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Special Article

Human Origami: The Embryo as a Folding Life Continuum

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Abstract

The human embryo creates a body without a brain. Just how it does this, remains mysterious. While advances in science and technology afford scientists a privileged view of developmental changes *in vivo*, the embryo's dynamic growth patterns remain ill-defined. As Embryologists aligned with Goethean Science and Anthroposophy, another perspective has evolved: *Phenomenological Embryosophy*. Basic to this discourse is the concept that all biological organization and development is intelligent and *meta*-physical throughout the developmental timeline. Somatic education (Somatics) shares this holistic concept. Somatics is a *living* philosophy as well as an empirical approach to understanding the lived and living body through conscious movement practice. Throughout the 20th Century, Somatics spawned multiple movement practices, pathways to an embodied understanding of human potential and relational depth. Developmental movement has been critical to this study. In this article, the author draws from her personal engagement with Somatics, highlighting parallels between embryosophical theory and somatic practice. To illustrate key relationships, the author describes elements of her personal practice-based research called *human origami*. Human origami is an improvisational exploration of bodily folding. The inspiration came from French phenomenologist Gilles Deleuze who wrote extensively on the aesthetics of folding. Beyond the particulars of Deleuzian Phenomenology, human origami offers a means of re-enacting one's biological history through mindful movement practice. Here, elements from one practice session are described: the embryonic phase of gastrulation (the formation of the primitive streak and consolidation of the axial midline). The practice is informed and affirmed by trans-disciplinary studies in dance phenomenology, fractal biology and embodied cognitive science. *Human origami* ultimately aims to obliterate artificial

divisions between theory and practice in underscoring the impact of prenatal processes on lifelong health and wellbeing.

KEY WORDS movement, folding, phenomenology, Somatics, embryology, embryosophy

Introduction

Embryonic morphogenesis is a study in *complexity*. No one process, property or interaction explains the full story. Each new scientific interpretation seems to demand 'a radical reappraisal' of previous theory (Fleury V., 2012, p460). The embryo is complex because it is constantly moving. Moment-by-moment, through burgeoning growth, the embryo seeks its destiny – becoming a human body. (van der Wal, J., 2014, p5). From fertilization onwards, the embryo becomes a body through its own active movement patterning within an animate womb. Both mother (matrix/external world) and embryo are in dialogue through multiple rhythms, patterns and flows – a *dance* of immanence and imminence. As cellular migrations consolidate into a coherent body plan, these dynamical patterns continue throughout the life span, imprinted into our overt and covert expressions of posture, movement, and our communicative gestures (van der Wal, J., 2013, Behnke, E., 1997).

Today, technological advancements offer a privileged view of embryonic life in real time. The third person vantage point of science is one way of understanding life's processes from an objective stance, outside of experience (Hanna, T., 1986, Blechschmidt, E., 2004). Phenomenology offers an empirical inroad into understanding embodiment through personal observation and reflection. The turn is *corporeal* – a turn *away* from privileging the material body and a turn *towards* embracing living embodiment (Sheets-Johnstone, 2009). This non-reductionist view of life underscores behavioral dynamics, not as physical matter, but as the ongoing emergence of a lived and living body (Sheets-Johnstone, M., 1997, Hanna, T., 1986). Pre-natal Biologists also have aligned with phenomenology, in part within the Goethean tradition of Phenomenological Science. This has brought about a re-evaluation of embryological processes (Blechschmidt, E., 2004, van der Bie, G., 2011, van der Wal, J., 2005, 2010, 2014). As a challenge to third person positivist science, phenomenology posits a *meta*-physical view of embryonic life, in which agency, not matter, is fundamental to development (van der Bie, 2011) The embryo's phenomenal act of body making offers

> 'the possibility of understanding the relation of consciousness and behavior to the shape of the body.' (van der Bie, G., 2011, p 6).

This general article is designed to expand the conversation on embryonic ontology. The focus is on somatic movement experience (Somatics) as a way of knowing and understanding the embryo and its movement dynamics. The author, a dance and Somatic

Movement Educator, created a practice called *Human Origami* (HO) in which participants explore bodily folding. The practice of HO derives its inspiration and theoretical impetus from Biology, Phenomenology (including dance phenomenology), and embodied cognitive studies. As a pragmatic practice, the work is rooted in a Century-long tradition of *Somatics*

(See Eddy, M., 2016, for review). The author designed and piloted two research projects on HO which underwent ethics review at a dance conservatory (London UK). Rather than summarize the research, however, the author posits three aims:
(1) To locate the practice of HO within the somatic movement tradition;
(2) to enumerate parallels between somatic and embryosophic theory; and
(3) to illustrate a mindful movement practice as an empirical example of practice-based research in embryology.

