

Heine's account is true in some cases, but unsupported as a universal claim and thematically distracting from more complex affordances introduced by bodily relationships across the transverse plane and their structural/experiential meanings.

It will be helpful to begin with a case that seems strongly in favour of Heine's position. In his discussion of world numbering systems, his proposed unidirectional principle of upper-to-lower intrafield mapping seems to be clearly manifest. At the time of Heine's publication and during the intervening years, more and more comprehensive studies of the world's languages continue to demonstrate a strong preference or universal tendency for counting systems that are "decimal" (based on 10), "quinary" (based on 5) or "vigesimal" (based on 20 or hybrids of 20 and 10). A recent study by Comrie (2011) based on a sample survey of 196 languages estimates that 84% of the world's languages fall into these categories. Such systems are demonstrably grounded in bodily relationships not simply because most of us have five fingers on each hand, ten fingers total and twenty fingers and toes, but also because the terms for "digits" and units in these systems so often originate in bodily partonymy and meronymy.

Naturally, Heine (1997) zeroes in on the fact that the hands are the default starting place for counting; this provides him with strong evidence that the upper body is conceptually prior to the lower. He then notes that even in the minority of languages that select a vigesimal counting system (actually a full 21% of the languages surveyed in Comrie's 2011 study), speakers rely on their fingers first before moving on to their toes for counting. This, indeed, is unsurprising: fingers are more dextrous than toes and are easier to see. Could this simply be a case of functional marking? For Heine, though, this is a manifest sign that "the lower half tends to be conceptualized in terms of the upper half" since the upper half is "more differentiated and more salient for perceptual and communicative purposes" (1997: 134). In my own reading of the book, Heine's assertion of this principle seems to grow into a kind of unassailable assumption that begins to seem suspiciously top-down itself.

Is it possible that there is more to the story of hand-foot relations (plus many others besides, such as arm-leg relations, face-groin relations, head-buttocks relations, shoulder-hip relations, etc.) than an asymmetrical, unidirectional edict can account for? The mere fact that vigesimal counting systems exist in some 20% of the world's languages is an index of intrafield conceptual relations shared not merely between upper and lower body regions but more importantly between their part-whole (or category vs. member) relationship sets across the waistline. In short, the unidirectional mapping constraint overlooks the existence of shared, experiential paradigm sets that integrate hand-finger relations with their complementary analogues: foot-toe relations. As a consequence it is easy to overlook the significance of their further embedding as four sets of five divided by two. What is being neglected in effect is the whole system. In the Mamvu counting system, by contrast, this sense of an integrated wholeness composed of embedded sets is lexically evident. In Mamvu, a Nilo-Saharan language of central Africa, the term for '10' is derived from "all hands"; the term for '11' is a lexicalization of a clause: "the foot seizes one". The feet go on to seize nine, which results in the numeral '19'. Then the numeral '20' is derived from a phrase meaning 'one whole person' (Heine 1997: 20, Vorbichler 1965: 231–232).

I propose that it is the whole person, along with our potential for integrative modeling and creative embedding that we neglect by settling for a unidirectional top-down account. I also wish to suggest that the account is unsupported as a universal claim. Top-down mapping as a general tendency relevant for certain domains and modes of conceptual relations (especially those that Heine selects for discussion) may indeed be valid; but in many other domains and modes the tendency itself dissolves or becomes irrelevant. As I have noted elsewhere (Pelkey 2017), Heine's restrictive, universal claim is vulnerable from at least six angles of attack:

1. General lexical evidence to the contrary
2. Unified mappings across the transverse plane
3. Paradigmatic intrafield meronymic mappings
4. Parallel categorization of transverse partonymies
5. Ambidirectional and unified intrafield shifts
6. Diagrammatic and functional aspects of transverse markedness

I touch on points related to items 3-6 later in this paper. For a more in-depth discussion, see Pelkey (2016, 2017). For present purposes, items 1 and 2 are adequate for casting further doubt on the validity and adequacy of the unidirectional top-down thesis on bodily paronymy and its conceptual entailments.

