**The Senses and Sciences of Fascia: a Practice as Research Investigation**

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*Practice as Research 0: Sitting and Reading*

Start with your current posture; perhaps you are sitting (or standing) as you read this. As you read these words, your attention oscillates into sitting as doing, as something you are performing (in one way rather than another), into sitting as a kind of moving. Sitting may seem static when compared to dancing, but as we learn from biology, ergonomics, kinesthetics, and contact improvisation, we are always on the move, even while sitting. We are filled with multiplicities of micromovements: gaseous, liquid, microbial, muscular, and bony. We are engaged in what Steve Paxton called "the small dance," a constantly creative adjustment of orientation, alignments, contractions, relaxations, and balancing (Paxton 48). Attending to all this motion is fantastic; attending stretches our imaginations and feelings of embodiment. But it also risks skipping over how this motion is dynamically *still***.** Given all this activity, how are we able to be still enough to read, to hold our head steady, to repeat motions precisely, over and over? Our bodies, muscles, attention, and sensations all have *habits*, contractions of the past into the present (Deleuze; Malabou; Rothfield). Muscles and brains are one part of the answer, but in this essay we would like to take you on our exploration of a relatively unexplored and untaught aspect of our bodies: fascia.

Fascia is often called connective tissue—the viscous goop that connects, divides, and slides between muscles, organs, skin, and cells. It has also been found to be active, intelligent, communicative, and a sensory organ—sometimes three, sometimes many and sometimes one—

liquid, solid and mucus. Plastic surgeon Guimberteau's videos are perhaps the best way to experience their textures and relations (Guimberteau, http://tinyurl.com/guimberteau). Fascia has opened up into a new field of fascia studies that we are exploring by moving with them. Fascia, or connective tissue, is the center of attention and sensation, of experimentation, scientific investigation, and performance research. Fascia research stretches between communities of biologists, massage therapists, clinicians, anatomists and pathologists, yoga and pilates teachers, doctors and dancers. Members of these communities have gathered every two to three years since 2007 at the International Fascia Research Congress meetings, with attendance in 2012 capped at eight hundred researchers (http://www.fasciacongress.org). They are still learning to get along, to talk across their different vocabularies, affects (like hugging), and experimental systems (Findlay).

This essay is part of a long-term performative collaboration and comparative ethnography of anatomies and sensations, biomedical, virtual environments, bodywork, dance, and of course the academic anatomies of sitting. All of these are incredibly lively, dynamic moving practices. So turning them into an essay that keeps you quite motionless as you read reinforces the idea that your attention is a thing that you turn on with your head and perhaps coffee. But as with all research, attentive practices reveal more about what we think we are attending to. They train our sensations, movement and attention to sense, move, and attend differently.

In this essay, we detail our investigation of fascia and movement through "Practice as Research" (Riley and Hunter, 130), not only conducting participant observation and interviews, but also experiencing and experimenting, creating a movement research lab, and piloting experimental teaching venues at academic conferences and dance festivals. We wanted to try out,

experiment, and place ourselves in the midst of these new forms of experimental embodiment by moving with the different scientific studies and body-based therapy practices concerning fascia. We hypothesized that in experimenting with particular subsets of fascia research through movement-based practices, we would develop new kinds of questions about fascia and new ways of thinking about the body. This was confirmed. We were pleasantly surprised how often this also generated new ways of moving. Our work begins by attending to the training of sensitivity across divergent fields of fascia research and sinks lively into the viscous materialities of connections.

If the body is defined by the relations that compose it, we investigated how our bodies would be affected by the different stories we read about the fascia system. We started the lab thinking that as we came to understand the form and function of the fascia system and how it influenced movement, we could incorporate these new discoveries about fascia into movement practice and teaching. The more we read about the fascia system, the more it became strange and elusive, opening to something new. The first thing that became clear in our research was that we could not assume the "fascia system" was one thing.

Over 110 years ago in 1899, Andrew Taylor Still, founder of osteopathic medicine, wrote his foundational book that highlighted the importance of the fascia system (Still; Findley and Shalwala). He wrote about fascia's importance in enabling muscles to glide over adjacent muscles and ligaments, its harboring of interstitial fluid, its network of nerve cells which enable certain kinds of awareness, and its relationship to breath and health (Still). However, it is only recently that fascia research has come to the foreground in research on the physical body.

Fascia was systematically ignored, dissected out and thrown away when studying the

anatomy of the body (Schleip 2003a & b). The scientific research on fascia is still in formation, existing in what historian of science Thomas Kuhn calls a "pre-paradigmatic state," in which multiple views exist simultaneously and where terminology and methods are in flux (Kuhn 2012). For instance, there are at least three opposing nomenclatures and definitions of what counts as fascia and what does not (Schleip *et al.* 2012).

