The Arm Lines

By Thomas Myers

In our continuing series on visual assessment via the Anatomy Trains lines, let us now explore BodyReading the shoulders and arms. The shoulders involve not one, but six myofascial meridians. Our highly mobile shoulders move and shift position in a wide variety of ways relative to the ribs and neck, contributing to strain and pain patterns that include everything from headaches to compensations in the low back and even the legs.

With such complexity before us, we simplify here by 1) highlighting the uniqueness of the human arm architecture, 2) briefly outlining the lines involved, and 3) giving some indications of how the shoulder can efficiently rest, move, and respond to the breath.

Our shoulders have a complicated history. In most four-legged creatures, the foreleg bears more weight than the hind leg. The ribs and spine rest into a myofascial sling made primarily out of the serratus anterior muscle (Image 1A). In a well-trained horse or a thin fellow doing a push up, the saw-toothed slips of serratus are readily visible. Since we reared up on our hind legs some 4 million years ago, we freed the shoulder from its job of being the primary support that holds the torso up off the earth.

If the anthropologists and comparative anatomists have it right, our line of ancestry went through a time of swinging through the trees, which developed the prehensile capability of our hands, and involved the shoulder moving and rotating laterally to support the entire weight of the body—but this time in tension, from hanging, not bracing (Image 1B). When we came down out of the trees and onto the seashore, the arms were freed to swim, pick up sticks and stones, curl around our beloved children, steady the plow, and tap on computer keys.

Our human shoulder is no longer the major structural column (except for those doing handstands or headstands). For us, the shoulder is supported by the structural column—a yoke that half hangs off the neck and half rests on the top of the ribs. When you include the weight of the attendant muscles, the shoulder girdle is remarkably heavy, and can easily load the neck and spine significantly, and detrimentally if it is out of balance (Image 1C).

While the arm and leg are similar in construction—a ball and socket joint, then one bone, then a hinge joint, then two bones, then three, four, and five bones in a similar arrangement—the shoulder and arm definitely lean toward mobility, while the leg and hip are designed more for stability (Image 2). Put simply: to keep up

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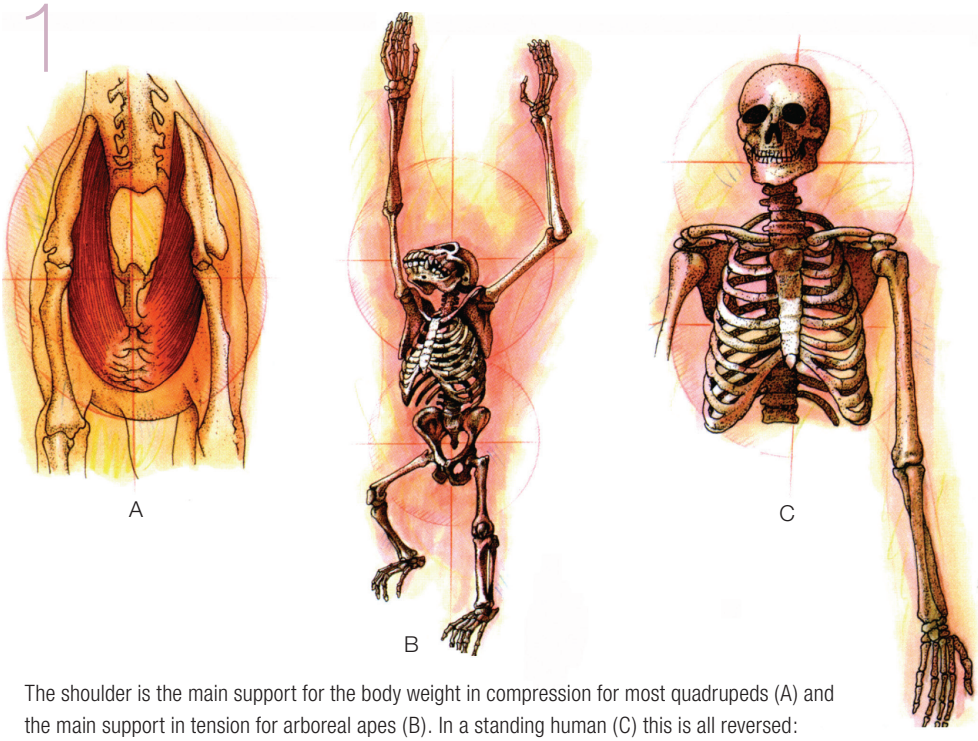
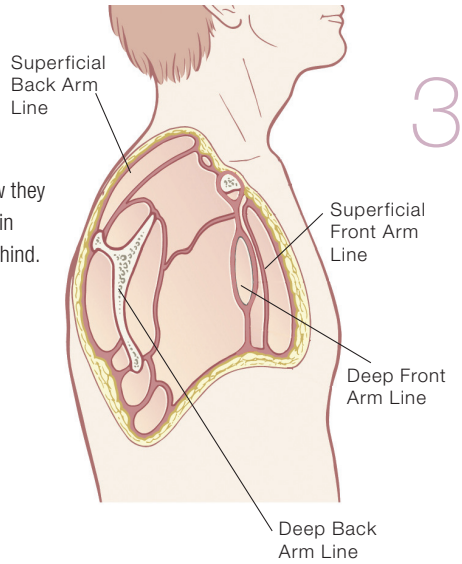


