

From milestones to wayfaring: Geographic metaphors and iconography of embodied growth and change in infancy and early childhood

Abstract

This article discusses the curiously geographic metaphors that shape how we understand embodied growth and change in infancy and early childhood and explores possibilities for developing new metaphors, and iconographies, which better represent how young children's bodies grow and change. To do this, it explores the dominant milestones metaphor, and its iconography of milestone charts. It then considers alternative metaphors, which represent the dominant approaches within contemporary developmental movement science: Esther Thelen's physical landscape metaphor, which represents the dynamic systems approach, and botanical metaphors, which represent a Gibsonian ecological approach. The paper, then, suggests that Tim Ingold's notion of wayfaring may provide a simpler metaphor that retains the dominant motif of developmental journey while emphasizing the adaptation, flexibility, difference and diversity that characterize the more complex physical landscape and botanical metaphors. In doing so, the paper seeks to develop a metaphor that can meaningfully capture the geographic character of embodied growth and change.

Keywords: infancy, early childhood, embodiment, physical development, geographic metaphor

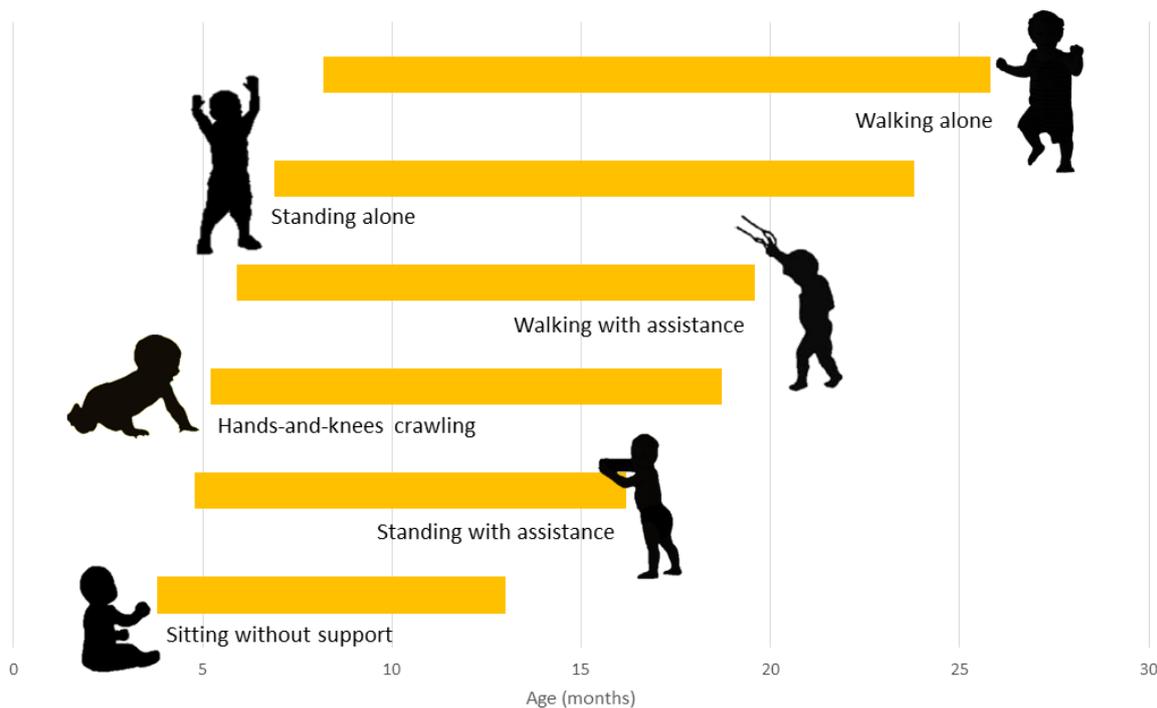


Figure 1: Examples of a milestones chart, which presents 'motor milestone windows of achievement'. The chart is based on data from based on data from the World Health Organisation Child Growth Standards (WHO Multicentre Growth Reference Study Group 2006).

Geographic metaphors of development

Curiously geographical metaphors shape how we understand the rapidly changing nature of young children's bodies and bodily capacities. We think of child development as a journey—

which unfolds in time, rather than space—with an identifiable point of origin (birth, or in some cases conception) and a predefined final destination (adulthood). This developmental Grand Tour follows a more or less set itinerary, in which children take in all the key landmarks along the way as they travel from infancy to adulthood (via variously determined periods of childhood and youth). Children’s progress along their developmental journey is judged according to a sequence of ‘milestone’ skills—sitting, standing, cruising, walking—which enable development to be assessed according to their timekeeping within the universal developmental plan. Figure 1 is an example of a milestones chart, which visualizes the windows for achieving key motor milestones along this developmental journey.

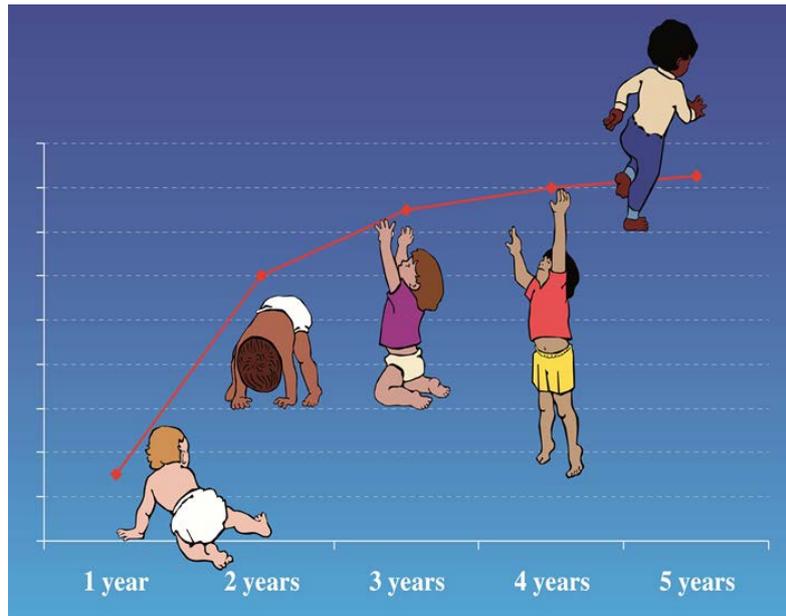


Figure 2: Cover image representing motor developmental progress from the WHO Child Growth Standards (World Health Organisation 2007)