Heine himself grapples with problems related to the first point (see esp. Heine 1997: 134–136) in the form of a collection of counterexamples that beset his would-be unidirectional mapping claim. His top-down unidirectionality is first threatened by German *Handschuh* ('hand shoe'), translated 'glove' in English; but he dismisses this as a possible defeater, arguing that protecting the feet is more common than protecting the hands and that gloves are not body parts per se but only coverings for body parts. Next up is Hausa 'knee of arm' (English 'elbow'), which he dismisses by suggesting that the term is merely evidence of a shift from back to front: after all, knees face forward and elbows face backward (1997: 135). Are these accounts sufficient explanations or are they, rather, attempts to explain-away the existence of counterexamples?

Counterexamples continue to emerge that demonstrate the lower-body's potency as an intrafield source domain for upper-body targets. In Phola, a Ngwi language of Southwest China (Pelkey 2011a, 2011b), the term for 'arm' (shoulder to wrist) is a compound construction consisting of three nominals: *lā* 'hand / arm', *γù* 'bone' and *pō* 'thigh' as shown in (1):

- (1) *lāγùpō*
lā +*γù* +*pō*
 hand.arm +bone +thigh
 'arm' (shoulder to wrist)

In this case, the lower-body morpheme cannot be explained away. It is clearly cognate with Proto-Ngwi etymon #121B *(j)-boŋ² 'thigh' (Bradley 1979: 304), making the intrafield mapping direction bottom-up. In other words, Phola 'arm' (wrist-to-shoulder) is conceived of as the 'thigh bone' of its hypernym: *lā*, the 'hand-arm' continuum. Similarly, in the Dene Słiné language, spoken by indigenous Chipewyan descendants of Athabaskan in northwestern Canada, the term for 'fingerprint(s)' is *dene-lá-ké* (Rice 2014: 90), which is glossed 'person-hand-foot' as shown in (2):

- (2) *deneláké*
 dene- lá- ké
 person- hand- foot
 'fingerprints'

Here 'footprint' is understood to be an extension of *ké* foot. The lexicalization integrates multiple levels of metonymic and meronymic mapping, and the lower body is clearly the conceptual source for lexicalizing an upper-body target. In short, the universal, unidirectional mapping thesis does not hold. As mentioned above, there are multiple other angles of attack from which Heine's argument is still more vulnerable. Some can be identified in the Tzeltal reanalysis to follow. Before moving on, though, it should also be noted that Heine's position, for all of its groundbreaking insight, is not simply suspect on its own but also presents an unnecessary distraction, serving to gloss over a more integrative account of upper-body/lower-body relations that would stand to enrich his own "structural template" theory substantially by coming to terms with the lived nature of *transversality*, as I describe in the next section.

6 Upright posture and the anatomical planes

In studies of human physiology, it is axiomatic that three virtual divisions known as the "anatomical planes" organize kinetic experience. These are the "sagittal" (establishing right-left relations), the "transverse" (establishing upper-lower relations) and the "coronal" (establishing front-back relations). Figure 4 illustrates these divisions in terms of their cardinal positions, along with corresponding axes of contrast.

The sagittal plane can be discussed in relation to the “craniocaudal” axis which runs length-wise, or vertically in upright posture; similarly, the transverse plane can be discussed in relation to the “left-right” axis, which runs horizontally (see Kent 2006, Coleman 2008). Such relations are helpful to note, but they should not be conflated. It is important not to confuse planes of experience with dimensional axes since the experiential planes are not simply imaginary divisions that cut through our bodily midlines. More importantly, they establish relationships of contrast between differing modes of perception on either side of an experiential divide. The sagittal plane may run front-to-back along the vertical axis, but it establishes an inverse set of relationships between left and right that are, in turn, often horizontally conceived. The transverse plane, in turn, may be oriented along the horizontal and front-back axes, but it brings into dialogue inverse relations between the upper and lower halves of our bodies that are far more vertically (vs. horizontally) oriented.