Scientists, and all of us, learn through due attention, which is Practice as Research: "knowledge requires: that by due attention more can be found, that is, learned" (Stengers, 48). Biologists, clinicians and massage therapists all find more in fascia through paying due attention to it, though of course, their forms of attention vary wildly. Today there are hundreds of articles on fascia spanning these divides, coming from disciplines that still do not know how to talk with each other, particularly between movement- and bodywork-based practices that emphasize individual experience and variation, and more biological and clinical ones that aim at standardized training and generalizable notions of anatomy. Each of these frames is almost a caricature, but this divide is at the center of translational work being done at the Fascia Research Congresses and in our movement lab.

We came to think of fascia as concepts made up of multiple relations rather than a known fixed object. The research of science and technology scholar Annemarie Mol on anatomies, practices, sensations and taste shows how senses can be formed and how important they are in everyday life. One of her conclusions is that "different practices enact different versions of the body" (Law, 3; see Mol, and Mol and Law). Our readings on fascia evolved into multiple , different embodied practices that slowed down our ability to compartmentalize fascia. As Mol points out, what we habitually call anatomy is just one kind of anatomy. Shigehisa Kuriyama's

writing on the divergence of Greek and Chinese medicine also highlights how medical anatomies have differed greatly between cultures. Kuriyama writes that when dissectors inspected the body in ancient China, they did not see the nerves and muscles that Greek anatomists found so arresting. They lingered on other kinds of measurements, which generated different kinds of relations and ethical practices. In lingering on different ways of exploring and measuring the fascia system, we created different embodied practices.

*Practice as Research 1: Reaching Out*

> The artist's perception is not more authentic [than a scientist's], it is different; and, what is more, it testifies to a trained eye.
>
> —Isabel Stengers, *Thinking with Whitehead.*

Start again. Wherever you are, very slowly, extend one hand out to the side. As it slowly reaches out, attend to your body. Now, you may think of your hand and your arm as having a set of muscles, some of them activating in order for you to move slowly. But as we learned in both movement and dissection classes, if only your arm muscles activated, then as your hand extended, you would fall over—since your center of gravity shifts with your arm. But you don't fall over—because your other muscles throughout your body are all adjusting, minutely but clearly, if you attend closely enough to sense their actions (see http://tinyurl.com/fasciaten). If your feet are on the ground, you can probably experience slight shifts in your toes on the opposite foot from your hand, and as you continue very slowly to extend and then draw your hand back, sensing and attending, you might experience shifts in your hips, your other foot, your neck, and so on. It might be hard to find any part of your body not participating in your slow

hand extension. This kind of participation, extension, and sequencing are all part of a Practice as Research that you are engaging in here.

<INSERT FIG 1 here>

Mathematician and philosopher Alfred North Whitehead defined a body as parts exquisitely sensitive to the modification of the others. One kind of fascia is that which wraps each muscle. Sometimes called "deep fascia," it not only wraps muscles, the wrapping itself becomes the tendon that connects the muscle to the bone (see Figure 1). But according to fascia researchers, this is still a completely wrong way of saying all this, because connective tissue wraps each muscle bundle and within that each muscle fiber, as well as guiding the nerves and arteries and veins to each muscle (T. Myers; Paoletti; Schleip 2012). When muscle fibers contract, the directions in which body parts move is determined by these fascial wrappings at each scale. The ongoing shape and growth of the wrapping thus define "the muscle's" meaning.

The wrapping does not just connect to a bone, though. It continues around the bone and into the next muscle, and then the next one, and so on (see http://tinyurl.com/hedleyg). When a muscle contracts, the movement occurs only because of the total force of this fascial web wrapping the whole body into partially connected parts. Given the totality of muscles that must move in order for the appearance of one movement, Dumit's dissection instructor, Gil Hedley, explained, it is much more helpful to think of yourself as having just "one muscle." So we could say, "as you extend your arm your (one) muscle integrates your motion" (Hedley).

Fascia is thus one way in which parts of the body can be particularly sensitive to each other's modifications. Fascia is a sensorium. As we explored these practices of slow, attentive movement in our lab, we became aware of how our movements changed. Drawing on the

research of movement experimenter Moishe Feldenkrais, Dav Clark, Frank Schumann, and Stewart H. Mostofsky describe this type of movement as mindful, as a type of exploration that extends the capacities of our body, mind, and attention (Clark et al.). In a related series of explorations, Mabel Elsworth Todd highlights that how one thinks the body moves can change the way the body moves (Todd; Franklin; Overby and Dunn). In her "Posture Lab" at Columbia University in the 1930s, Todd called this effect of ideas about movement on movement, "ideokinesis." Eric Franklin took this idea into ballet training using a series of different visual and physical metaphors to change how dancers were able to move. Attending to and imagining movement facilitates movement, making the body different in the process. Together these make up "the thinking body," the title of Todd's book. In the "Reaching Out" investigation, participants often found themselves moving differently as they attended to how their "one muscle" body moved itself. Practicing research with ideokinesis reveals how we have habits of movement but also habits of sensation, of attention, of speed and coordination. These are habits we can investigate once we learn to note them.