This milestones metaphor distorts our understanding of embodiment in early childhood, but has become naturalised to the extent that we are no longer very good at recognising it as a developmental theory (Burman 2017). Milestones and milestone charts are powerful technologies of normalisation in early childhood, rather than neutral reflections of growth and change in infancy and early childhood (Rose 1999). Professionals in healthcare, social work and early childhood education and care use milestones to assess the children’s development and to label their developmental *progress* in relation to a normative timetable. Figure two, which is the cover image from the World Health Organisation Child Growth Standards report, clearly illustrates the normalizing aspects of milestones charts. It shows young children striving and reaching for the line that represents their expected growth trajectory, and then running along it at age five. Parents are also encouraged to assess their children’s development according to milestones, and will often frame their concerns about their children’s development and overall wellbeing in relation to the extent to which they are ‘meeting their milestones’. In this way the milestones metaphor contributes to a kind of ‘expert blindness’ in both parents and practitioners where they are unable to see the child herself (or himself) because of the distortions within the developmental lens they are encouraged to look through (Ramaekers and Suissa 2012).

Moving away from developmental norms—which apply equally to all children wherever or however they live—foregrounds the geography of young children’s bodily growth and change. Research in developmental movement science suggests that development is always embodied, embedded in particular environments, and inflected with cultural practices (Adolph and Berger 2015). However, the dominant metaphors and iconographies of child development do not reflect this. The child on a milestones chart is abstracted from his or her environment and presented against a blank background. While child development is often couched in geographical metaphor, the milestones metaphor somewhat ironically serves to obscure the geography inherent to processes of child development.

We cannot escape metaphor entirely, but we can carefully consider—and perhaps reconfigure—the metaphors we use to describe and discuss embodied growth and change in infancy and early childhood. Even if we set aside the inherently metaphorical character of language (Noxolo et al., 2008), the notion of development is itself a metaphor, rather than a straightforward reflection of reality. There have been sustained critiques of ‘developmentalism’ within childhood studies and children’s geographies (e.g. Prout and James 2015, Holloway and Valentine 2000, Wyness 2012) but these critiques have had little influence in counteracting the naturalisation and reification of development outside of particular pockets within academia (Tisdall and Punch 2012). Esther Thelen insists that metaphors are invaluable to developmental science because all theories are metaphoric. Indeed, this metaphoric character makes developmental theory accessible: ‘metaphors help us to make the bridge from the theory to the phenomenon’ (Thelen 2005, 259).

This paper examines the metaphorical language and iconography through which we understand the processes of bodily growth and change in infancy and early childhood, and considers how we might develop other metaphors and iconographies to better represent both *how* young children’s bodies and bodily capacities grow and change and to reflect the diversity of developmental paths that young children take. The paper focuses particularly on physical and motor development where the milestones metaphor is particularly dominant, perhaps because milestones charts originated within physical and motor developmental research. Nonetheless, the milestones metaphor, and the arguments made here in relation to it, are not restricted to any one aspect of development, and may be useful in discussing development more generally. I discuss the dominant milestones metaphor and the issues that make its continued dominance problematic, before exploring alternative metaphors that represent the dominant approaches within developmental movement science (see Adolph and Berger 2015): fluvial and geomorphic landscape metaphors that represent a dynamic systems approach to development (see Thelen and Smith 1996) and more botanical metaphors that represent ecological approaches to child development (see Gibson and Pick 2000). The paper draws upon Tim Ingold’s (2011) notion of wayfaring to offer an alternative metaphor that is more closely aligned to the dominant motif of development as journey but which refocuses our attention on adaptation and flexibility, difference and diversity. In this way the paper tries to re-centre the metaphors of bodily growth and change in infancy and early childhood around the *geographies of and within child development*.

The milestones metaphor

The milestones metaphor, and its accompanying iconography, are a legacy of a period in the early twentieth century that is sometimes referred to as the ‘Golden Age’ of physical developmental research. This period produced a corpus of innovative and detailed research

(e.g. Gesell and Thompson 1934, 1938, McGraw 1945, Shirley 1931) that continues to influence how we understand children's embodiment and, indeed, on how we understand childhood at all. Research during this period represented a new scientific interest in children built upon the relatively new idea that their growth and change was a *developmental* process (Rose 1999). Possibly the most influential of the 'Golden Age' researchers[1], Arnold Gesell viewed Darwin as having 'saved' infants from the dubious attentions of philosophy and theology by positioning them as 'proper' objects of scientific interest (Thelen and Adolph 1992). He viewed his own research as an extension of Darwin's project to discover and describe the 'ideological order' in human growth and development (1948, 36).



Figure 3: An infant both within and abstracted from the environment.

Nikolas Rose argues that Gesell's research provides 'an exemplary demonstration' (1999, 146) of the techniques through which the psychological sciences discipline human difference through observation, standardisation and normalisation. The emergence and extension of new institutional forms, particularly the clinic and the nursery school, which gathered young children together and made their behaviour accessible to researchers (Rose 1999), alongside a range of more conventionally technological advances enabled a wide range of methodological innovations that allowed Golden Age researchers to record and evaluate their observations systematically. Gesell's novel 'morphographic methods' and 'analytic cinematography' (Gesell and Thompson 1934, 4) were applied to young children inside his specially designed observation dome at Yale University. Children inside the dome were filmed as they performed a range of standardised tasks. Researchers reviewed the videos and individual photographic stills were isolated and captioned to become illustrations of particular behaviours. This process of captioning was not merely descriptive, but served an analytic function insofar as they produced 'instructed readings' of the out of context images, which could then be compared and rendered intelligible (Livingstone 1995). As such, Gesell's morphographic methods did not simply make child development visible; the techniques his team employed shaped what exactly was made visible and how it could be understood (Rose 1999). Figure 3 shows how an infant isolated from the environment can become an illustration of 'standing with assistance'.