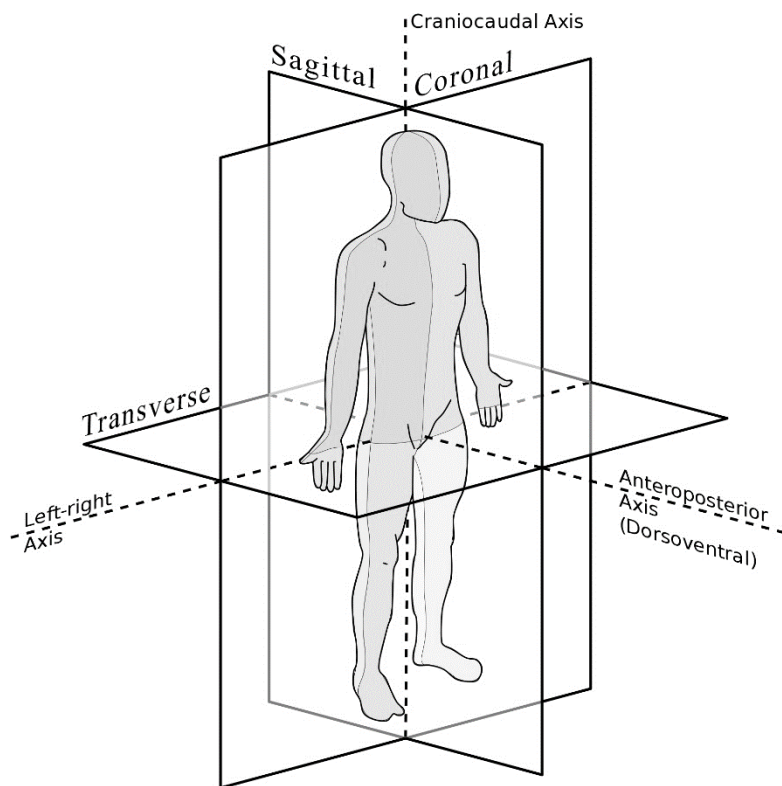


Figure 4. Human upright posture and the anatomical planes (adapted from Edoarado 2017, creative commons attribution license).

Two further aspects of transversality should also be noted for the purposes of this study: 1) its reconfiguration in upright posture relative to the default mammalian posture and 2) the conceptual priority of transverse relations over sagittal relations in pre-modern and traditional societies. We gain insight into these aspects of transversality by attending to the work of anthropologists and historians. In the first instance French anthropologist Henri Van Lier (2003, 2010) draws our attention to the powerful reorganizing effects of habitual upright posture grounded in orthogonal opposition to the perceptual plane of the earth’s surface. This effectively reconfigures the default mammalian back-belly (“dorsal-ventral”) orientation, formerly lived in parallel with the earth, into a new front-back (“anterior-posterior”) orientation, lived in perpendicular opposition to the earth. As a result, the head-tail (“craniocaudal”) axis is no longer organized as front vs. back but, rather, as up vs. down, respectively. Thus, Van Lier refers to human beings not as the “orthogonal primate” but as the “transverse primate” (2003). It is the transverse plane that serves to organize

the new gestalt, including upper-lower relationships, the frontal dominance of the coronal plane and the lateralization of the sagittal. These modes of experiential modeling are shared with others and mapped onto the world. Hence, “while other animals are radiolarian or caudal-rostral, Homo is transverse, and thus frontal-dorsal *stricto sensu*, conferring a front not only to himself but to everything coming in front of him” (Van Lier 2003: 4).² Van Lier argues that transversality serves to introduce new conceptual and analytic possibilities—a point that is important to keep in mind for appreciating the arguments and discoveries discussed in this paper.

In the second instance, two historians Giora Hon and Bernard Goldstein (2008) draw our attention to the curious ascendance of bilateral (left-right) relationships in theory building and model-making over the past two hundred years. In fact, current thinkers who consider the potential influence of the anatomical planes in human conceptual cognition tend to assume that bilaterality is the predominant mode of modeling in play (Washburn and Crowe 1988, Turner 1991, Norrman 1999, Humphrey 2004, Ewins 2004). Such sources discuss patterned replications and transformations of linear, mirrored relations, or their opposition in marked symmetries (also known as “antisymmetry”). But even the conceptualization of bilateral symmetry as a theoretical construct is a relatively recent development in human understanding, not clearly articulated until the work of Adrien-Marie Legendre (1794), building on a century of work by others. Hon and Goldstein (2008) show that bilateral concepts are absent from ancient and medieval understandings of symmetry, which they frame instead as *summetria*. *Summetria* they describe as a conceptual awareness of part-whole proportionality or harmony between categories and their memberships. At the level of bodily grounding, this especially involves upper-lower oppositional contrasts brought into relation via the transverse plane (see Figure 4).