Themes in HO range from aesthetics to the biological structure and function, inclusive of the embryonic phases of development. Here, the author has extracted one theme from HO, the embryonic phase of gastrulation, as illustration of the process. The imagery for the movement process is derived from the induction of the primitive streak and axial midline formation. HO is more than a metaphor for morphogenesis. Rather, the practice affords a means of accessing deeper roots of ontology and the behavioral underpinnings of life. The ultimate aim of HO is to dismantle dualistic and artificial divisions between theory and practice in understanding the impact of prenatal processes on lifelong health and wellbeing.

Somatic roots

Somatics, a compendium of holistic (body-mind) methods, arose within Western culture throughout the 20th Century. The Somatics movement was characterized by the proliferation of diverse body and movement centered practices. These mindful movement approaches provided pathways to embodiment and transformational consciousness. The proliferation of movement practices reached its apogee between the 1970's and 1990's, alongside the movements in Humanistic Psychology and Holistic Health (Hanna, T., 1970, Eddy, M., 2016). The root of the word somatic comes from the Greek word, *soma*, meaning, the unified organism, acting as an undivided body and mind in all things. The soma is phenomenal - a *lived* process (Merleau-Ponty, M., 1964, p22), in a living, moving, animate being (Sheets-Johnstone, 1999/2011). To have a body is to be embodied - not simply to move, but rather to live into your potential in being alive. Pragmatic yet transformative, somatic practices transform daily automaticity of habit into mindful presence and awareness of the wonderment of human life. If there is an aim to Somatics, it is to fulfill human potential throughout life, that is, not merely to *exist*, but to *become*.

Pioneer Somatic Educator and Philosopher, Thomas Hanna (1928-1990), coined the term

Somatics to validate first person experience *as* a biological science, the Science of Somatology (Hanna, T., 1973, 1993). Somatics is the actual experience of the body as perceived from within. It is the first person (subjective) narrative of lived experience as opposed to the third person (objective) vantage point of Science (Hanna, T., 1986/2017). Somatic *data* are unique. As Hanna states '… from a first-person viewpoint, quite different data are observed. The proprioceptive centers communicate and feed immediate factual information back on the process of the ongoing, unified soma - with the momentum of its past, along with the intentions and expectations of its future. These data are already unified;

they have no need to be analyzed, interpreted, and later formulated into a unitary factual statement… This interlocking reciprocity between sensing and moving is at the heart of the somatic process – a process that constitutes its own unity and continuity by constant self-regulation. The externalized "body" seen by the third-person observer is the living product of this continuous somatic process. If that process ceases, then the human body – quite unlike a rock – ceases to be: It dies and disintegrates' (Hanna, T., 1993, p. 198).

The latter half of the 20th Century witnessed a flurry of theoretical discourse around embodiment in the Sciences, the Arts and Humanities (Bresler, L., 2004). Somatic practices were designed primarily to dismember Cartesian dualism, a rebellion against the reigning methods of physical education of the early 20th Century. Somatic pioneers (many of whom came from dance) wanted to radicalize the formal study of Biology and Anatomy through mindful movement practices (Eddy, M., 2016). Learners not only could become acquainted with the material body (the anatomy of bones and muscles), but also gained insight into the actual processes underlying self-regulation. The body no longer was treated as a mechanism to be mastered by oppressive forms of physical control; rather, the *soma* realized its potential through self-organizing and self-actualizing (Hanna, T., 1970, 1993). The purpose of Somatics, then, is not merely to acquaint oneself with the physical (kinesthetic) sensations arising from the moving body. Rather, it is to enable access to the autonomy, intelligence and transformative capacity of human biological tissue (from cells-to-systems) (Wright Miller, G., Etheridge, P., Tarlow Morgan, K., 1993).

Somatic education relies on sensory awareness, touch, and movement as critical to understanding embodiment and its relationship to human potential. Bringing conscious sensory awareness to the moving body illuminates both earthly and transcendent bodily wisdom. When humans attune their own sensory awareness to their bodies, access to different states of consciousness unlock memory and meaning (Hartley, L. 2004). By augmenting sensory awareness as one moves, the physical material body takes on *somatic* consciousness. Somatic movement allows us access 'into deeper dimensions of micro-levels of cellular consciousness,' (Hartley, L., 2004, p100) and cellular intelligence that impact on all subsequent lifespan behavior (Cohen, B.B., 1993). Such intimate insight into personal consciousness is transcendent, connecting beyond the physical and mental to the meta-

physical -- that is, with the higher orders of universal (divine) consciousness (Kalsched, D., Jones, A., 1986, Williamson, A., *et al*., 2014). Sensory awareness is channeled and deliberately focused to enable conscious access to specific qualities relating to tissue *mind* and allow personal time-travelling (Mills, M., Cohen, B.B., 1979). Herein lies the core of bonding and attachment, emotional life, and even thought itself (Sheets-Johnstone, M., 1999/2011).