*Practicing Scientific Research*

Our lab was also influenced by the work of science and technology studies (STS) scholar Natasha Myers and her work with Dumit. Myers and Dumit attend to the affective sensibilities acquired by cell biologists, protein crystallographers, and geologists at work and play in their laboratories (Myers and Dumit). They write of the scientists' bodies as "excitable tissues for gathering up the energetics and movement of the world, and manifesting these as perception, affect, and action" (see also Myers 2006, 2015). Myers' background in dance prepared her to

notice how scientists' bodies move differently as they articulate and describe the molecular movements they model. In being lured into thinking about our bodies as excitable tissue, we were curious how our bodies would be moved into action by the science stories being told about the fascia system: how might these stories influence the way we think about the moving body and help us develop different ways of moving in our dance teaching practices?

STS research has long focused on the trainings of scientists to become exquisitely attentive and sensitive beings. Historians, anthropologists, and philosophers of science have documented that science proceeds through learning by doing, craft and collaboration, and mentored discipline (Hacking; Shapin; Latour; Kortright). Hustak and Myers' work on Darwin's "involutionary momentum" shows the long, careful process through which Darwin trained himself to become sensitive to the temporalities and affections of orchids (Hustak and Myers). Practice as Research for our movement lab involves a slowing down reflection on the process of how bodies learn to move and sense and attend. Thus, we learn to be curious in specific and articulate ways (see also Clark et al.). It is part and parcel of how all scientists are trained, even if this training is not always foregrounded. Excitable tissue describes the ocular muscles of the microscopist, the good hands of the chemist, and the contouring hands of the geologist, as much as the articulate foot of the dancer, and the texturing hands of the charcoal sketcher (cf. Jain; Heath; Crary).

Our dance research process therefore created a dialectic or feedback loop between science research, image making, and touch and movement practices placed within a Practice as Research dance studio context. Within our lab, we attend to what new movements or relationships in the body we as dance researchers find in relationship to the fascia theories, and

we document, discuss, and experiment with them in teaching contexts. We thus use these fascia theories as a doorway to new experimental movement practices. Our insights and questions can also be brought back to fascia researchers as sources of further investigation.

*Practice as Research 2: Anatomy Trains*

The book *Anatomy Trains* by Tom Myers (2009) greatly influenced thinking and movement in our lab. Myers is a body worker who worked directly with Ida Rolf (founder of Rolfing). During his own cadaver dissections, Myers discovered that one could find the "muscles" described in anatomy books *only* by using a scalpel to cut the fascia/tendonous connective tissue near the bone. But if one instead lifted the wrapped muscle away from the bone the fascia could be followed around the bone to the next muscle and so on, creating entire connected lines traversing the length of the body. These "fascial lines" are as anatomically "true" as muscles and define lines of tension (T. Myers). They either show a continuation of fibers along their length or are directly connected to bones at "station" points (T. Myers). Using the anatomy trains book as a guide, we imagine our body as a set of lines of tension composed of fascia-wrapped muscle chains.

We worked with three different fascial trains. The first was the superficial back line which links the toes to the sacrum and the sacrum to the cranium on either side of the body (see http://tinyurl.com/sbackline). It is a fascia train that works its way up the backside of the body, tying the toes and the ball of one foot to the sit bone on the same side, continuing up one side of the spine (along the erector spinae muscles) and over the head, and stopping at the brow bridge. After the back line, we worked with the superficial front line. This line balances out the back

line, moving from toes up the leg to the anterior border of the hip bone, continuing along the pubic bone up the front of the body to the jaw, and ending at the front of the cranium. The third line we explored was the lateral line. This line moves from the middle of the outside of the foot to the hips, criss-crossing up the muscles from the waist to the shoulder girdle at the side body and ending at the neck.

We started by improvising movement across the floor, changing levels from standing to lying down. Then we worked in trios to sense into the fascia lines. One person would stand and another person would "trace" the front line with their hands from foot to cranium while another person would do the same with the back line. Tracing involved a firm moving touch with the hands. We did this a number of times until the person standing could sense the pathways along both the front and backside of their body. Once the person standing still had a sense of the pathways in their body, the two people tracing the lines would back away. The person receiving the touch along the fascial lines would then return to re-explore the initial movement while paying attention to these pathways. We repeated this process for the lateral line.