Note that the claim here is not that the sagittally related left-right axis of contrast was absent in human tacit cognition prior to the 18th century. Its experiential presence is indexed by the marked status of the left hand (side) relative to the privileged right hand (side) across cultures (with few exceptions); but the dividing plane itself, and the analytic powers that bilateral transformations afford for analytical thought and model building were neglected, or simply considered to be irrelevant, for human understanding until the late modern era. As a result, bilateral transformations are not only conceptually foreign to ancient civilizations but also to many traditional societies around the world in contemporary times (see Levinson and Brown 1994; Danziger and Pederson 1998; Danziger 2011). It is remarkable, then, that an opposite state of affairs has now emerged, at least among highly literate inquirers with analytic training. This leads to the enforcement and reinforcement of at least two problematic assumptions. The first assumption is that only bilateral relations are legitimate in cultural and body-based modeling (see e.g., Washburn and Crowe 1988, Norrman 1999). I discuss this problem elsewhere (Pelkey 2013a, 2016, 2017). The second is far more relevant for my current argument (as introduced above in critique of Heine 1997): the assumption that only the upper half of the human body has potential for conceptual modeling.

7 Inverse partonym paradigms across the transverse plane

Conceptual modeling is a core function of meronymic mapping, and meronymic mapping across the transverse plane is the core focus of this paper. It is here that the cover term “meronymy” comes into its own. What MacLaury (1989) discusses as “body part locatives” and their “metaphorical extensions” and Levinson (1994) discusses as “body-part terminology and object description”, Bohnemeyer and Tucker (2014) bring together in a unified concept: *meronymy*. This they define as “terms that describe entities as parts of larger entities.” If an exclusively linguistic analysis of meronymy is somehow necessary (or possible), it may be fair to focus on meronyms as “terms”; but this aspect of the definition is rendered superfluous by the more comprehensive nature of meronymy I am drawing attention to in this paper. Here “terms” are incidental or symbolic indexes of something far more fundamental and pre-linguistic: the bodily

² Here the term “caudal-rostral” is a synonym for tail-head or posterior-anterior; and the term “frontal-dorsal” is intended to contrast with “ventral-dorsal” (i.e., underbelly-back), due to the experiential transformation of the hidden ventral underbelly into a front-facing approach to the world as a result of habitual upright posture.

experience of part-whole relationships and their pre-reflective existence in movement, making the approach in this paper more broadly semiotic than narrowly linguistic (see Bundgaard 2010 for further discussion of this distinction).

With this in mind, it should also be noted that part-whole (or category-member) relations are neither focal in MacLaury's account nor in Levinson's account. This may matter little for MacLaury since the Zapotec system involves global analogical mapping. The oversight is more problematic for Levinson, however, since his focus on object description and its incompatibility with bodily experience leads him to claim that no "gestalt of the source object" can possibly exist in Tzeltal (1994: 812). What he neglects to consider is that the shape-vector "algorithm" he identifies as an alternative might itself originate in *embodied meronymic mapping*, or more specifically, part-whole (or category-member) experiential relations above and below the waist and their inverse functional marking across the transverse plane. In other words, the missing gestalt is actually a composite with embedded, interrelated gestalts.

The particular benefit of re-thinking Levinson's analysis in terms of meronymy is the conceptual shift in focus this entails, calling attention to the embedding of part-whole relations or paradigm sets (and their own intrafield interrelations) that are in turn mapped onto object domains of embedded part-whole relations. In languages around the world, we can identify both limb and face meronymies above the waist that share systematic (and oppositional) correspondences with meronymic sets below the waist. Roughly speaking, using English terminology to illustrate, shoulder-arm-hand-wrist-finger relations above the waist map onto hip-thigh-foot-ankle-foot-toe relations below the waist. Additionally, cheek-nose-lip-mouth-head-hair relations above the waist map onto cheek-penile-labial-anal-buttocks-pubes relations below the waist. The mappings are imperfect and partial (especially when compared between languages), and they differ substantially from language to language in terms of category partitions and paronym correspondences; but the general principle remains: intrafield analogies between transverse paronym paradigms can be identified relative to the transverse plane in languages around the world (see Ellen 1977, Pelkey 2016). Such relations are rarely discussed, and comprehensive analyses based on largescale comparative databases are still forthcoming, but such relationships have been noted in the literature for decades (see also Matisoff 1978).