Rose argues that these charts and tables act as 'immutable mobiles' (see Latour 1987), which translate the 'unstable and inconvenient' reality of individual children into stable forms that could be used outside of the clinic or laboratory (Rose 1999, 148). The captioned

photographs could be compared side by side and, in doing so, used to demonstrate and summarise the development of all children through a whole range of tables and charts of 'developmental milestones'. Amber Coons (2014) suggests that milestone charts, like other immutable mobiles, allow us to replace *geography* with *standards*. That is, milestone charts encourage us to ignore the geographically variable factors that influence children's bodily growth and change and, instead, present a standard sequence of developmental norms against which all children's development can be assessed. In this sense, milestone charts do not simply act as mere *references* for child development within a particular population, but as *standards* that children are expected to achieve and against which their development can be judged as accelerated, normal or delayed.

Developmental milestones and norms have become '*prescriptions* of what is desired rather than relatively narrow *descriptions of what may be acquired*' (Karasik et al. 2010, 95, original emphasis). There may be some fudging around the universality of any given set of norms (often expressed as a set of age ranges, or small print advising that individual children may reach developmental milestones at different ages), but the concept of developmental milestones itself remains unquestioned and apparently unquestionable. Milestones charts and the milestones metaphor they represent were, and continue to be, diffused through scientific, professional and popular literatures. A enormous range of parenting and childcare manuals, advice for teachers and early years practitioners and psychology textbooks began to incorporate ideas of 'milestones' and 'landmarks' of development (Hardyment 2007). The enduring influence of the 'golden age' of physical developmental research can be seen in contemporary health monitoring practices, early years curricula, advice for parents and in everyday conversation. One key consequence of the popularisation of the milestones metaphor and its accompanying iconography has been to make it possible for a much wider range of people, indeed potentially anyone, to evaluate a child in developmental terms (Thelen and Adolph 1992, Rose 1999).

Adolph and Robinson describe the iconography and metaphorical language surrounding motor skills development as both 'compelling and dangerous' (2013, 405). The metaphor is compelling insofar as it 'resonate[s] with our hopes for progress', but it has become dangerously reified. Rose argues that the milestones metaphor has become reified to the extent that the standardised and stable sequences of skills and postures presented within milestone charts seem more reliable, and indeed more *real*, than individual children themselves (1999). In this sense, the milestones metaphor is a particularly good example of the naturalisation of developmental knowledges in society (Burman 2017). We do not tend to think of developmental milestones as a developmental theory at all, but as the natural truth of childhood growth and change. For Adolph and Robinson (2013) this is particularly problematic because the milestones metaphor distorts our thinking around how children grow and acquire bodily capacities and skills. Milestone charts simply do not represent what actually happens as children's bodies grow and change.

The value of the milestones metaphor, then, appears to lie in the simplicity of the message and the convenience of its simple iconographic representation rather than because it accurately represents bodily growth and change in infancy and early childhood. Adolph and Robinson (2013) review research in developmental movement science over the last 30 or so years has clearly demonstrated the inadequacy of the milestones metaphor in representing both the character and the shape of developmental change (see also, Adolph

and Berger 2015, Adolph and Robinson 2015). Yet, the metaphor persists and continues to feature in guidance and resources for both practitioners and parents. As they explain:

The milestone chart with its ascending postural forms says in a picture what it has taken us more than 1000 words. It is the most pervasive metaphor for progress in motor development, but *the underlying message is more fable than fact*. (Adolph and Robinson 2013, 412, my emphasis).

The simplicity of the milestones metaphor and its representation in milestones charts is what accounts for its endurance despite decades of research evidence demonstrating its inaccuracy.

Metaphors necessarily simplify the world but, in doing so they make ideas more accessible. For some developmental movement scientists, metaphors may appear to be a 'misguided economy' (Adolph and Robinson 2013, 428) which over-simplify and distort the results of empirical research. However, Thelen explains that metaphors help developmental scientists to attend to 'the big picture' as well as 'the details of content' in their research (2005, 256). Exploring alternative metaphors, then, might make it easier to navigate the complex evidence and theories within developmental science and make them accessible to wider audiences. This is important because, as Thelen reminds us, developmental theory affects how we understand and interpret childhood and, as a result, how we treat children. The next two sections of the article will explore metaphors associated with the two dominant theoretical perspectives within motor development research. First, I will discuss dynamic systems approaches, which understand development as an emergent property of self-organising systems. This approach is most associated with Esther Thelen (1996, 2005) and often invokes metaphors based on the evolution of physical landscapes. Then, I will explore ecological approaches, which understand movement as a perception-action system (Gibson 1988, 2000) and is sometimes associated with more botanical metaphors.

Landscapes and dynamic systems

The milestones metaphor emerged from maturational approaches to development in which bodily growth and change were understood as an unfolding of biological destiny. Gesell's norms were based on a highly unrepresentative sample of young children. Thelen and Adolph explain that the Yale Psycho Clinic drew its participants from its local community. While the research involved more than 500 children (50 children in each age category), the sample was 'a homogenous white, middle-class group of British or German extraction from intact two-parent families' (1992, 372). However, Gesell did not consider this sample to be problematic because of the epistemological framework within which he operated. He viewed children's development to be a natural process of biological maturation. As such, he set out to uncover the universal 'laws' of children's 'natural growth' (Gesell 1948). He sampled multiple children, not because he required a large sample in order to produce generalizable results, but because it would be too onerous (for the child) to study any individual child in sufficient detail. Subsequent research has sought to address this particular methodological failing in Gesell's norms (for example WHO Multicentre Growth Reference Study Group 2006) but the resulting milestones charts retain this maturational logic.

Maturational approaches to children's bodily growth and change offer a *descriptive* rather than an *explanatory* account of child development. Milestones charts identify only a progression of forms, skills and postures and rely on maturation as the explanatory

mechanism. However, Thelen and Smith argue that maturational accounts of development are inherently teleological and tautological: 'what started out as descriptive became explanatory' (1996, 7). Developmental progress is explained only in terms of the 'milestones' within the grand ontogenetic plan outlined in milestones charts. The concept of maturation is mired in a logic of infinite regress in which the supposed single cause of development retreats ever further within the organism; the 'instructions' for the plan continually shift to some supposedly more fundamental or earlier process. Indeed, Thelen and Smith note that this 'causal simplicity' actually detracts from the 'descriptive and theoretical richness' of 'Golden Age' research. Gesell and his contemporaries produced what Thelen and Smith describe as 'a sophisticated theory that acknowledged both the dynamic and nonlinear nature of developmental processes' (1996, 5) but this simply does not come across in the milestones metaphor or the normative milestones charts that constitute their legacy.