Somatic principles therefore, correlate readily with those of embryonic growth and development. The phenomenological embryo is a living, moving Gestalt, a 'coherent whole.' (van der Wal, J., 2005, p 2). As a somatic whole, the embryo makes a body because it *can*. Through movement, the embryo exhibits agency – the urge and ability to act autonomously according to its needs – even before the brain develops.(van der Wal, J., 2013, Cohen, B.B., 1993)'. Agency enables the embryo to fulfill its potential to become a human being. These are

not cognitive directives. The embryo's intelligence lies in its animate vitality (Sheets-Johnstone, 1999/2011). Even before the nervous system develops, the embryo touches and is touched, moves and is moved. It generates its own movement in response to its inner sensations and its contact with its environment. Perception and action, impression and expression are interwoven processes. (Cohen, B.B., 1993)

The Phenomenology of Folding

My impetus for creating HO derived from reading French Phenomenologist Gilles Deleuze. His book *The Fold: Leibniz and the Baroque*, is an argument on esthetics, a materialist metaphysics, and a viewpoint on the *Psychology of Perception*. Accordingly, folding is a living continuum that shapes body, perception, thought, culture and even the soul (Deleuze, G., 1993). (The phenomenological and Anthroposophical perspective of dynamic morphology also locates soul as central to embryonic life, transcending matter and form.) (Marc, V., Marc, O., 2007, van der Wal, J., 2013).

Summarizing Deleuze, the fold is the metaphor for all that is open-ended, inclusive, in-inexhaustable, and unlimited. For Deleuze, the fold is infinite:

> 'The smallest unit of matter is not the point, but the fold… Matter is infinite in its enfoldment…' (Deleuze, G., 1993, p7)… Folding leads – not to a finite finish – but to another fold, a continuum of inside and outside…' (Deleuze, G., 1993, p93).

Deleuze also views unfolding as more than a mere reversal of folding. Rather, unfolding is a kind of paradoxical continuum in which the endpoint is neither predestined nor known. Folds are processual, but also allow for nonlinear (alternate) routes towards realizing difference and individuation.

> 'Folding-unfolding no longer simply means tension-release, contraction-dilation,

> but enveloping-developing, involution-evolution. Folds over folds: such is the status of the two modes of perception, or of microscopic and macroscopic processes. That is why the unfolded surface is never the opposite of the fold, but rather the movement that goes from some to the others.' (Deleuze, G., p3)

Deleuzean scholars find correspondence between the folding dynamics of the universe and the life processes of organisms:

> 'The universe itself creates an interior that is not an inside grown autonomously from the outside world but merely a doubling of the outside, expanding and contracting both inwardly and outwardly… this is also the movement of life, in particular organisms, which internalize small aspects of their milieu until they no longer need those aspects of the milieu to survive… which can be described as difference providing the becoming-unnecessary or becoming independence of life.' (Culp, A., 2013).

Parallels can be drawn between Deleuzian folding and prenatal science. Embryonic life is ever-changing, always brewing, forthcoming, inescapable, inevitable, looming, and on the

verge of change. Form arises out of motion. The opposite – form precedes motion – is considered reductionist (van der Wal, J., 2013). The embryo creates its form by enfolding[1] and unfolding. Folding is the embryo's working knowledge of embodiment. It is how humans become. Each phase of growth is characterized by polarities of inward and outward expansion that manifest as folding (enfolding and unfolding) movement patterns (van der Bie, 2011, Solnica-Krezel, L., Sepich, D.S., 2012). This *dance* is both structured and improvised, genetically determined and epigenetically influenced (Talbott, S.L. 2013).

Patterns of enfolding and unfolding (expanding) are common, not only throughout embryonic life, but throughout postnatal life. As Somatic Educator Emilie Conrad notes,

> '… we *are* movement; it is not something that we *do*' (Conrad, E., ed).

These patterns can be functional or gestural, goal-oriented or spontaneous. We enfold and unfold in a myriad of pedestrian actions – getting up, dressing, making breakfast, getting in and out of the car, and so forth. We are largely oblivious to these acts of folding unless they become difficult or painful. Attending to the body *as* it folds is potentially transformative, however. The practice is *somatic* in its intent. By becoming consciously aware of the moving body, it is possible to transcend the habitual oblivion of bodily experience common to everyday life.