It will suffice for our purposes in this paper to draw attention to the vital role of marked transverse relations in the Tzeltal system that Levinson describes. My argument is that the productive meronymic mapping process Levinson describes as a linear, procedural "algorithm" involving shapes and vectors, can be accounted for more parsimoniously and with better experiential grounding when considered in terms of transverse marked relations in paradigm sets. First it will be helpful to review some of the key features of Levinson's account. Then we will show how they function in inverse relations across the transverse plane with reference to illustrations discussed above in Figures 2 and 3.

As discussed earlier in Section 3, the seven stages Levinson identifies in the Tzeltal meronymic mapping process are primarily concerned with two goals: the correct analysis of "ends" and the correct analysis of "projections". The first is facilitated by paying proper attention to an object's "model axis": its identification, its direction and the proper terms to apply to either of its two ends. The second is facilitated by paying attention to the proportionate length of the projection and to its location relative the two ends of the model axis. A final minor step involves the correct identification of surface features and/or minor protrusions. Notably, two key terms are available in Tzeltal for each of the central procedures; and in both cases—both for the identification of ends and for the identification of projections—the two terms are selected from contrasting embodied meronymic paradigms: one above the waist and one below.

For the correct identification of ends, a transverse relation between *s-jol* 'head' and *y-it* 'buttocks' is required. The correct identification of projections, in turn, draws on a transverse relationship between *y-akan* 'lower leg/foot' and *s-k'ab* 'hand/arm'. These transverse relations are marked in an inverse pattern, such that the head-buttocks set necessary for end-identification is marked below the waist, while the arm-leg set necessary for the identification of projections is marked above the waist. These propositions are illustrated in the Figure 5 schematic.

The transverse bodily relation between head and buttocks is validated in that a structurally unmarked object, i.e. one without any noticeable direction to its axis, should be classified as double-headed: with both ends being referred to as *s-jol* 'head'. Axis directionality is indicated by a trajectory of growth (like a leaf)

or functional tip (like a knife). Once a tip is identified on one end of a model axis, the opposite end is labelled ‘y-it’ ‘buttocks’. Hence *s-jol* ‘head’ is the unmarked identifier for model axis “ends” in Tzeltal, and its intrafield analogue below the waist serves as its marked counterpart—both below the waist in the embodied source domain and at the opposite “end” in a given target domain object (such as the end of a machete handle).

Similarly, but antithetically, with the transverse mapping of arm-leg relationships in Tzeltal: *y-akan* ‘lower leg, foot’ is the default, or unmarked, choice for describing salient object projections.³ Exceptions occur only in cases such that a projection is smaller than 1/5 of the overall length of the model axis, or in cases such that the projection is located toward the unmarked *s-jol* ‘head’ end of an object having ‘y-it’ ‘buttocks’ marking. In such cases, the marked term *s-k’ab* ‘hand/arm’ is used instead. This may seem unsurprising given the tacit influence of the whole set of bodily relations, which determines that the default placement of leg-parts should be closer to buttocks than head (and vice versa for arms), regardless of the markedness status of head and buttocks. Thus, for purposes of body-based model building or *embodied modeling* (discussed further in Sections 8–9), Tzeltal upper limbs are marked as projections and lower limbs are unmarked; head is unmarked as an end point and buttocks are marked. In other words, two sets of upper-lower analogues emerge as salient for productive meronym mapping in Tzeltal, and the two sets share an inverse or “chiasitic” ($A : B :: B' : A'$) relationship with each other such that we find marked buttocks and unmarked legs below the waistline in relationship with unmarked head and marked arms above.