In working with the fascia trains we noticed how the prior palpation of each particular line kept our attention moving along it as we moved. We did not stay focused on one particular muscle or joint but on a train of relations up the back, front and sides of the body. A slight pull or tug along one part of the line would affect the whole. Focusing on the fascia line trained our attention to the making of particular relations in the body. For example, one lab participant, Hilary Bryan, noted that

> I notice the relation between the superficial back line and a straight leg lift to the front of the body [she moved her hand down the back of her body from the base of her cranium to

her heel and she kicked her right leg forward and up]. Paying attention to this relation, from my heel, up the backside of my body to the cranium enables me to sense lifting the leg from the whole back line of the body rather than from the hip. I feel a sense of moving back to kick forward and a loading and release of tension along one section of the 'track' resulting in a kind of springing another section into action.

The fascia lines train us to think and pay attention to the field of relations that encompass the body while moving. Similar to the first practice, we learn to pay attention to how each movement is a whole body movement, engaging long myofascial trains. Like Steve Paxton's small dance, movement moves along tracks feeding back into the body. As movers, we explore how training and attuning our attention to this relational field shifts the way the fascia system responds and acts in relation to movement. Directing our attention to the fascial tissues as a relational network in this way enhances and trains our proprioception.

In the context of ongoing discussions about these new ways of paying attention, our research lab was a practice in becoming articulate subjects. Bruno Latour writes, "an inarticulate subject is someone who whatever the other says or acts always feels, acts and says the same thing. In contrast, an articulate subject is someone who learns to be affected by others, not by itself" (Latour, 210). Our practice was one of discovering embodied fascia variations which led to multi-sensorial articulations, in which the fascia was the "other" that one learned to articulate. In this way, each somatic experience in relation to the fascia text produced a new kind of kinesthetic experience, a new sense and feeling of the body in motion. Each imagining resulted in a new way of thinking about our bodies, which led to particular felt sensation, directing our attention to new movement pathways and experiences.

*Practice as Research 3: Mechanoreceptors*

Start again: slowly extend your arm. If you bring it back and slowly flex and curl your wrist, then twist your wrist, the typical way to describe this is that your forearm muscles are being differentially activated (contracting and lengthening in various oppositions). You can feel them with the other hand if you grasp near the elbow.

Those "muscles" are sliding across each other. Differently in each of you. So different that some of you may find some of the directions painful. They may not slide, they may stick. If you have been injured or working at a computer too much, there may be restrictions and pain. In others, especially mountain climbers, the fascial tendonous sheaths in your fingers have thickened over the many durations you have hung from their tips. These sheaths now function like little ratchets enabling you to hang for far longer than your "muscles" alone would allow (BBC). They are part of your grip, your extension, your capacities.

Sliding and sticking: two muscles wreathed in fascia with fascial film between them so that "they" slide. The filmy fascia enables the slide, or it is the slide, the "sliding" itself is a type of tissue act, process and relationship, as much as stickiness, as much as communication, as much as continuity (through cells maintained by connective tissue). One of the great challenges of the Fascia Research Congresses is to understand the processes that underlie the changing relations of sliding and stickiness. What are the changes responding to?

Robert Schleip is a leading fascia researcher who bridges scientific investigation and body-work practice. In his articles on fascia plasticity, he examines the neural dynamics behind fascial plasticity and offers new perspectives for myofascial treatment methods between

myofascial practitioners and their clients (Schleip, “Fascial Plasticity Part 1” and “Fascial Plasticity Part 2”). Through it, we learn stress can cause fascial stiffness, therefore linking the fascia system to the central nervous system. Surprising to many researchers, fascia contains many types of sensory nerve endings called mechanoreceptors, and each of these receptor types responds differently to different manual manipulation pressures. Through Schleip’s review article on fascia, we learn how manipulating the nerve endings can change skeletal muscle tone, therefore changing the stiffness of the fascia system and muscular holding patterns (Gehllhorn).

In our lab, we addressed three of the types of mechanoreceptors outlined by Schleip and Müller: the Pacini corpuscles, Ruffini receptors, and Interstitial receptors. Pacini corpuscles respond to rapid pressure changes and vibration and are conducive to proprioceptive feedback that potentially results in improved local movement control. Ruffini receptors respond to sustained pressure, especially lateral stretch. They inhibit the sympathetic activity, relaxing the local tissues. The Interstitial receptors are found almost everywhere in the body and prefer both a soft, sustained, paintbrush-like touch across the body and sustained deep pressure along the bones.

We experimented with different ways of physically stimulating the mechanoreceptors and putting them into relation to our moving bodies. Then, working with partners, we tested different kinds of touching we would use to activate the other sensory nerve endings. We activated the Pacini receptors by having one person stand still while their partner switched between jiggling different areas of the body and patting quickly and firmly with cupped hands across the body. In addressing the Ruffini receptors, one person manipulated the person standing still with long, slow compression along the skin, stretching it along the same plane as the tissue below. And

finally, to address the Interstitial receptors, we worked with a soft, continuous, paintbrush-like touch moving across the surface of the skin, coupled with hard pressure along the bones with our finger tips.