From Phenomenology to Embryology

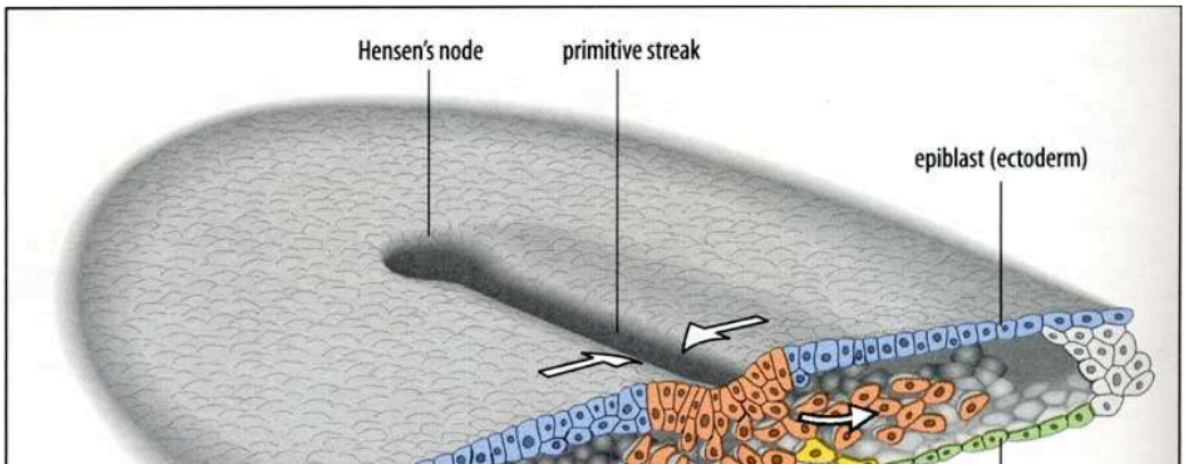
I was struck by the complementarity between Deleuze's writings and my own experiences of somatically-informed movement. I initiated the practice of HO in 2013 as a guided movement

exploration for pre-professional dance students. My intent was to find a practice through which to improve technique and performance. I wanted to design a process that would engage the dancer in exploring his and her own embodiment at a deeper level than ordinarily accessed in training. I believed that honing a deeper sense of bodily ownership and agency through a mindful movement practice would be effective. I began to evolve a guided, improvisational movement practice in bodily folding. In developing this process over time, I began to draw imagery from the ample folding patterns described in *embryogenesis*. As I studied the various phases, I realized that folding was a basic form of biological enactment. Folding manifested in many different ways at different phases of biological growth and development, from ultrastructural protein folding to fractal organization of organ formation.

The folding patterns observed during gastrulation provided me with a wealth of imagery to guide the process of deep embodiment in HO. *Gastrulation* is one example. The induction of the primitive streak and the formation of the axial midline during gastrulation is considered basic to the human body plan (van der Wal, J., 2010, Lu, C.C., Brennan, J., Robertson, E.J., 2001).

The beginning of this phase has been described as a folding pattern that arises out of the streaming of various cellular migrations. To simplify the science, cells begin to migrate from the lateral region of the posterior epiblast towards the center, forming a visible thickening (Hensen's node). The cells from either side of the lateral margins of the germ disc, move

towards the center, meeting each other at the midline. They then fold (*invaginate*) in from a dorsal-to-ventral direction, subsequently differentiating into the germinal layers of the mesoderm and ectoderm (Solnica-Krezel, L., Sepich, D.S., 2012). As the cells continue to fold ventrally, these streams progress in a cephalo-caudal direction.



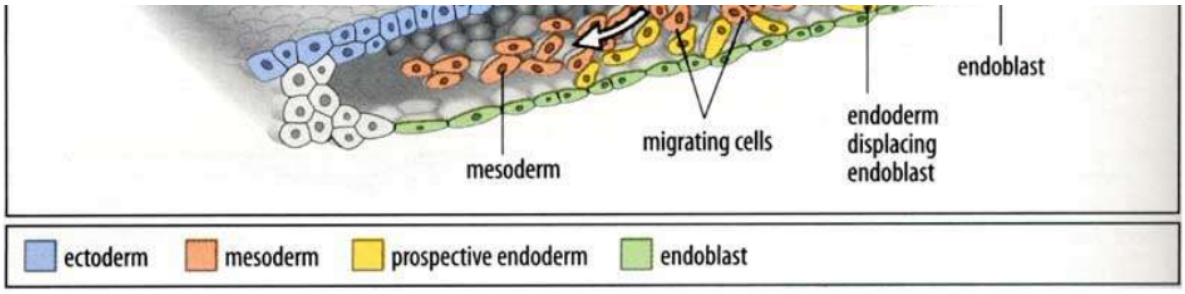


Figure 1: Gastrulation: The Primitive Streak.
Sinauer Associates, with permission.