By focusing entirely on the destination and the markers of progress along the way, the milestones metaphor fails to recognise the importance of the journey itself, never mind the possibilities for diversions, periods of rest, returns, and redirections along the way. The milestones metaphor and its iconography can only describe the apparent *outcomes* of development; it cannot begin to tackle the *processes* and mechanisms through which development occurs. Indeed, by working backwards from an assumed final form (mature, adult walking) and tracing the milestones along the way to achieving this form, milestones charts present development as the realisation of a grand developmental plan. However, as Thelen and Smith remind us, 'development is not the specification of the outcome—the product—but is the route by which the organism moves from an earlier state to a more mature state' (1996, xvi).

The milestones metaphor, and the milestone charts in which it is deployed, cannot but oversimplify developmental processes; in doing so, they actually make it more difficult to comprehend the complex and dynamic systems from which development emerges (Thelen and Smith, 1996). Milestone charts present the development of bodily skills and capacities as a linear and unidirectional evolutionary sequence. Development is presented as an orderly sequential process through which children acquire a set of important and hierarchically arranged motor skills. Children are generally shown as lying before they can sit, sitting before they stand, and standing before they can walk. Adolph and Robinson (2013) describe this as a 'parade' of skills and postural forms in which *precursors* (those skills or forms that commonly come before others) appear to be *prerequisites* (skills or forms that must be accomplished before a child can progress to the next skill or form). However, there is enormous difficulty in distinguishing starting points and arranging skills into an evolutionary sequence. Adolph and Robinson suggest that, rather than thinking in terms of starting points and precursors/prerequisites, it is more useful to think of skills and form as having developmental histories. In order to learn to walk, a child must draw together and build upon a whole range of other skills, capacities and attributes, each of which has its own (equally complex) developmental history.

Thelen and Smith (1996) explain that the appearance of child development as an orderly, linear and unidirectional process is an artefact of the resolution at which developmental research is carried out. At low resolutions—where sampling takes place at wide intervals—development appears to be 'a linear stage-like progression through a grand sequence of increasingly more functional behaviours, driven towards adult forms by a grand plan (and

scheduled by a grand timekeeper)' (Thelen and Smith 1996, 6). At higher resolutions—where sampling takes place more regularly—the 'grand sweep' of developmental order falls away and the developmental process looks quite different. As Thelen and Smith put it:

As we turn up the magnification on our microscope, we see that our visions of linearity, uniformity, inevitable sequencing, and even irreversibility break down. What looks like a cohesive, orchestrated process from afar takes on the flavour of a more exploratory, opportunistic, syncretic, and function-driven process in its instantiation. (1996, xvi)

Sampling intervals can profoundly alter how researchers perceive the shape of developmental change (Adolph and Robinson 2013). The less frequently children's motor skills development is recorded, the more their developmental trajectories appear to be stage- and step-like. But at higher resolutions the patterns look much more variable. This reflects the simple fact that motor skills do not simply turn on and off in a binary manner; children learn to walk through processes of trial and error in concrete environments and may walk on one day but be unable to do so the next. Similarly, closer sampling intervals can alter how we perceive infants' growth and weight gain. Increasing the resolution indicates that growth occurs in spurts and phases rather than the smooth continuous curves represented on infant growth charts (Adolph et al. 2008). The variability in the developmental data at high resolutions is not simply 'noise' in the data. Instead, sampling at inadequate resolutions distorts and misrepresents young children's physical development (Adolph and Robinson 2011).

Increasing the resolution of research exposes the indeterminacy of developmental processes and encourage us to explore the systems that produce developmental effects. In his work on video game interfaces, James Ash (2015) discusses the resolution of objects within games. He uses the term resolution not simply to refer to how many pixels are displayed on a screen but to refer to how effectively objects become available to players. Within video games, low resolution objects are quite indeterminate and players are not able to control them effectively, while players are more easily able to interact with higher resolution objects. Increasing the resolution of child development creates greater indeterminacy—things no longer look quite so neat and easy to organise. This would be a problem if we were playing videogames, but it is an advantage in understanding embodied growth and change because it prevents developmental scientists from being taken in by the apparent order. Increasing the resolution of developmental research forces researchers to look beyond illusory categories and stages and to explore the complex dynamic and interrelated systems through which produce 'child development' (Thelen and Smith 1996).

Thelen invokes a fluvial landscapes metaphor to explain the dynamic systems approach to young children's development. Specifically, she compares development to a mountain stream, which is always moving as it makes its way through the landscape. Both child development and stream are continuous, but they develop patterns nonetheless. The stream may continue to flow but it is not necessarily consistent in how it flows: 'we can see whirlpools, eddies and waterfalls, places where the water is moving rapidly and places where it is still' (Thelen 2005, 259). The patterns and features of the landscape, whether developmental or fluvial, are not driven by any prior plan; they emerge from the interactions between the flowing water (or child) and the environment through which it passes. The interactions reflect both the immediate conditions and the history of the system as a whole.

Moreover, the stream acts on the environment just as much as the environment acts on it. The landscape or developmental system ‘is so mutually embedded and interdependent’ that it is difficult, and perhaps even ‘not possible to say directly what causes what’. (Thelen 2005, 259).