Once we had established our own interpretation for activating each receptor we put them into relation to a moving body. Working in trios, one person would slowly improvise movement across the studio, changing levels from lying down to standing. The two other lab participants utilized the three physical manipulations we had developed. We experimented with both manipulators using the same manipulation at the same time, for example, patting and jiggling the body of the person as he or she moved across the floor. We also experimented with the manipulators improvising and using different manipulation techniques so the person moving was experiencing different mechanoreceptor activations at the same time.

In moving with and activating the fascia mechanoreceptors through Schleip's reading of them, we created a kind of warming up that both calmed us down and stimulated the whole peripheral body. Those who had spent a long day in classes before the lab reported being particularly intrigued with the effect. It was a quick method for the person moving to drop out of the feeling of busy "street" time and slow down into paying attention to the felt changes they experienced within their fascial system. We felt a kind of waking up to attending to the peripheral body and a heating up of the body. The two kinds of manipulation at the same time evoked a sense of disorientation in the mover. We called it a tenderizing warm up.

Individually, each activation of the mechanoreceptors created a different kind of readiness for further movement, affecting one's future self. For example, activating the Interstitial receptors with a light touch created a kind of calming affect and a heightened

sensitivity to being moved by the slightest touch. Activating the Pacini receptors was more stimulating, readying the dancer for potentially more dynamic movement. Each activation felt like an activation for another particular practice, setting a chain in motion. More research is needed in how physical/movement practices stimulate and activate the attentional fascia matrix.

Affectively charged kinesthetic experiments created different kinds of results. The storying and fictionalizing of science in new ways provided us with new repertoires for moving with fascia, they sensitized us with new types of readiness (cf. Goldman). The individual body, its structure and its power to act and be acted on, is defined by its engagement with its wider milieu. The dancing adds to the experiment and puts it into motion. As the dancer's attention and movement develop, we can follow how, to use Bourdieu's language, history is turned into nature and experience becomes a "durably installed generative principle of regulated improvisation" (Bourdieu, 78). Our histories of attentive practice shape our new bodies, expanding our capacities. In moving with different fascia studies, we are using our dancing bodies to further the inquiry about what the different kinds of fascia studies do for us in the moment of dancing.

*Practice as Research 4: Touch Touching Touch*

Start again: two hands, such as your two hands, touching, feeling, sensing each other. In this Practice as Research, experiment with the peculiar intimacy of two hands exploring each other. One hand pauses on the skin of the other, warming it perhaps, sinking in. The other softens in response. This softening is related to a change in tensional relations amongst the whole matrix of the hand: the skin, fascia, muscles, and entire extracellular matrix, things slide and squish and

tense in new ways.

Physicist, feminist and STS scholar Karen Barad explores the strangeness of touching: “When two hands touch, there is a sensuality of the flesh, an exchange of warmth, a feeling of pressure, of presence, a proximity of otherness that brings the other nearly as close as oneself. Perhaps closer. And if the two hands belong to one person, might this not enliven an uncanny sense of the otherness of the self, a literal holding oneself at a distance in the sensation of contact, the greeting of the stranger within?” (Barad, 206).

How might we explore this stranger within our flesh, the otherness of bodies, including our own? One hand touching another and each feels the skin, and under the skin, of each hand. One hand touches another and both change, in skin and under the skin. The many senses—of touching, feeling, tactility, thermal, mechanical, and kinesthetic impressions, proprioceptive movement, weight and balance of self and others, the senses of affective pleasures, pain, distention, tickling, itching, tension and tone, proprioception, interoception, anticipation and inspection—are each in flux, social and cultural, yet trainable, extendable, transformable. Each nameable variable of the experience seems to matter and feeds back into the experiment: pressure, weight, angle, movement, direction, depth of feeling, intent, relaxation, length of time, sensitivity, attention.

Inspired by Barad’s two hands touching, we set up different touching/moving experiments. We played with a practice we called “touch touching touch” as we moved alongside each other. Within this practice, we worked in partners and researched two different kinds of touching. The dancers would move across the floor practicing the first kind of touching practice and then would move across the floor a second time using the second kind of touch practice.

In the first kind of touching experiment, one dancer would hold another dancer's arm and pull the arm forward so that the other dancer was gently tugged along the dance floor. Within this practice, the dancer pulling attended to the touching and pulling of the arm. The other dancer attended to the initial pull allowing it to move them across the floor.