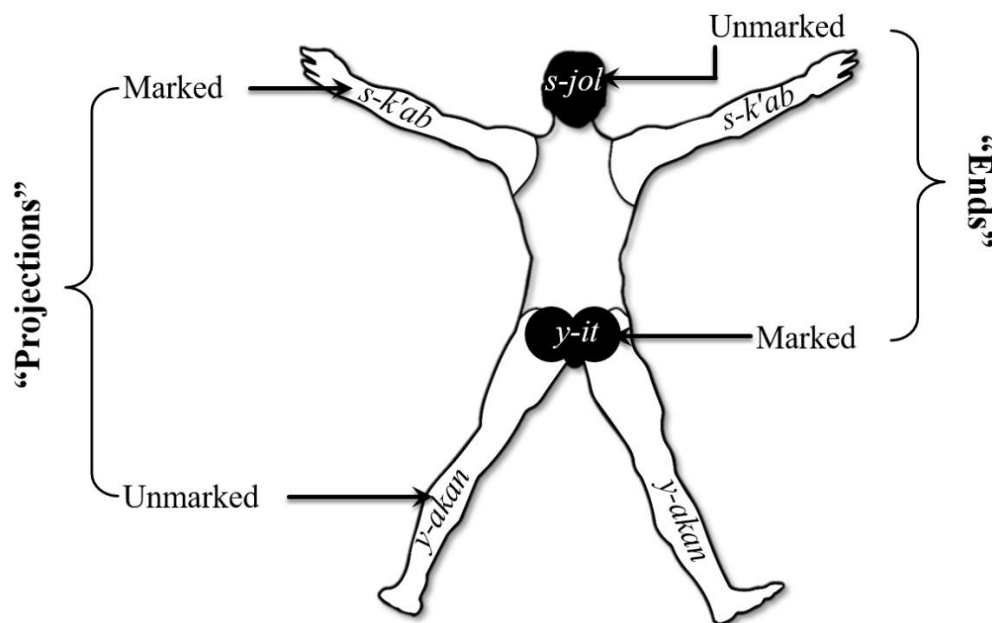


Figure 5. Transverse inversion of body partonym analogues in Tzeltal meronymy

Contrary to Levinson’s claims, then, these relations are actually deeply embodied. More specifically, they are embodied in a way that draws explicit attention to transverse meronymic relations in doubly inverse patterns of structural marking. Tzeltal meronymic mapping draws on the same “structural template” of shared human embodiment in an upright frame as the one which Zapotec speakers access in their own mapping system; but Tzeltal speakers select inverse meronymic paradigms across the transverse plane to

³ Recall, with reference to discussion in Section 3, that this operation coincides with the location and identification of secondary projections and their shapes, an assignment that occurs only once the direction and ends of the model axis have been identified and labelled. Thus, arm-leg mapping in Tzeltal is subordinate to head-buttocks mapping, (which takes priority). In other words, arm-leg mapping is irrelevant to the definition of the model axis.

achieve productive mapping strategies rather than selecting global analogies that would tend to obscure the existence of transverse relations.

Still missing from the account above, however, is the place of *s-ni* ‘nose’ in the analysis since objects with tip ends are described with ends consisting of nose-buttocks oppositions instead of head-buttocks oppositions. Does this break ranks with the parsimonious account provided above, grounded in antithetical relations? Levinson himself asks a related question: “And why use *s-ni* ‘nose’ as the prototype protrusion, and not say *x-chu* ‘breast’? Why ignore all the metaphorical possibilities of shoulders, chins, chests, cheeks, and so on? How would one block the application of such terms under any free metaphorical process?” (1994: 835). The answer to both questions brings us back to the analytic vs. metaphoric distinction. In fact, the metaphorical process mapping transverse relations is not free but constrained. The constraints are organized according to universally available antithetical oppositions arranged in paradigm sets. In this case, the nose happens to be the most conspicuous single protrusion on the head. The head, in turn, is selected as the unmarked end, narrowing the options for protrusions to those located within its meronymic membership.

Next it is important to consider the question of the model axis, the direction of which is determined by the status of its two ends. Levinson argues that “On the object-centered account, there is no reference to rich sets of vocabulary in parallel domains. There is simply a need for whatever terms are required by the particular geometrical distinctions. For each object, we need terms for each end of the model axis, between one and four for the facets related to the orthogonal axis” (Levinson 1994: 835). Here it is helpful to consider the impossibility of establishing the direction of the model axis without reference to transverse relations. The axis of contrast that should be focal is not vertical per se; rather it places vertical relations into positions of opposition. In other words, the transverse bisection (i.e., above and below the waistline) sets up oppositional contrasts between upper and lower head/buttocks paradigms and upper and lower appendage paradigms, along with the feature marking that these naturally entail. Once established, the orientation of the object comes to be inconsequential. In its natural context leaf tip ‘noses’ are pointed downward and the ‘buttocks’ of machete handles in their sheaths are pointed upward, turning the transverse model upside down, but such transformations do not change the bodily mapping of the model axis itself which is established based on upright posture, or a transverse structural “template” of antithetical relations.