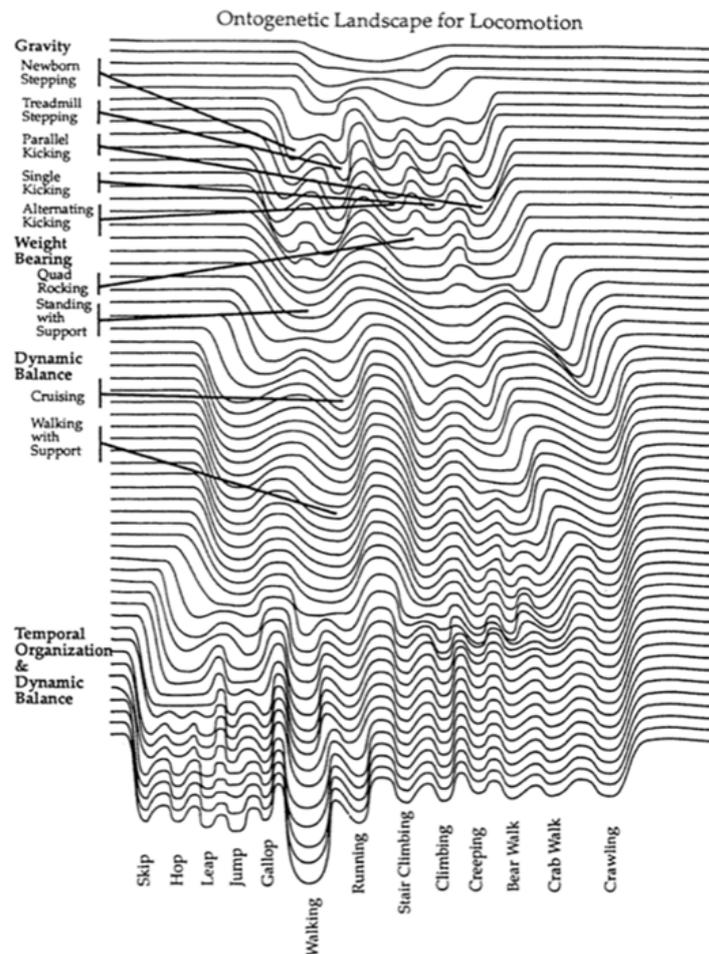


Figure 4: Thelen and Smith’s Ontogenetic Landscape for Locomotion, which shows how developmental processes become both more differentiated and more stable over time (1996, 124).

Thelen has adapted Conrad Waddington’s epigenetic landscape model[2], to visualize what she calls the ‘ontogenetic landscape for locomotion’ (see Figure 4). Developmental time runs vertically in this diagram, from top to bottom. The horizontal lines indicate the probability of an infant demonstrating a particular motor behaviour at any particular point in developmental time. The topography of the ontogenetic landscape—the hills and valleys—illustrate the stability of different behavioural options. Steep and narrow valleys represent relatively stable areas of the system, where an infant has fewer behavioural choices, while wider valleys indicate more variability. Small hillocks within the landscape can indicate multiple possibilities for different ways of moving. The shape of the landscape at any particular point is indicative of ‘the cooperative interaction of every part of the infants’ body and nervous system’ (Thelen 2005, 270). Even minor changes in an infants’ body or the environmental support available can produce developmental cascades that affect the shape of the landscape at any point in developmental time. Thelen and Smith argue that their

dynamic ontogenetic landscape presents development as ‘a series of *changes* of relative stability and instability’ rather than a progression toward ever more stable (and successful) forms of motor behaviour (1996, 122).

Adolph and Robinson (2013) commend Thelen’s landscape metaphor for its focus on the processes of developmental change and the complexity and dynamism of developmental cascades[3], but criticise it for ignoring the active role that children play in shaping their own development. The water within the mountain stream may have an impact upon the environments it passes through, but it does not do so intentionally and its path is channelled by various elements of the landscape through which it travels. It is more or less *transported* through the landscape and any effects it has on the environment are a by-product of its transportation. By contrast, Adolph and Robinson explain that infants and young children are active in exploring and interacting with their environments:

Unlike a ball passively rolling downhill or water coursing through a streambed, children seek out and change features of their environment through active exploration and interactions with caregivers. (Adolph and Robinson 2013, 428)

Instead, they suggest that more botanical metaphors arising from ecological systems approaches to development may offer a more satisfactory alternative to physical landscape metaphors.

Plants and ecologies

Adolph and Robinson (2013) are not advocating a reinvigoration of romantic naturalism in within developmental theory[4]; instead, they suggest that botanical metaphors might help us to appreciate the *ecological* nature of bodily growth and change in infancy and early childhood. Adolph and Berger (2015, see also Adolph 2008) explain that bodily movement (and, indeed, all aspects of child development) can be considered to be *embodied*, *embedded*, and *enculturated*. Movement is embodied insofar as it results from and is limited by the physical properties of the body. The relationship between infants’ physical embodiment and their capacity for movement is reciprocal: performing movements has effects on the physical properties of bodies, just as the physical properties of the body influence the possibilities for movement. This is further complicated by the environment in which movement takes place. Both physical and the socio-cultural aspects of the environment can influence whether young children can move and how they are able to move. This is what Adolph and Berger mean when they claim that movement is embedded (in a physical environment) and enculturated. As in the case of embodiment, the relationships between infants’ movement and the environment are also reciprocal.

Ecological theories of growth and change suggest that motor development does not conform to any simple, universal sequence for all humans because it emerges from the interactions between body and environment. Nonetheless patterns can emerge within cultural groups because important aspects of the shared environment for a particular group can profoundly influence the changing shape, form and capacities of infants’ bodies. Those bodily capacities that do emerge more or less universally—such as, sitting, walking and manual object manipulation—do so because they prove to be useful and adaptive for infants in all human cultures, not because they are driven by a pre-set developmental plan (Karasik et al. 2010). Nonetheless, when and how these common skills and capacities emerge does differ cross-culturally. For example, an infants’ umbilical cord can be expected to drop off

during the first few days after birth. However, Alma Gottlieb (2004, 2017) explains that babies in West African Beng communities tend to lose their umbilical cords more quickly than would be expected in Western infants. The loss of the umbilical cord has particular spiritual significance within Beng culture, so Beng mothers very regularly apply herbal lotions to infants' umbilical cord, which encourage it to dry up and fall off. In Western communities, the umbilical cord is not afforded particular developmental significance and is not generally subject to any particular treatment (beyond keeping it clean and dry).

In abstracting the child from his or her environment, and focusing only on discrete embodied skills, milestones charts fail to recognise the enculturated and embedded nature of embodied growth and change. Child development varies alongside the childrearing goals and practices of particular families and communities (LeVine et al. 1996, Rogoff 2003, Monaghan 2012, LeVine 2014). If we return to the photograph of the child in Figure 3, we see not just an embodied skill ('standing with assistance'), but a young child within a socio-material environment. The objects and materials in the child's bedroom (and, indeed, the fact that he has his own bedroom) are indicative of prevailing cultural norms and values in a particular place at a particular time. The infant is standing on a carpeted floor holding on to the bars of his cot. The wooden bars of the cot and the friction of his feet (in socks) on the carpeted floor help him to stay upright, even if he is not able to move in this upright position. Behind him sits an older child (his brother) who watches him intently and is able to catch him if he falls. The infant looks towards the adult taking the photo (his mother) and smiles. Both mother and brother provide the infant with encouragement and reassurance. In the photograph, standing with support seems less like a discrete skill that resides in the child than a contingent achievement, rather than properties that a child accumulates and stores. In this sense, we might understand skill as 'a practice of *correspondence*' (Ingold 2017, 4, original emphasis) between body and environment.