In the second kind of touching experiment, one dancer would hold the arm of another, attending to the initial touch of the arm as in the first practice. However, they would also attend to the other dancer's arm touching back, then attend again to the touch and holding and pulling of the arm. The dancer whose arm was being held, attending to the initial touch they felt as their partner held their arm, then attended to their own touching back and finally to the touch and tug of their arm as they were moved off balance across the dance floor.

We noticed we quickly moved across the floor together during the first touching experiment. We focused more on the displacement of the bodies from the tug of the arm and less on the quality of the touch. The second time we went across the floor, we were slowed down as we sensed into touch touching back. The quality of the initial touch was softer in the second experiment. It took us multiple times of moving across the floor together before we could attend to the sensation of touch touching touch again. We were learning what one of our teachers and co-founder of contact improvisation, Nita Little, calls "moving at the speed of attention" (Little, this volume). It begins by learning to move at the speed of your ability to attend, and then to move at the speed of your ability to attend to your partner's attention.

Through this practice, we developed a kind of listening within the touching. This kind of touching cultivated many questions. What was the initial dancer attending to in her or his first touch: the skin, muscle, fascia net, texture, temperature…? In touching back, what was the

second dancer attending to (the skin, the warmth of the hand, the pressure) and where were they attending from (their skin, muscle, fascia net)? How did attending to or from differently make a difference in the duet? How did the difference make a difference in the final movement that resulted from the tug? There were infinite possibilities within this duet. Sometimes the first dancer would attend to the skin of the dancer's arm he or she was holding, the second dancer may attend back from their muscle, however the first dancer might feel the fascia net touching back which changed the quality of the tug of the arm, shifting the movement of the dancer being pulled along. Within touch touching touch, there was a kaleidoscope of configurations.

One dancer commented that in the initial touch she felt a slight tug of what she imagined to be her fascia net. Her touching back was a kind of small recoil of her fascia net before she ultimately was pulled along in the direction of the initial touch. Her description is modeled on the idea of fascia as a body-wide tensional network (Schleip, "What is 'Fascia'"; Schultz *et al.*; T. Myers). She was imagining a catapulting effect of fascia tissues. Her touching back allowed her to sense a slight pre-tensioning of the fascia matrix in the opposite direction of the initial touch. This is comparable to using a bow to shoot an arrow, where the fascia is actively pre-tensioned in the opposite direction. In focusing on this pre-tensioning she described her attuning to the timing of the release so that she could be moved along by the dynamic recoil action of the fascia, rather than on her muscles working.

Dancing with fascia highlights what performance scholar Erika Fischer-Lichte calls the "transformative power of performance." She writes of performance as always shaped by the interaction between actors and spectators, where newly emerging, unplanned and unpredictable elements from both sides of the loop are integrated. In this way we can understand the dynamic

of “touch touching touch,” with fascia and skin playing the role of the third parties, no longer spectators but active and intelligent participants in the dances.

Embodiment becomes a system of transformation (Lepecki, 37). The dancer and the fascia system being investigated are mutually involved in an ongoing dynamic of being in relation, not under the control of either. Our research led to the experience of ongoing relocalization, reorientation and the constant transformation of the dancers’ modes of embodiment. Dancing with fascia attends to a performative way of knowing that depends on incoherence and incompletions, having the potential towards disorienting certain kinds of fixed bodies and disrupting the move towards assimilation or totalization. In slowing down and listening differently to a particular kind of fascia, the dancer is able to perceive more in her own body and others’. The familiar becomes strange, the self potentially opens to different, otherwise unperceived, connections.

For Whitehead, according to Stengers, sensation is an organism’s wager for and of a world (Stengers, 88). The senses of an organism are for that world, and nature is all that you are aware of in perception. It cannot be otherwise, what cannot be sensed is the risk of death you take. The world that is sensed is your bet, your survival. In embodied experimentation practices, our hands become different, become trained, better at touching, moving, holding, listening and experiencing. Hands become sensitive in new ways and invent new worlds.

*Practice as Research 5: Myofascial Release*

Start again: slowly extending your hand out and back. Where do you experience your fascia extending? Do you have to oscillate from one hand to your shoulder to your eyes, to the rest of

your (one) muscle? Can you move your hand so that it moves at the speed of your attention, at the speed of your hand's attention, at the speed of your fascial attention? How can you become curious about your attention's abilities and speeds, and how does that affect your movement?

One of the participants in our lab had trained in structural integration and so we researched the work of structural integration, commonly known as myofascial release. Myofascial release is a hands-on body-work practice that evaluates and treats the human structure, with a focus on the fascial system. The goal of the practice is to remove fascial restrictions. We read an article on myofascial release by the founder of the technique John F. Barnes and then were led through a practice.

