seen shoulders drop away from the ears when the feet and legs are worked, low back pain melt away from work in the groin, or a client's breathing open from work on the forearms. The Anatomy Trains map offers one way of understanding and managing these effects in terms of mechanical or energetic communication across our 'sinew channels' of the fascial connections.

Once the relationships within each line are understood, the interactions among the lines open new possibilities for resolving long-standing postural and movement patterns which will not yield to 'single part' attempts to remedy a problem. Progressive work with the lines can create dynamic shifts in these patterns, resulting in the re-introduction of 'poise' – an integral balance and length in body structure.

### Larger Considerations

One of the sequelae from the recent industrial and electronic revolutions is a society increasingly alienated from its body. While a few hone their kinesthetic skills through sport and dance (while others hone their reflexes with sophisticated computer games), many more are losing muscle mass, losing an accurate body image, and generally losing 'touch'.

Physical education and manual therapy, in both their traditional and holistic forms, seek to restore balance, awareness, proper functioning, and a healthy relationship with the physical self. New models, such as the concepts outlined above and other systems-oriented views, open new avenues for a populace weakened by constant sitting, fixed focal lengths, improper footwear treading relentlessly flat surfaces, cheapened sexuality, reduced contact with the natural world, lack of activity, and poor education concerning their physical selves from infancy on up. One major challenge for the 21st century is to adapt body systems forged in a Neolithic world to the socially crowded and almost entirely man-made environment we are rapidly constructing worldwide.

We are accustomed to the idea of IQ – measuring the intelligence of the brain. We are becoming more accustomed to EQ – the idea of emotional intelligence. What is needed is a map to the territory of KQ – kinesthetic intelligence, the intelligence of the body in motion. From the skill and awareness that makes an awkward body graceful to the inherent sense that warns us of impending danger; from the precise coordination required in a basketball lay-up to the body memory involved in plucking just the right strings on a harp; from the wisdom of rest and activity cycles to the cellular letting go required to forgive

– there is great intelligence in the body that is not yet well understood. Therefore it is not being taught, and therefore it is being progressively lost, except for small pockets within Eastern and Western medicine where what the great physiologist Walter Cannon called the 'wisdom of the body' is being honored and developed. The most reasonable part in us is the part that does not reason.

These various lines of inquiry into KQ could be gathered under the banner of 'Spatial Medicine' (as opposed to the medicine of Matter [allopathic or nutritional], or the medicine of Time [psychotherapy or shamanism]). What can we learn from how humans are arranged in space, and how they perceive and work with their spatial arrangement? Osteopathy, chiropractic, orthopedics and physiotherapy would qualify as Spatial Medicine. So do the entire alphabet of new (and old) therapies from Alexander, Bioenergetics and Continuum, through Feldenkrais and Gyrotonics, to Rolfing, Somatics, and Tai Chi, all the way to Yoga and Zero Balancing. All these (and the many more not named) are inquiries into our spatial relationships and their meaning, and all seem to contribute to the whole picture. Shifting the positions of bones, altering the length of fascial and myofascial tissues, and training the neuro-muscular system all aim for the same goal – easy, generous, poised movement, structural stability, and the extension of healthy movement into later life.

In short, a systems view (as opposed to the symptoms view) of our structural and movement selves is required to counter the destructive effects of the world we have created for ourselves. The anatomical details so vividly and economically set forth in this book can help with the task of finding, restoring, appreciating, and properly using our amazing locomotor system. So can new overall organizing schemes like the Anatomy Trains – the ever-smaller can be put into service of the ever-larger, and vice versa. True human intelligence – what Norbert Weiner called 'the human use of human beings' – will be attained not by transcending the physical self, but only through our full participation with our marvelous physicality.