Ecological approaches seek to explore what infants actually experience as their bodies and bodily capacities grow and change. Within developmental research 'experience' is commonly reduced to quantitative measures of time passing; chronological age is used as a convenient shorthand for 'developmental time' (Adolph and Robinson 2015). The 'onset age' for a behaviour or skill is the term given to the period between a child's birth (which is itself a somewhat arbitrary marker in developmental terms, for all its significance within many societies) and the day on which a child first demonstrates that particular behaviour or skill. The concept of onset age (and, indeed, developmental milestones) assumes that there is a discrete and identifiable moment at which children learn or develop a particular skill or capacity. 'Experience' is routinely operationalised within mainstream developmental research practice 'experience' as nothing more than the quantity of time that has elapsed between the onset age for the relevant behaviour or skills and the date on which a child is tested. Experience is presented as the mere passing of time, and 'time is conceptually empty' within this kind of approach (2013, 424).

However, Adolph and Robinson insist that, 'The actual experiences matter, not just the empty passage of time' (2015, 128). When we attend to children's everyday experiences it becomes clear that motor skills do not simply turn on and off like a switch; infants may be able to walk on one day but unable to the next. Similarly, new motor skills do not come from nowhere; they build upon the developmental histories within a range of different developmental systems and emerge in the course of infants' everyday bodily practices. Over time, infants and young children are able to gain an enormous amount of variable practice in

concrete environment, and with social support (Adolph and Robinson 2015). The content of this experience—what children actually do—matters a great deal. Research from Adolph's Infant Action Lab at New York University suggests that North American infants get a great deal of practice in quantitative terms; over the course of a day, the 16 month olds they studied walked 14,000 steps and fell 100 times (Adolph et al. 2012). However, the ways in which the infants accumulated this walking practice did not resemble how walking is tested in experimental conditions. In most experimental tests, infants are encouraged to walk over a standard distance in a straight line. Left to their own devices, the infants' walking was omnidirectional and meandering. Furthermore the infants did not tend to walk in sustained bouts of steps; more than half of their bouts of walking were of fewer than three steps at any one time (Cole, Robinson and Adolph 2016). In their summary of this research, Adolph and Berger (2015) note the 'curious irony' of generating developmental theories about walking based on the study of practices of walking that are quite different from how infants actually walk.

By focusing on what young children actually do as they move around and interact with an environment, ecological approaches to embodied growth and change in infancy and early childhood redirect our attention from 'abstract, esoteric motor skills to flexible, adaptive behaviours' (Adolph and Robinson 2015, 118). We can understand children's bodily skills and capacities as emerging from a perception-action system in which children learn to perceive and respond to the environment around them. Eleanor Gibson was particularly influential in developing this approach to infant development. Her work builds upon James Gibson's (1979) work on perception and, particularly, his concept of affordances, or the relationships between an organism and its environment that enable action[5]. Gibson and Pick identify three key concepts within their ecological approach to infant development: affordance, information (or 'how the world is specified for perceivers in ambient arrays of energy') and information pickup (which refers to both how the perceiver obtains information and what they actually perceive) (2000, 15). Infants' exploratory behaviour is a key element in the relationship between perception and action. A key argument within ecological models of infant development is that, through multisensory exploratory activity, infants *learn* to perceive and adapt to the affordances in the environment around them; infants are able to make judgements and adapt their comportment and movement in line with their understanding of the constraints and possibilities of their own body and the environment (both physical and social) around them. For Gibson and Pick (2000) developmental change is a process of learning: infants do not simply learn to move, or learn fixed solutions that they can apply to problems they encounter; they learn to perceive and generalise affordances for action. Within the ecological approach, then, infant development is a process of learning to learn (Adolph and Berger 2015).

Ecological approaches present infants as able to respond to problems they encounter in the environment in creative and flexible ways. In fact, Adolph and Robinson (2013) suggest that infants' relative inexperience in many situations may allow them to be particularly open to improvising creative and unconventional solutions to problems they encounter. They discuss experimental research with North American 16 month olds who were tested crossing narrow bridges with wobbly rubber handrails and navigating impossibly steep slopes. The children responded to these situations in a range of different and creative ways. Children explored the wobbly handrail using both visual and haptic strategies in order to determine whether it was safe to cross and how to modify their gait to do so (see also Kretch and Adolph 2017). In crossing the bridge, they employed a range of more or less idiosyncratic

solutions including making use of the wobbliness of the handrail, 'leaning backward as if mountain climbing, hanging on to the rail in a sideways wind-surfing position, leaning over the rail in a hunchback position, as so on' (Adolph and Robinson 2013, 423). Children adopted a similarly diverse and creative range of strategies to navigate steep slopes, including various ways of sliding, crawling and walking down the slope.

Young children's strategies for tackling the problems they encounter as they move around an environment are related to the affordances they perceive, but both their 'effective environment' (Gibson 1988) and their embodiment are subject to change. Ecological approaches to embodied growth and change in infancy, therefore, consider the environment to develop alongside an infant (Adolph and Robinson 2015). Viewed at low resolution, a pattern emerges in which an infants' embodiment first restricts his or her access to the environment. The infants' environment expands alongside the emergence of new skills and bodily capacities. But this developmental journey is not straightforwardly one of gradual improvements in skill and a resulting expansion in an infants' effective environment. New motor skills sometimes prove to be less efficient and effective than previously mastered forms of movement. A particularly good example of this loss of function is the transition between crawling and walking. With sufficient practice, walking does prove to expand an infants' environment, but it is not the case that walking is simpler straightforwardly a more 'advanced' or superior form of movement for infants (Adolph and Tamis-LeMonda 2014, Kretch, Franchak and Adolph 2014).

Rather than thinking of bodily growth and change as the cascading development of fluvial landscapes, Adolph and Robinson suggest that we might think of it more ecologically in relation to the growth of trees. But they are not satisfied with a generic tree metaphor. Instead they identify the banyan tree as '[a] particularly apt image' (2013, 428). Initially, the banyan is an epiphyte—it grows upon a parent tree, but is not parasitic upon it. Over time, the banyan's roots grow down from its branches towards the ground, forming new trunks. As the banyan grows, its roots and branches both diverge and merge. Adolph and Robinson explain that the value of this metaphor lies in the agency attributed to the banyan tree in exploring and responding to its environment and in the difficulty in determining where any particular banyan tree started, or where it ends. As a result, we can observe enormous diversity of form among banyan trees as they change and grow.