The shoulder is the main support for the body weight in compression for most quadrupeds (A) and the main support in tension for arboreal apes (B). In a standing human (C) this is all reversed: it is the turn of the heavy shoulder assembly to be supported by the ribs and spine.



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The Arm Lines are named for how they present at the armpit level—two in front of the axillary space, two behind.

with the arm and hand's many talents, the shoulder has to slide all over the place, making it more vulnerable to both injury and misalignment.

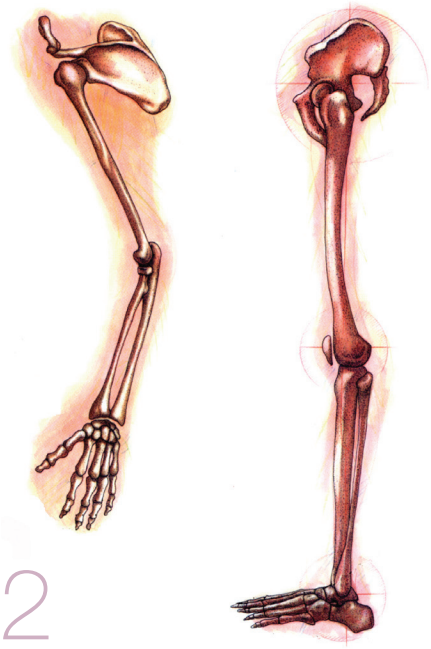
THE ARM LINES

The complexity of the myofascial structures along the arm is mind-boggling. The arms have to control the finest instrument the world has ever known—the human hand—at one end, and are anchored into the head, neck, upper spine, ribs, low back, hip, sacrum, and even arguably the femurs at their other end. Let us make some sense of this by organizing the "myofascialature" (I made that up, don't repeat it to anyone with a degree) into a series of connected lines.

To qualify, these lines must 1) start at the axial skeleton and go all the way to the fingers, and 2) involve conjoined fascial fibers running in a fairly straight direction. Using those rules, one can divide the arm's soft tissues into four of these lines.

We name the Arm Lines for how they are arranged in the armpit (Image 3). The pectoralis major is part of the Superficial Front Arm Line (SFAL) (Image 4A). The pectoralis minor and subclavius, and the fascia that surrounds them, are part of the Deep Front Arm Line (DFAL). In the back, the trapezius and deltoid form the beginning of the Superficial Back Arm Line (SBAL) (Image 4B). Beneath these are the rhomboids and levator scapulae leading to the rotator cuff of the Deep Back Arm Line (DBAL). These lines terminate in the four corners of the hand—the palm, thumb, back of the hand, and little finger respectively.

Because the intricate anatomy is beyond the scope of a short article, you can follow the individual structures in each line by following the charts in Image 4. For simplicity, you can best visualize the four Arm Lines as the four aspects of a bird's wing. Lean forward and stick your arms out like a kid playing airplane: the SFAL is the bottom of your wing from pectorals to palm; the SBAL is the top of your wing from trapezius



2

The arm and leg are similarly designed in a 1, 2, 3, 4, 5 arrangement of bones, and the muscles are easily comparable as well. The arm tilts this design toward extra mobility, while the leg tends toward greater stability.