This coordinated longitudinal *folding* (invagination) has been called *the Polonaise Dance* (Cesari, F., 2007). These '[s]wirling dance-like patterns of cellular motion... As the cells continue this 'pulsatile' dance, (Maître, J.-L., 2015, Maître, J.-L., et al., 2015, p849) from the thickening, the primitive streak lengthens and narrows, giving rise to the anterior-posterior body axis.

Not only are the cells of the embryonic body in motion, but also the extracellular matrix. The extracellular matrix moves in a coordinated fashion with that of the epiblast (Zamir, E.A., Rongish, B.J., Little, C.D., 2008). Thus, the cellular processes do not take place on a 'static scaffold.' Rather, the substrate is active in an attraction-repulsion pattern, cellular activity that is more than simple '*chemo-attraction*.' (Zamir, E.A., Rongish, B.J., Little, C.D., 2008, p 2163). At the same time, the amnion expands in all directions. The embryonic body gradually will separate from the amniotic fluid. The final connection with this freely floating environment of the amnion becomes the evolution of the umbilical cord from the connecting

stalk. The embryonic body folds on itself, forming a cylinder and transforming from an "open body form" into a "closed bodily form." (van der Bie, G., 2011, p29).

> What precipitates the folding of the primitive streak remains unknown. The theory of *induction* has been questioned by Blechschmidt. (Blechschmidt, E., 2004). This fold in the germ disc allegedly can be recognized well before this process begins, pre-existing observable physical movement (Fleury, V., 2012, Lu, C.C., Brennan, J., Robertson, E.J., 2001). By the 17th day, three body dimensions are observable: 'a dorso-ventral direction (epiblast-hypoblast), and, after development of the axial structures, a caudal-cranial direction, and a left and right side.' (van der Bie, G., 2011, p28-31).

Practice Process

I found that all phases of embryonic morphogenesis not only offered a wealth of folding

imagery for the practice, but also allowed for embodied re-entry into one's historicity. Other examples of imagery I brought into the practice of HO include the radial expansion of the amniotic fluid, the folding of the lateral body wall and exploration of movement between the right and left halves (*neurulation*), and subsequent fractal folding in the generation of organs (heart and lungs).

Re-enacting embryonic life is not readily accessible through everyday ways of perceiving, however. Simply imitating the movement patterns of embryo (fetus or infant) does not necessarily lead to accessing prenatal embodiment. First, the teacher needs to create a safe container for exploring embryonic movement. The learning environment should be free of judgment and the muscular effort related to goal-directed achievement (Batson, G., Wilson, M.A., 2014). No movements should be demonstrated to avoid mimicking and copying and to foster the dancer's own autonomous ways of moving.

Second, movement practices often take on aspects of ritual. Here phenomena arise that are outside conventional boundaries of space-time, i.e., non-linear, non-literal and liminal. To facilitate an immersive learning environment, my verbal guidance was sensory-rich. The use of mental imagery can either help or hinder, however. My verbal prompts worked better to evoke a shift in consciousness when the imagery was tactile-kinesthetic, rather than visual. I avoided showing the dancers visual images of embryos, phases, and developing anatomy. **Rather than *seeing* an image of an embryo or imitating preconceptions of embryonic movement, t**he dancers make contact with their inner body, with breath and other movement phenomena arising from contact with the floor or other bodies.

Figure 2 : Ritualistic Folding.
Photo by Susan Sentler. Dancers Bettina Papavasiliou and Clementine Telesfort, with permission.

Third, I wanted a means of inviting movers into their own historical (ontological) journey. One main technique was to help the dancers cut through habitual postural tensions resulting from various forms of sociocultural shaping, training and education (in this case, dance training). For example, dancers frequently refer to their midline, central axis, or center as a site of movement initiation and control. These ideas often are learned in the dance classroom through the use of static, mechanical imagery, such as lines and poles. The result often is increased postural tensions and unnatural and effortful forms of bodily control. I was looking for a means of freeing the dancer from these constraints. Thus, a particular form of attention, reflection and discernment as called for. To do this, I used verbal guidance, touch/contact and body movement to harness their attention to inner body sensations for a sustained period. My verbal prompts drew liberally from tactile-kinesthetic and visual imagery to guide the process. The dancers were guided into an augmented multi-sensory dialogue, quietly attending to internal bodily cues for approximately twenty minutes. These cues included, for example, listening to breathing and heartbeat, but emphasizing the *movement* qualities of these vital signs, rather than the sounds. As well, other internal and external body-to-environmental contact and movement feedback were emphasized. Pacing

of verbal prompts is slow, intermittent, unexpected, giving movers time to reflect in an open (undesignated) space. Here is an optimal place for movers to inhibit the desire to control the movement process. Rather, they can wait for the next movement impulses to shape the destination. In this state of open attention and discovery, the dancers could more easily access primal memory and move with reduced mental and physical effort.