Although the banyan is a tree, this metaphor shares many of the qualities that Deleuze and Guattari (1988) value in their rhizome metaphor. Both metaphors emphasise multiplicity and open-endedness. As such, they resist 'any trace of preordained destiny' (Deleuze and Guattari 1988, 13). Neither metaphor is concerned with competence in relation to predetermined skills; rather they encourage us to attend to infants' experience and their actual performance in concrete environments. Finally, they both insist that we attend to the emergence of structure without seeing it as fixed. These botanical metaphors, then, are oriented towards mapping out territories of new possibilities rather than tracing preordained paths. In this sense, we might look towards exploring new iconographies of embodied growth and change in infancy that are based in open-ended and exploratory practices of mapping.

Wayfaring

Physical landscape or botanical metaphors are valuable in that they present more satisfactory and culturally-sensitive images of contemporary research and theory about the growth and change of infants' bodies, but they lack the simplicity and accessibility of the milestones metaphor. In this final section of this paper, I want to suggest that Tim Ingold's (2007, 2011) concept of *wayfaring* might bring together the strengths of the metaphors discussed in the previous section while retaining the simple motif of the developmental journey. Indeed, the concept of wayfaring can help to reconfigure this notion of developmental journey in ways that emphasise change and adaptation while problematising notions of 'progress'. The wayfaring metaphor seems particularly apt for thinking about embodied growth and change because it is centred around movement, and reflects discussions about how young children actually move around (omnidirectionally, in bouts of varying length, and often without an explicit goal) within contemporary developmental research (see, for example Cole et al. 2016).

Ingold explains that we tend to think of journeys in terms of *transport*. Transport is inherently oriented towards a particular destination, and concerned with the timely and efficient arrival of the traveller or cargo at this destination. Indeed, there is little difference between the cargo and the traveller within transport:

'The transported traveller becomes a passenger who does not himself move but is rather *moved* from place to place. the sights, sounds and feeling that accost him during the passage have absolutely no bearing on the motion that carried him forth.' (Ingold 2007, 78, original emphasis)

The milestones metaphor employs a logic of transport (across developmental time, rather than space). The infants' journey starts at birth (or conception of we are including the period of development within its mother's womb), and the infant is transported by the processes of maturation towards adulthood. Along the way, and according to the itinerary, the infant passes a range of important landmarks that have been identified for her [6]. The journey itself is of little consequence in relation to the destination and the milestones that mark her progress along the way.

Ingold offers an alternative concept for understanding movement as wayfaring. Where transport moves people and things along pre-specified tracks and paths, wayfaring is itself 'movement along a way of life' (Ingold 2011, 162). For the wayfarer there is no final destination, 'for wherever he is, and so long as life goes on, there is somewhere further he can go.' (Ingold 2011, 150). Unlike the transported infant (who is abstracted from her environment), the wayfaring infant inhabits a landscape with which she must actively engage (for a discussion of embodied development as inhabitation, see Gallacher 2015). Indeed, Ingold insists that wayfaring is movement and perception. In this way, the wayfaring metaphor presents infant development as driven by exploration. As wayfarers, infants outline their own maps as they learn to perceive and adapt to an environment that develops alongside them.

Within a wayfaring metaphor, particular motor skills are not inevitable markers (or stops) along a pre-planned journey from which deviation is undesirable, and even disastrous; they are emergent achievements of the infant wayfarer as she moves through the (developmental) landscape. In their critique of the milestones metaphor, Adolph and

Robinson insist that the landmark skills that constitute the developmental grand tour are neither universal nor inevitable: 'it is only tradition that reifies particular forms to milestone status' (2013, 412). Milestones, then, are not absolute markers of developmental progress, but common points of transition where wayfarers can rest and reorientate themselves as new possibilities for movement emerge. Child development, then, might be understood as a kind of *anthropogenesis*—a socio-material 'making-in-growing' (Ingold 2015, 122)—in which infant wayfarers inhabit the developmental journey as a whole, rather than only the stopping points. In her research about young children's embodied and embodied and sensory experiences of moving through museum spaces, Abigail Hackett argues that we can use Ingold's concept of wayfaring to explain how children's learning is constituted in movement and framed by their embodied ways of being (Hackett 2015b, see also, Hackett 2012, 2014). The metaphor of wayfaring can also help us to understand how developmental time is produced and changes alongside body and environment, and might enable us to address a range of important questions and issues in the geohumanities more widely (see Holt 2013 for a discussion of infancy within geographical research).

A metaphor of wayfaring allows us to rethink the lines and pathways of embodied growth and change in infancy. Ingold explains that, the straight and unitary line can be understood as 'an icon of modernity' insofar as it appeals to 'reason, certainty, authority, [and] a sense of direction' (2007, 167). The milestones metaphor does not trace an iconically modern line (other than at very low resolutions); instead the methodological processes from which the milestones metaphor and its iconography emerged, employed what Ingold refers to as 'a logic of inversion', which 'converts every track or trail into the equivalent of a dotted line, first by dividing it into stages, and then rolling and packing each stage into the confines of a destination' (2011, 151). In contrast, a wayfaring metaphor encourages us to map 'an ecology of life' (Ingold 2007, 103) in a meshwork of free-roaming lines 'taken for a walk' (here Ingold is following Klee 1961).

A key advantage of the wayfaring metaphor is that it allows for children to take other roads on their developmental journeys, and to follow their own (emergent, rather than in-built) timetable. The singular and unidirectional trajectory presented in the milestones metaphor denies (or at least ignores) the variability and diversity of developmental processes. Adolph and Robinson (2013) explain that the standardised progression from lying to rolling to sitting to crawling to cruising to standing to walking ignores the idiosyncrasies of so many children's developmental pathways, and the myriad ways they find of moving and positioning their bodies. For example, when crawling is presented as a developmental milestone (as it is in Figure 1), it is presented as one very particular manner of crawling: 'on hands and knees, in a rhythmic near-trot (right arm and left leg move together and left arm and right leg move together)' (Adolph and Robinson 2013, 408-9). This is the most common way in which young children crawl. However, the focus on one iconic image of crawling comes at the expense of the many other possibilities for moving around that might be considered more-or-less crawling, which include: 'bear crawling' (hands and feet on the floor), 'bum shuffling' (hands and buttocks on the floor), 'crab crawling' (using one foot or knee to pull the body forward), 'spider crawling' (crawling using hands and feet but starting on the back), 'log rolling' (rolling sideways), and several varieties of different kinds of 'belly crawling'.