A

B

4

The four Arm Lines go from the axial skeleton to the four corners of the hand.

to fingernails; and the DFAL is the leading edge from the pectoralis minor out to your thumb. The final and most problematic (from our point of view) line is the DBAL, the trailing edge of the wing from your levator and rhomboids through your rotator cuff on out through the triceps and point of the elbow to your little finger (Image 4, page 97).

These lines are minutely detailed in *Anatomy Trains* (Elsevier, 2009), but here and now, this will have to suffice on the anatomy. In terms of function, the SBAL holds the arm aloft and fixes it in position and the SFAL directs the hand and fingers, while the two deep lines provide stability and refinement in aiming the hand at whatever we are working with.

SHOULDER POSITIONING

If you are working with a musician, jeweler, draftsman, or ping-pong player, the details of the forearms and hands are relevant, but here we will concentrate on the positioning of the shoulder. Even with that limit, we encounter sufficient complexity. The postural position of the shoulder rests largely with the scapula. With some exceptions, the clavicle and humerus have to follow the scapula's lead. The scapula itself is a roundhouse of muscular pulls all competing to dictate its position (Image 5).

Please do not talk to me of a "scapulo-thoracic" joint—there is none. The scapula floats in a sea of elastic guy-wires that can be tense or relaxed, concentrically or eccentrically loaded, competing and restricting or ready to accommodate. Although I personally shrink from defining good versus bad for a scapular resting place (it depends on the shape of the back, the head, occupation, and a few other factors), many would argue that good positioning involves:

- the vertebral border of the scapula lying vertically along a line above the angle of the ribs, and
- the scapula hanging vertically when viewed from the side, with the proviso that the rib cage must also be vertical. In the all-too-common case of the rib cage being posteriorly tilted, then the scapula that is vertical to the gravity line would actually be anteriorly tilted relative to the rib cage (Images 6A and 6B).

Common displacements include a very common (but often rib-cage centered) tilt of the shoulder girdle as a whole, or the scapula can be:

- too wide or too narrow (laterally or medially shifted);
- held up or too far down (superiorly or inferiorly shifted, though the latter is rare);
- wider apart at the bottom than the top or (again, more rare) wider at the top than the bottom (laterally or medially tilted in our language, but upward or downward rotation in physiotherapy-speak);
- held forward or pinned back (anteriorly or posteriorly shifted); or
- anteriorly or (very rare) posteriorly tilted.

The commonly used protraction and retraction are insufficiently exact to lead to coherent strategies for correcting shoulder position. The exact nature of the terms outlined above—tilt, shift, and rotation applied to each of the clavicle, scapula, and humerus—provides a shorter road to the most efficient treatment plan. Protraction may involve different levels of lateral shift, medial rotation, and anterior tilt, not to mention anterior, posterior, or superior shift relative to the rib cage.

THE SCAPULAR X

The scapula is a roundhouse in Anatomy Trains-speak, meaning that many muscles compete in setting its position. There are muscles going in nearly every direction from the triangle of the shoulder blade. Four of these, however, are key to setting its position.

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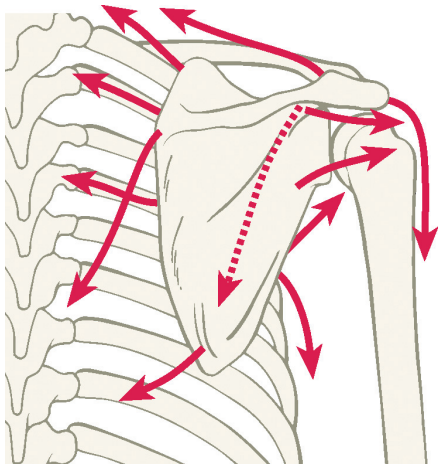

The scapula has many muscles attaching to it—and thus its position rests with the balance of these guy-wires: the rotator cuff, deltoid, teres major, triceps, biceps, and coracobrachialis attach it to the humerus; the serratus anterior and pectoralis minor attach it to the ribs; and trapezius, rhomboids, and levator scapulae attach it to the spine and head. We can safely ignore the omohyoid in terms of scapular position.