To practice this release in relation to the reading, we had one person lay down on his back and a second person hold him just above one ankle with both hands while sitting. The hold with both hands helped practitioners feel into the fascia system so that they could notice how a slight pull moved all the way up the leg and into the torso. The person seated would then gently lean back, creating a firm but gentle counter balance between themselves and the person lying down on their back. The idea in this practice is that the elastic component of the fascia system is slowly stretched until the practitioner feels a firm barrier called the "collagenous barrier" (Barnes). In applying gentle pressure to the firm barrier, it yields or releases back to the springy feel that is considered a healthy component of the fascia (Barnes). We repeated this exercise on the other leg and on both arms. Each person lying down received about 10 minutes of pull on each limb. The people receiving the work would then spend fifteen minutes moving, paying attention to the felt sensation in their bodies and the differences they felt.

In both of these exercises, we placed our attention on the three-dimensional sense of the

fascial matrix. For the person receiving the work, the practices resulted in a deep state of relaxation. This kind of relaxation was not a falling asleep but resulted in a felt sense of moving toward dreaming. Carol, one of the lab participants, noted, "As I dropped deeper and deeper into relaxation I could feel myself going." As she said this, her hands touched her body and moved away, reaching away in all directions. She could sense her body in relation to a field that was not contained by the boundaries of the physical structure of the body. Here we think of sensing into fascia as a milieu (Manning). By milieu, we mean both middle and surroundings, or a middle that wraps around to self-surround, with a twist. Carol described her experience in receiving the work as going on a "mobius trip." In these embodied relationships that we discovered between fascia and deep relaxation, we question if there are connections between the central nervous system, the parasympathetic system (rest and digest), and sensing beyond the skin-bound body and into the undifferentiated field.

After receiving the work, the people lying on the floor would roll onto their sides and slowly start to move. Dancers could sense the intensification of connections that allowed them to make the slightest movement. This intensification was not located in one place in the body but travelled from multiple directions before any kind of movement was actualized. It felt like a gathering of some kind before moving out into space. We became aware of the relational ties in the body that need to intensify before movement can be seen. Dan, a dancer and lab participant, noticed a connection between his lower belly and right leg as he started to move. In describing this connection his hand moved around his belly in counterclockwise spirals and then glided down the inside of his right leg. He felt the spiral energy in his belly before his leg began to move. Nita noticed the intensification of pain in her shoulder from an old injury. She could feel

into the places where the movement was restricted and how these restrictions extended into other places in her body through the fascia web.

Not moving much, for example, sitting for long spells of reading or typing, transforms our fascia in different ways, creating different tensions and possibilities for moving with fascia (see Bryan this volume). The myofascial release practice felt like a gentle remaking or resetting of the fascia matrix. Attending within this practice, we felt how the slightest shift in the fascial matrix would make a difference, allowing the receiver to feel new pathways, connections and movements within their body. We discussed how these practice-based experiments created new questions: Could there be more than form of attention and sensation going on right now? Could our fascia be paying attention? How can we learn to play with these multiple forms of attention as new types of improvisation?

*We Are All Embryos*

> Albert Dalcq is moved by the fact that the embryo's response to his experimental questions has "all the surprise and charm one can find in the answer of an intelligent interlocutor."
>
> —Isabel Stengers, *Thinking with Whitehead*

You are always starting again. The tension you put on fascia, through your use of your body, such as by sitting, facilitates changes in you. Yet fascia is not passive. Fascia responds to your use of yourself, intelligently, trying to help you do what you do more. But it is an other intelligence, a stranger, an alien. One of our lab findings was that we need to approach our bodies, our parts, as aliens: they try to help but are of a different order of being, they are not

"ours" in any simple way.

If we don't move, fascia helps us not move. If we move, it helps us do that. So when we are injured and avoid using part of our body and put strain on other parts, fascia helps make that pattern part of us (T. Myers). Similarly, when we sit at a computer with our head forward—the head, being heavy, requires a lot of effort to keep up—fascia is eager to help lessen the load on our muscles, thickening and even calcifying, becoming bone-like, the hump that some people develop in their upper back (Paoletti). That same alien thickens the fascial bands and tendons in the hands of mountain climbers, enabling increased grip strength and denser bones. Our older selves may depend on the grip strength and dislike the hump, but both have been the ongoing result of a decades-long relationship with our alien helper.

The change in properties of fascia relate to the growth of fascia, raising the question of *how* it knows where to grow. This questions turns out to be a place where biologists, clinicians, and massage therapists meet in fascia research. Embryologists are their heroes, especially Albert Dalq and Erich Blechschmidt, whose painstaking work tracing development suggests patterns of movement and tension that continue to inspire. The fascia researchers are all fascinated and mystified at the wiliness of fascia in action, growing from embryo to us. And while embryology seems to be about a past phase of our life, if we as adults are still made by use in an ongoing way - *then we are still embryos*.