A summary of key dynamics in the process includes:

- **Coming into the field of micro-mobility:** Movers are invited to attune to and listen to all movement sensations with as little movement effort as possible. The inner motility of the body becomes more present when ordinary postural tensions and muscular effort is reduced to a minimum. They are moving in a gravity-minimized environment and being led by imagery that suggests fluid effortlessness.

- **Removing cortical interference:** In this process, the senses lead. The process helps free movers from over-analyzing what their bodies are doing. Time is spent activating the imagination and allow the senses to attune to the inner fluidity of the membranous, embryonic self. Movers are encouraged to explore new territory other than the usual (habitual) ways of moving. They are allowed to discover their own autonomous ways of moving, getting out of their own way by trying to do the *right* thing. The environment offers the freedom to explore without having to perform in any way.

Figure 3: Autonomous Improvisational Folding, *Photo by Susan Sentler, Dancers Bettina Papavasiliou, Christopher Spraggs, Stefania Pinato, Clementine Telesfort, with permission*

- **Augmenting the senses:** Here, the movers are encouraged to attend to the smallest

perturbations in space-time (jostles, pulses, pressures, etc.) that arise solely from subtle shifts (such as the contact of body halves). Repetition with subtle variation in cueing helps to engender trust the mover's own sensations and find new pathways of movement within their bodies.

- **Avoiding musical entrainment:** The exploration is not led by music. The point is to avoid entraining to a pre-existing rhythm, and to allow the mover's own inner rhythms and those of the moving field of participants that also shape the inquiry.

- **Suspending goals:** HO is not goal-directed. Movements neither arrive, nor finish. A movement impulse can give rise to a line of movement without a pre-destined end or goal. The sense of time and space is suspended and movement is meaningful in itself. These are not stretching or conditioning exercises. Movement trajectories can start in one direction, then change directions or simply dissolve and submerge into the inner fluid landscape automatically. If there is a purpose, it is to embody tissue qualities (blood, e.g.). Blood would have its own texture, pathway, shaping, definition, and meaning.

- **Residing in the unknown:** There are many states that arise where a lot is happening, but just what is happening at a micro-level of organization is unknown. Here, the mover can suspend in the moment, pausing, waiting and listening, and inhibiting the brain's desire to set a goal, direct an outcome, or otherwise interfere with internal processes generating their own solutions.

From Deleuze to Bio-Origami

In my investigations, I began to correlate processes common to both somatic education and biological organization. I sourced from mainstream and phenomenological Embryologists, *Somatics*, dance phenomenology and embodied cognitive science. I correlated the following list of concepts that I consider interwoven and inseparable:

- **Coherent Emergence:** Biological morphogenesis challenges description because embryonic growth is an emergent continuum. Its growth is not limited by static stages with pre-determined beginnings and endings. It is always moving, never static, even in moments of poised stillness. The body itself becomes the central vortex of coherent organization, consolidation, and emanation. One might extrapolate from watching infant behavior (i.e., the ways infants *become* themselves), in understanding emergence-y. Developmental Psychoanalyst Daniel Stern notes:

> 'In order for the infant to have any formed sense of self, there must ultimately be some organization that is sensed as a reference point. The first such organization concerns the body: its coherence, its action, its inner feeling states, and the memory of all of these. That is the

> experiential organization with which the sense of a core self is concerned. Immediately prior to that, however, the reference organization for a sense of self is still forming; in other words, it is emerging." (Stern, D., 1985, p45-6).

- **Flow Dynamics:** The embryo itself is a fluid wave form. Developmental biologists have described embryonic movement as a continuous streaming, a flow of visco-elastic material similar to a gel or foam (Zamir, E.A., Rongish, B.J., Little, C.D., 2008). Deleuze concords:

  > 'Matter is infinitely porous, spongy, or cavernous texture without emptiness, caverns endlessly contained in other caverns, no matter how small, each body contains a world pierced with irregular passages, surrounded and penetrated by increasingly vaporous fluid, the totality of the universe resembling a 'pond of matter in which there exist different flows and waves' (Deleuze, G., 1993, p 5).