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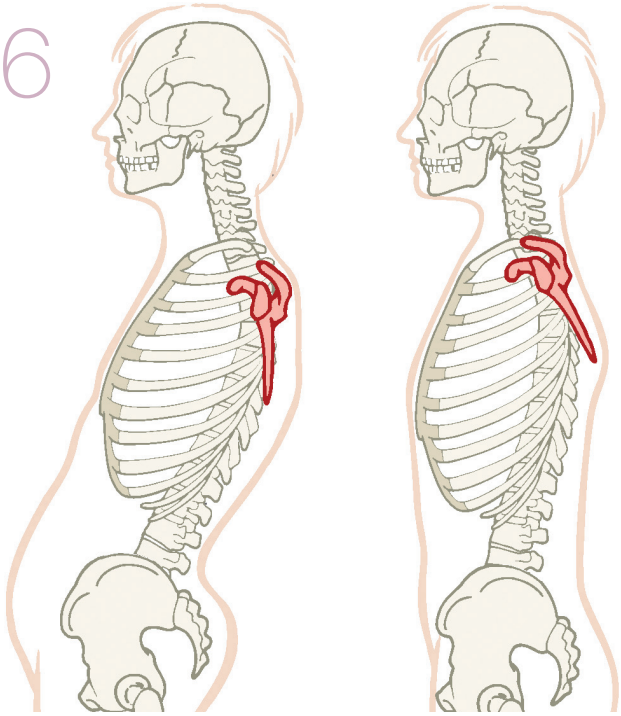

A B

The scapula relates primarily to the rib cage in terms of BodyReading. The scapula can appear vertical relative to the gravity line (A), but still be anteriorly tilted relative to the ribs. Straighten the ribs, and then you will see the anterior tilt of the scapula (B).

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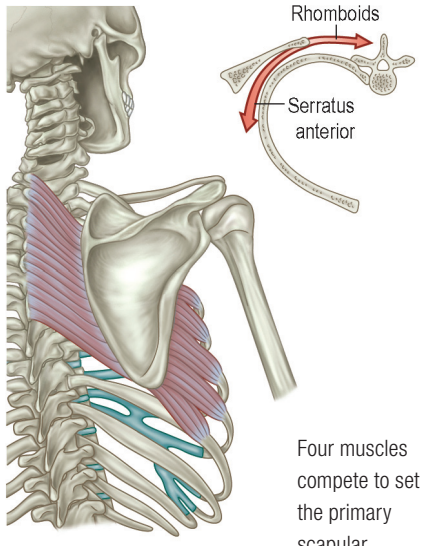

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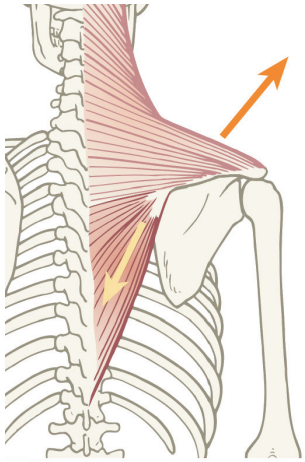

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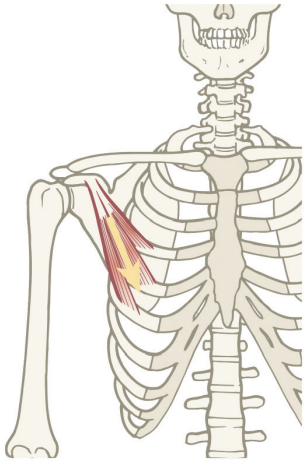

C

Four muscles compete to set the primary scapular postural position: the rhomboids and serratus anterior form one leg of an X, while the lower trapezius and the pectoralis minor have an antagonistic relationship along the other leg of the X.

One leg of this X is the oppositional forces between the rhomboid muscles and the serratus anterior—the former pulling up and in (assisted by levator) while the latter pulls down and out (Image 7A). When the serratus overcomes the rhomboids—is hypertrophic or concentrically loaded—the scapula will rest too laterally on the back (this happens frequently in kyphotic patterns). When the rhomboids dominate—and this happens frequently in flat-back patterns—the scapulae rest too close to the vertebral spinous processes, and too medially for optimum function.

The other leg of the X is a little less straightforward, but just as powerful (Images 7B and 7C). The only muscle that pulls down and in on the scapula is the lower part of the trapezius. To oppose this force, a muscle would have to be pulling up and out on the shoulder, which is clearly impossible—that would be a muscle out beyond your ear. But wrap that strap over the front of the body, and you can see the reciprocal antagonistic relationship between the lower trap and the pectoralis minor, which can pull the scapula up and over the rib cage into anterior tilt or medial rotation.