8 Inverse paradigm relations as transitional modeling systems

Whether or not Heine’s “structural template” terminology (see Heine 1997: 30, 40, 46, *passim*), or template-based analogies in general, are the best way to discuss these dynamics should now be called into question. Are there more fitting ways to characterize the phenomenon of transverse patterned relations grounded in shared experiential dynamics of upright posture? Is it possible that a “structural template” framing is not only too rigid and abstracted but also prone to generate the kinds of unwarranted biases that lead to the assertion of an exclusively universal top-down mapping constraint in the conceptualization of bodily relations? These questions are salient since their answers will tell us about more than terminological fitness; they also stand to tell us something about the fitness of related dynamics useful for grounding processes of meaning construal in the human lifeworld.

First it is important to consider the fact that neither upright posture nor transverse relations would be in place apart from “the primacy of movement” (Sheets-Johnstone 2011). The organizing force in question is not a structural template but contrastive sets of body memories grounded in first-hand experiences of movement and in developmental layers built on the observations of others whose movements and selective attention we mime and internalize in nested levels of experience (Zlatev 2013, 2016, 2017). With these dynamics in mind, the patterned relationships in question come to seem ill-suited for discussion as a static structural template. Instead, they are far more process-oriented, socially embodied and experientially dynamic, involving proprioception, kinesthesia, imitation and memory as much as positional slots, paradigm sets, markedness and opposition.

Next it is important to consider the distracting fallacy of upper-body ascendance in the evolution of human consciousness. Just as a template is a top-down construct, assumptions of upper-body ascendance are top-down assumptions (not only spatially but logically as well), ignoring or explaining away any

evidence to the contrary. Heine is not alone in assuming the primacy of upper body relations. Biases in favor of the upper half of the human body and its presumed priority and ascendance over the lower continue to hamper theory building on the role and impact of upright posture on the evolution of human semiotic consciousness. In a recent treatment of the role of upright posture in human evolution, for example, Gallagher (2017) tacitly considers the evolution of manual dexterity and upper limb specialization to be the sum of the topic, neglecting along with most others who theorize on this theme the importance of transverse relations and other whole-body dynamics that upright posture also facilitates.

If the term “structural template” is unacceptable for describing the emergence and function of transverse relations, how should the experiential process and gestalt memories underlying the general pattern be framed? I propose that the terms “embodied model” and “embodied modeling”, drawn loosely from Sebeok and Danesi’s (2000), “Modeling Systems Theory” of semiotics provides a helpful alternative. Their project is one among many attempts to integrate insights from cognitive semiotics with insights from biological systems theory (Uexküll 1909, 1928) in an evolutionary, experiential frame grounded in the human Umwelt. An Umwelt, as described by Uexküll (1909), is a species-specific experience of the world, along with its affordances and its evolutionary history—that which both allows and constrains a given organism’s perception and/or action. According to Uexküll, the human Umwelt includes an “Innenwelt”. This Innenwelt allows us not only to model the world (something common to all animal Umwelten) but also to creatively model possible worlds out of layers of learning through embodied experience.

According to Sebeok and Danesi (2000), modeling systems are built up through layers of primary modeling at the Umwelt level through the course of development, with Secondary and Tertiary levels of modeling slowly emerging through time. These latter two levels involve metaphorical mapping and creative analogical blending, respectively, through which the Innenwelt emerges, while still remaining grounded in our species-specific Umwelt. Naturally, modeling possible worlds can only happen via socially embodied learning in specific cultural and physical contexts. This is why modeling systems theory requires further integration with other modes of explanation. Zlatev’s (2013, 2016, 2017, 2018) synthesis of research identifying a semiotic hierarchy inclusive of bodily mimesis and embodied intersubjectivity, serves among other things to unpack the complexities of mimed behaviour that inform development at levels of primary and secondary modeling that go on to inform tertiary modeling, including language, imaginative blending and our capacity for modeling possible worlds.