  In somatic education (Body-Mind Centering® being a hallmark example), flow is integral movement quality to accessing the *mind* of biological life. The type of flow experienced in somatic practices is grounded in the biological body. In somatic movement sessions, attention is brought to the circular and spiraling enfoldment of the fluid body of many systems, including 'blood circulatory flow, venous flow, arterial flow, the lymphatic system, cerebral spinal fluid, synovial fluid, cellular fluid and the semi-viscous fluid of connective tissue.' (Cohen, B.B., 1993, p15)

  Bodily folding patterns often find their moving complement in water imagery. Here, focusing on fluid, wave-like motions facilitates folding in multiple patterns and direction (Conrad, E., 2007). Fluid movement imagery facilitates transformational consciousness of self and environment at both macro- and micro-level of systems biology. Examples include (but are not limited to), the double helix of DNA, the spiraling lamellae of the bony Haversian systems and the spiraling patterns of long bones. (Juhan, D., 1987). As flow patterns arise in the moving body, they take various shapes, twisting, torqueing and streaming, allowing for the surfacing of memories that lie deep within the somatic body. The flow of images, as sensed and moved, allows the mover to enter into a 'pre-conscious watery cellular awareness,' recalling the wet womb or the expansive-contractive flow of cellular breathing... The sensory recall of our more-than-human cosmic flow-forms is a balancing and synthesizing of opposites, meeting the spiral around the other side, at a higher or lower level of circularity and through a shape-shifting as a dark fluid body within a dark fluid environment.' (Williamson, A. *et al*. 2014 p349-350).

- **Eco-Continuity:** Embryonic movement is not an isolated phenomenon unto the body itself (Blechschmidt, E., 2004). Throughout all stages of morphogenesis, the embryo exerts an urge to connect and converse with itself and its environment (van der Wal, 2005, 2010). The embryo needs an environment in which to thrive and grow. The multiplicity of dynamic forces in embryonic growth act in concert the external fluid

matrix (Fleury, V., 2012). This fluid conversation between mother's womb and embryo is both drive and regulator of growth and development (Talbott, S.L. 2013). Not only does the body fold, but so does the fluid matrix of the womb. This dynamic interface manifests in temporal patterns of enfolding both continuous and discontinuous, synchronous and asynchronous. (Maître, J.-L., et al., 2015) Here, one finds conceptual resonance with the anthroposophical/phenomenological perspective in pre-natal science, as well as in fractal biology and other forms of non-linear cellular self-organization.

- **Iteration:** The explosive growth of the human body is a pattern of both inward and outward expansion. Inward expansion particularly is possible through fractal organization. Embryonic folding exhibits dynamical processes of differentiation and integration that renders a form compact, yet amazingly complex. While the first three weeks of biological time is absorbed by the growth of organ systems is iterative. Tissues replicates at smaller and smaller (even infinitesimal) levels of scale. The lungs and the brain, for example, exhibit amazing economy of scale. Your brain does not become the size of a football field! But fractal organization in nature is more than efficient. It ensures comfort and safety (Williams, F., 2017). Iteration allows the embryo to revisit itself over and over again, finding limitless space within its inner habitat and bonding with itself in the process. By folding inwards, the embryo builds a recognizable self and comes to know and trust itself as it is growing.

- **World Incorporation:** Folding envelops, affiliates, and accommodates the world. As the embryo folds, it takes a part of the world into itself, literally and figuratively *in-corporating* it. To 'have' (ownership) is to fold that which is outside, inside (O'Sullivan, S., 2016). And, to act (agency), is to unfold that which is inside, outside. In folding, the embryo takes a part of the world within, invaginating (ingesting), as two of its own body surfaces close in on each other. Deleuze states:

  > 'The outside is not a fixed limit but moving matter animated by peristaltic movements, folds and foldings that altogether make up an inside: they are not something other than the outside, but precisely the inside *of* an outside.' (Deleuze, G. 1988, p 96-97).

  Movement Teacher Irene Dowd illustrates this concept of world incorporation in her eloquent blogpost about the development of the lens of the human eye (Dowd, I., 2012).

- **Individuation (Style):** There is no recipe for a cloud.