You will have a difficult time finding people where the lower trap has overcome the pectoralis minor to pull the scapula too far down and in, but you will not have to go far to find those where the scapula is crawling up over or around the rib cage to the front. Medial rotation or anterior tilt of the scapula often lies with a short pectoralis minor (or restriction in the clavipectoral fascia in which it is imbedded). Various stretching and manual therapy methods can reach and lengthen these short tissues, and are commonly needed for proper shoulder girdle balance.

Whichever way we achieve an even tonal balance among these four and the other muscles that pull on the scapula, the reward will be an easy and mobile shoulder movement.

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THE CLAVICLE

The clavicle holds our shoulder out away from the midline, and is thus fairly well anchored to the top of the sternum medially and must follow the scapula laterally. There is a small disc in the sternoclavicular joint, which tells us this joint must glide a little, which is a necessary movement for good shoulder function.

When you ask a client to open his arms wide (as if about to enfold a grandchild) and you see the scapulae rise in back, the cause is often not a too-tight levator scapulae or trapezius, but a sternoclavicular joint that cannot glide laterally, causing this compensation in the back. When you see this pattern, release the subclavius under the medial third of the clavicle. When this heavily-fascial muscle relents, the clavicle can glide, and proper arm carriage returns.

THE SHOULDER IN BREATHING

An easy but telling assessment for the shoulders is to watch their response to the breath. Watch first with the client's normal tidal breath, but if that is too small to produce any shoulder movement, have him increase the depth of the breath gradually until you see some movement response in the shoulder girdle.

Generally, you will see one of three patterns:

- The shoulder girdle moves straight up with the in-breath and back down on the exhale. In this case, look to the muscles that hold the shoulder to the ribs—serratus anterior and pectoralis minor principally.
- The shoulder girdle hardly moves, even with a deeper breath. In this case, the shoulder is hanging off the neck and head, and you should look to the trapezius and levator scapulae that hold the shoulder girdle from above. Interestingly, release of the scalenes, which are not normally listed as shoulder muscles, but do attach fascially to the arms, can often bring good results for this pattern.
- The shoulder girdle moves up and out on the inhale; down and in on the exhale. This, in my opinion, is the Goldilocks movement—just right. The shoulder is loose enough to ride and glide on the rib cage in response to the breath.

THE RELAXED ARM

From the hand up, one can read more or less flexion in the fingers (everybody flexes a little), ulnar or (rarely) radial deviation at the wrist, chronic pronation or supination of the forearm, or excessive flexion at the elbow—come to class for these details.

For space reasons, the last issue we will deal with for the arms is where the humerus lies in terms of medial and lateral rotation. Various measures have been proposed for where neutral lies for the humerus. Ida Rolf urged us to go for a balance where the olecranon of the elbow pointed laterally, but I have never been able to make sense of this, either anatomically or functionally. Some yoga teachers have suggested that the elbow should point straight back behind us, and I have never been able to make sense of that measure either. The conclusion I have come to is that there is a broad range of neutral in humeral rotation. It is, after all, the most moveable joint in our body.

The humeral position that makes the difference is not relative to the torso, but relative to the scapula, and that in turn depends on the balance of tension in the rotator cuff—the SITS muscles. The subscapularis is a medial rotator; the supraspinatus, infraspinatus, and teres minor all contribute to lateral rotation—or more often, stabilizing during medial rotation.

For an easy way to BodyRead where the humerus lies, put the index finger of one hand along the top of the spine of the scapula with your fingertip near the acromion, and another finger to bisect the olecranon. A 90-degree angle between