Our ongoing hypothesis: we are made by use. We can be remade through different use. Our abilities to move, experience of moving, sense of wellness, pain, stiffness, and flexibility, are the ongoing result of how we have moved in the past. Fascia is the shape of certain habits of movement (and attention, and sensation), and can thus be approached as testifying to the life we

lead, up to the point when we do not. Embryology opens up the question of totality in comprehending growth. Every cell divides in relation to the other cells around it. “In embryology no cause has within itself the power to cause or the power to produce a specific effect independently of a specific environment. At the limit, all causes designate the developing embryo as such as ‘the cause’ responsible for their effect” (Stengers, 177).

In touching fascia, in paying a researcher’s due attention, we touch multiple practices that push anatomical understanding away from reductive understanding that imagines the body as made up of parts with clear boundaries. Fascia research practice allows us to co-invent the body as a tensegrity structure (Stephen Levin), train tracks (Myers), a carrier bag of memories (Barnes), a mesh, a web, a stocking, a bow, a bundle of elastic bands, a coven of witches, or a school of fish (Schleip, “Fascial Plasticity Part 1”). Each image unleashes unexpected potentialities, states and new movement research practices.

What we are making and remaking at all times then, are the very parts, and wholes, and environments of and for our bodies, our selves, and our worlds. Our habits of movement, sensation, and attention presuppose a world in which there is reliability. These habits are our wager that the world will continue to support our selves as we adapt to its variations. In our movement lab, our experiments are as much in modulating our attention to the speed of internal and external movement as in learning to move in new ways. Our hesitations are as valuable as our improvisations. And hesitation testifies to variability with that reliability (Stengers, 219). At the intersection of habit and hesitation, variability and reliability, is thus our Practice as Research. Each of our experiments attunes us to the limits of our current world through dancing along its edge. Attending to the unfolding moments where habits betray, extending our capacities

through hesitations and new extensions of sensation and movement, we modify our bodies while modifying our ideas of our bodies at the same time.

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Caption: Figure #1: Fascia wraps every muscle, organ, and most other structures in the body in a continuous web. Illustration of the wrapping of muscles, muscle bundles, and muscle fibers by different types of fascia. Bundles of muscle fibers, called fascicles, are covered by the perimysium. Muscle fibers are covered by the endomysium. (Source: Anatomy & Physiology, Connexions Web site. http://cnx.org/content/col11496/1.6/, Jun 19, 2013. Author: OpenStax College. Creative Commons 3.0)

Image Source: https://commons.wikimedia.org/wiki/File:1007_Muscle_Fibes_(large).jpg

The Research Investigation Process (RIP Â®) naturally integrates the 4 STEM content areas (science, technology, engineering & mathematics) within each investigation.Â  Both students and teacher had lost that sense of inquisitiveness that grows from interest and curiosity. Then something clicked!Â  How to Use This Book. Making Scientific Practices Matter in the Classroomâ€¦ and Beyond can be used in a variety of ways for different purposes. It serves as a â€œtool bookâ€ for teachers of Kindergarten through Grade 12; a "resource book" for curriculum and instruction support staff (coordinators and supervisors, content specialists, coaches and mentors, and program developers); and a "case study book" for college level teaching methods courses. Scientific ethics calls for honesty and integrity in all stages of scientific practice, from reporting results regardless to properly attributing collaborators. This system of ethics guides the practice of science, from data collection to publication and beyond. As in other professions, the scientific ethic is deeply integrated into the way scientists work, and they are aware that the reliability of their work and scientific knowledge in general depends upon adhering to that ethic.Â  At the time of the last appeal, SchÃ¶n had been working in industry, not as a research scientist, and it is unlikely he will be able to find work as a research scientist again. Clearly, the consequences of scientific misconduct can be dire: complete removal from the scientific community. Chapter 10: Forensic Sciences. â€œKnowledge of forensic tools and services provides the investigator with the ability to recognize and seize on evidence opportunities that would not otherwise be possible.â€ In this chapter, we examine various forensic sciences and the application of forensic sciences as practical tools to assist police in conducting investigations. The chapter is not intended to be a comprehensive dissertation of the forensic sciences available.Â  During a crime investigation, physical matching is typically conducted on items, such as fingerprints, shoe prints, tire prints, glove prints, tool impressions, broken glass, plastic fragments, and torn edges of items, such as paper, tape, or cloth. Practices for Science Investigation. Kindergarten-Physics Progression. 2010 Science Standards of Learning. Introduction. 1. Proficiency. Advanced Mastery.Â  The senses are used to observe differences in physical properties. (1.1a). Observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy. (1.1b) Simple tools are used to enhance observations. (1.1d). Observations and predictions are made and questions are formed. (2.1a).