  No two snowflakes are alike. Neither are two folds, or two human beings. Fractal folding enables biological self-similarity, yet paradoxically ensures individuality. Folding speaks to the interplay of self- and other recognition. Differentiation and individuation depend on the moment-by-moment changes and contingencies in

communication channels between the embryo (him- and herself) and the mother. Genetics plays a role, as well. If folding goes awry, genetic mutations can result in

Figure 4: There is no recipe for a cloud.
photo public domain.tumblr_ofgbthl8Nw1trfawoo1_1280.jpg.png

serious disease. A number of different dynamics can accompany these folding

serious disease. A number of different dynamics can accompany these folding patterns depending on contextual contingencies as well as the embryo's own personal movement style. The embryo is likened to 'a moving sculpture where oscillations, rhythms and complementary polarizing forces' yield 'startlingly indeterminate fluidity,' a 'standing wave,' rather than a rigid structure (Talbott, S.L., 2013).

At the same time, the embryo exhibits *style*. It is its own organism. The body enfolds and unfolds, streaming and expanding while expressing its own qualities in movement. Again, one can infer embryonic behavior from psychoanalyst Daniel Stern's descriptions of infants, who demonstrate 'shapes, intensities and temporal patterns.(Stern, D., 1985, p 51) [and] 'vitality affects, qualities such as "surging", "fading away", "fleeting", "explosive", "crescendo", "decrescendo", "bursting", "drawn out", and so on.' (Stern, D., p 54). For example, the embryo can fold by first thrusting towards the outside world, eagerly grasping and pulling it into itself (a more *extroverted* style); inversely, the embryo's style can be more receptive and *introverted*, *receiving* the outside world in the enfoldment.

- **Transcendence:** Folding embraces holism. The dynamics of folding, enfolding and unfolding become not only a means of *shaping* a body, but a process through which the material body can transcend itself. The fold is a pathway of relational depth, integrating the intimate and the ultimate (Batson, G., 2014, p 221-238). The embryo enfolds into the deepest intimacies of embryo and its mother, and also unfolds towards the divine. From the Deleuzian perspective, the fold is a manifestation of soul (Deleuze, G., 1993).

  Somatic movement pedagogies speak to this spectrum of transcendence in ways that are not explicitly religious. 'Many 'practices re-enact (pre)birth experience through imagery and movement that includes folding in the movements and symbolism' – folding is seen in religious symbolism of nature and the feminine…

  > 'These pedagogies of "deep immanence", "elemental resonance" and "inspirited anatomy", which engage deep-body cellular listening are the foci of experiential learning… Practices of deep descent into the *prima materia* of body-self… Participation and connection with the life force within (rhythm, sound, motion, vibration work) while also engaging with cosmic and universal energies whose boundaries between inner and outer body themselves are fluid.' (Williamson, A., et al., 2014, p 345-7).

Prelude, not Postlude

The phenomenal qualities of embryonic morphogenesis provide a *lived* perspective of embryonic experience. This perspective has much in common with the body- and movement-centered practices in *Somatics*. This article set out to expand the conversation on embryonic ontology through describing a body-based practice of bodily folding. The aim was to find points of correspondence between embryonic growth expression and somatic movement practice. I have found in this practice that HO is more than a metaphor of human development. It affords inroads into embodied knowledge, knowledge that is practical and meaningful. The process enables access to one's historicity. It speaks to the relevance of one's psychophysical timeline, harkening to a time when perception and action were indivisible. The imagery drawn from gastrulation was adapted imagery and infused with

tactile-kinesthetic richness in order to facilitate the shift in consciousness from that of everyday living to transformative consciousness.

The actual experience of the human embryo remains mysterious and elusive. Thus, the study of pre-natal life demands deeper - as well as trans-disciplinary investigation. Biological Science (as paired with technology), provides an entry into the mysteries of morphogenesis that yield insight beyond its material and mechanical properties and genetic determinants. Phenomenology sheds light on ways in which the embryo and its continued life as a human being, transcends material matter. As phenomenology meets the moving soma, our task to understand the embryo reaches a paradoxical crossroad: at once, the experience becomes within reach and at the same time, the complexity mushrooms. How to understand

> "the thing itself is formless, so much [ours] and yet so mysteriously and sometimes – always in the end – our most redoubtable antagonist, is the most urgent, the most constant and the most variable thing imaginable." (Valéry, P., 1964, p36).

The world awaits this stunning possibility.

Notes

1. Different terms appear in biology that appear to reference similar movement dynamics. I use the general term enfolding to connote deepening into a tissue cleft, cleavage, or fissure during the gastrulation phase. When embryologists refer to the forming and folding of cellular migration in chick - or sea urchin gastrulation, the term ingression is used. For frogs, the term involution, whereas for fruit flies, the term invagination is employed. I bow to the Scientists who understand the subtle nuances between these cellular movements. For a scientific review of gastrulation which refers to these terms see Solnica-Krezel L, Sepich DS. Gastrulation: Making and shaping germ layers. Annu. Rev. Cell Dev. Biol. 2012, 28:687–717.

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