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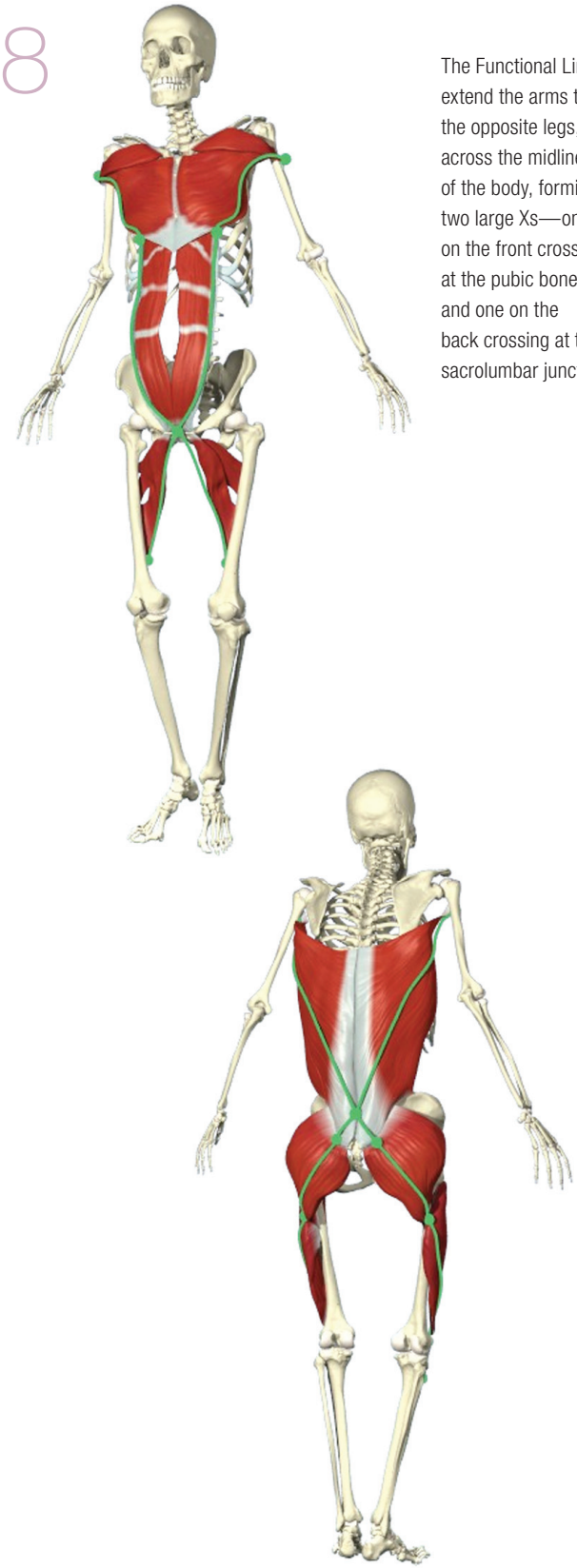

The Functional Lines extend the arms to the opposite legs, across the midline of the body, forming two large Xs—one on the front crossing at the pubic bone, and one on the back crossing at the sacrolumbar junction.

these two lines is about right—if the angle is too acute, the humerus is laterally rotated; if too obtuse, it is medially rotated in the glenohumeral joint.

THE FUNCTIONAL LINES

Finally, we should mention the other two lines that extend the arms down to the contralateral legs—the Front and Back Functional Lines (Image 8). When you throw a rock or a spear, or bat a ball, the force generated by the arm is multiplied by the additional lever arm of the trunk pivoting on the opposite leg. The Functional Lines transmit these forces across the midline of the body in two large Xs—one across the front, and one across the back. These conjoined muscle linkages—the lower edge of the pectoralis major to the line between the rectus abdominis and external oblique across the pubic symphysis to the adductor longus in front, the latissimus to the thoraco-lumbar fascia to the lower gluteus maximus in back—team up to reciprocally impart more momentum and speed to the hand.

Interestingly, despite the fact that we are all "handed" and thus use one set of these lines more than the other, my 30 years of observation tells me that these lines rarely govern posture, perhaps because they are used reciprocally with every step. Whatever the reason, when you see one shoulder closer to the opposite hip, it is usually the Spiral Line that is the culprit (January/February 2012, BodyReading the Meridians, page 94), not these innocent Functional Lines.

The arms are highly complicated bits of machinery, very handy accoutrements to our body's repertoire, and amenable to the poetry of bird's wings and nonverbal haiku. We have covered only a few major assessments, but we hope they are of use to you. Next issue will be the last in this series as we take on BodyReading of the last of the Anatomy Trains lines, the core of the Deep Front Line. **m&b**

Thomas Myers is the author of *Anatomy Trains* (Elsevier, 2009) and *Fascial Release for Structural Balance* (North Atlantic, 2010). Myers studied with Ida Rolf and has practiced integrative bodywork for more than 35 years. He directs Kinesis, which offers more than 100 professional certifications and continuing education seminars per year worldwide. For more information, visit www.anatomytrains.com.