A wayfaring metaphor allows us to understand difference as difference, rather the deviance or misadventure. Focusing only on the statistically average child elevates the iconic crawl from common to desirable and, indeed, a requirement of 'healthy' development. Not

crawling at all or not crawling 'correctly' is increasingly treated as a symptom of developmental disorders that practitioners and parents should look out for (for examples of advice for early years practitioners, see Macintyre, 2015; Portwood, 2013). Yet, while it may be common for children who experience motor skills or developmental coordination disorders to crawl in non-iconic ways or not to crawl at all, it is also common for many children whose development can be considered typical. Cross-cultural research indicates that crawling is much more common in some cultures than in others (Karasik et al., 2010). The prevalence of crawling has also varied historically: it is now much more common for American or British children to crawl than it was in the past (Cole et al., 2012). Even the apparently iconic crawling infant may also demonstrate a whole range of other crawling behaviours. Indeed, Adolph and Robinson (2013) explain that young children tend to employ several different skills or strategies at any one time. Contrary to popular wisdom, children do not need to be able to stand before they can walk, and children who can walk will often choose to crawl or cruise instead.

As such, a wayfaring metaphor might better represent the key priorities for effective developmental models outlined by Thelen and Smith. The wayfaring metaphor centres on the variability of infants' growth and change and replaces 'the tyranny of group-by-age comparisons' (Thelen and Smith 1996, 342) with a new respect for the individuality of the wayfarer. It also refocuses our concepts of developmental time by attending to the particular experiences of infant wayfarers as they inhabit an environment. Similarly, by focusing on movement and change, the wayfaring metaphor attempts to represent something of the processes of development. In doing so, it rejects simplicity and dualistic explanations—in particular it allows us to move beyond the nature-culture binary, which Eleanor Gibson has described as a 'hobgoblin' that 'haunts' the developmental sciences [7]. Finally, it encourages us to attend to the active role of the infant wayfarer as she engages with the environment she inhabits. In this sense, a wayfaring metaphor can both more accurately represent contemporary developmental theory and it can encourage adults to adopt a first-person perspective (see Ramaekers and Suissa 2012) as they inhabit the environment alongside the child.

Developing this metaphor of wayfaring can help to create 'cracks and fissures' within the dominant discourses that constitute what Erica Burman (2012) refers to as a 'banal developmentalism' that profoundly influences both how we understand children and childhoods and how we (as adults) engage with and treat children. Burman suggests that we cannot escape developmental thinking, but we can seek to disrupt it by producing alternative accounts and practices. In particular, a wayfaring metaphor reminds us that embodied growth and change occurs throughout life. Infancy is important because it is a particularly active period of bodily growth and change, but wayfaring is a process that occurs throughout the life course. Indeed, Ingold suggests that the lines traced by wayfarers can, and do, extend beyond their own lifecycles in various ways (2007).

Doreen Massey's concept of 'the event of place' refers to a 'throwntogether' here-and-now that emerges from 'a history and geography of thens and theres' (2005, 140), the elements of which will nevertheless be dispersed 'at different times and speeds' (2005, 141). Considering embodied growth and change through a wayfaring metaphor engages with the ongoing throwntogetherness of developmental time in which the ongoing developmental journey is not a pre-packaged tour but 'a uniqueness, and a locus of the generation of new trajectories and new configurations' (Massey 2005, 141). Where the milestones metaphor

creates what Jane Bennett (2001) refers to as a disenchantment tale, a wayfaring metaphor offers an 'alter-tale' that might open us to the surprising nature of ordinary and everyday processes of embodied growth and change. Rather than simply critiquing the dominant metaphor, we can try to adopt an 'affirmative mode of critique' (Woodyer and Geoghegan 2012) by developing new metaphors of bodily growth and change—and all manner of possible iconographies for communicating it—that emphasise the geographies of embodiment rather than simply employing it as a decorative motif.

Notes

[1] Other researchers, particularly Myrtle McGraw (1935), were no less innovative in developing methods for observing and recording young children's behaviour over time, although they may have been less efficient self-publicists (Thelen 2000).

[2] Waddington's epigenetic landscape model attempts to demonstrate the increasing differentiation of the body during embryonic development through processes of what he termed, canalization (see Waddington 1957).

[3] While Adolph and Robinson (2013) praise the focus on developmental cascades, there are issues arising from this concept. Henderson and Denny note that the concept of cascades has been picked up as part of a contemporary 'early intervention' agenda, in which it functions as 'developmental psychology's version of compound interest' (2015, 11). Cascade models have come, to some extent, to preplace stage models of development in public policy for early childhood, while still providing a temporal sequence of events. In this sense they can function to further naturalise developmental norms and prescriptions and to de-politicise debates about development. Indeed, the linking of 'competencies' and 'symptoms' in concepts of developmental cascades (see Masten et al. 2005) can have implications in terms of social justice (Cox et al. 2010) and may encourage views of some children as 'lost causes' (Castañeda 2002).

[4] The romantic discourse of childhood, and the horticultural metaphors of growth it tends to employ have been widely discussed in a range of literatures (see, for example, Lee 2001, Jenks 2005, Taylor 2011, Taylor 2013, Gallacher 2015, Gopnik 2016).

[5] Gibson's concept of affordances has been discussed and employed within the geohumanities in relation to a range of different contexts and situations (for example, Hackett 2015a, Kanngieser 2015, Anderson and Harrison 2016, Gilge 2016, Hunt 2016, Dunn 2017, Pink and Fors 2017).

[6] To counteract Ingold's assumed masculine in his discussion of wayfaring, I will refer to my default infant as 'she' here.

[7] The nature-culture dualism has been extensively discussed within the geohumanities (for example, Lorimer 2008, Whatmore 2013, Kirsch 2014, Longhurst and Johnston 2014, Anderson and Harrison 2016).

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