To better illustrate how these ideas are relevant to the focal topic of this paper, it is helpful to revisit the connection between intrafield meronymic relations across the transverse plane and the semiotic status of paradigms or paradigm sets. A paradigm set can be defined as a distinctively patterned group of relations with further internal relations, all of which are delimited or constrained, often by convention or habit, for purposes of efficient operation. Examples include embedded relationships featured in the pronominal system of a language, relationships of rank and ranking in a branch of the military, or the organizational layout of a home. When paradigm sets are juxtaposed for comparative mapping purposes (comparing one set of complex relations with another), unless the two sets are somehow identical, this necessarily raises the bar on degrees of complexity. This we may find, for example, in the cross-linguistic comparison of pronominal systems, the mapping of rank relations between different branches of the armed forces or the comparison of floor plan layouts between two homes. Where and how do such abilities originate?

Before we are prepared to engage in the complex mapping or analogic modeling of paradigms, we must be experientially grounded in the processes and relations that such paradigms and paradigmatic mappings require. A prime candidate for this level of experience is the double set of inverse marked relations modelled relative to the transverse plane of upright posture. We tend to think of structural paradigms abstractly, from the grammatical, to the logical, to the lexical; but we should expect to be able to identify, at the level of primary modeling, activities and relations that ground these abstractions in proprioceptive, kinesthetic experience. Mapping such relations within a given paradigm (e.g., finger-hand relations or left-hand right-hand relations) implies relatively simple modes of matching and modeling. Mapping such relations between paradigm sets that are both part of the same whole, or micro-set members of the same macro-set, involves more complex modes of matching and modeling (e.g., thinking of feet and toes in terms of hands and fingers and vice versa). This we can refer to as intrafield analogical mapping. Mapping intrafield meronymic sets

onto some body-external target domain (i.e., *interfield* meronymic mapping) is a task even more complex, requiring the introduction of constraints and shortcuts or the establishment of functional defaults. Such modeling activities may actually play a crucial role in the development of human consciousness, and they may well help us better understand various theoretical constructs and their origins. Two such constructs are *markedness theory* and *conceptual blending theory*.

9 Inverse embodied modeling as grammatical-integrational ground

As I have begun to argue elsewhere (Pelkey 2013a, 2016, 2017), conceptual blending theory (Fauconnier and Turner 2002) is in need of primary modeling explanations to better ground the theory-internal evolutionary proposal that “double-scope integration” underlies the emergence of the human language faculty. Simply put, double-scope integration is thinking of two or more sets of things in terms of each other by backgrounding certain features and foregrounding others in order to see them or something else in a new light or to otherwise introduce some new possibility. In short, the activity enables the modeling of possible worlds. As we have seen above, the inverse modeling activities apparent in the emergence of intrafield analogical mapping between meronym paradigm sets relative to the transverse plane provides a strong candidate for this purpose.

To illustrate, consider the German term for ‘glove’ introduced in Section 5. The lexicalization of *Handschuh* (lit., ‘hand shoe’) originally required that the transverse extremities and their coverings should be considered to belong to the same general class without being conflated, allowing for transfer between the distinctive features and attributes of each. At bodily levels and abstracted levels alike, double scope integration is in fact both metaphorical and analytic. It is analytic in that it requires the differentiation of parts and the recognition that integration does not imply identity or conflation; it is metaphorical in that it thrives on the recognition of resemblances or iconicities between integrated domains or paradigm sets (“mental spaces” according to the theory), often in ways that are unpredictable or motivated only in retrospect. In the first case, for example, hands and feet are analogous but distinct. In the second case, protective coverings for feet can be applied to protective hand coverings, only for hand coverings to differentiate individual digits, thus potentially calling into question the status of shoes with undifferentiated digits (see Pelkey 2017: 139–142).

A similar account can be given for meronymic mapping systems since they tend to “tolerate ambiguity and ignore absence of parts ... [accommodating] whatever is feasible rather than to insist on a one-to-one fit” (MacLaury 1989: 127). To the degree that meronym models are more systematic, involving consistent mappings between domains, they are in accord with analytic aspects of conceptual blending. To the degree that meronym systems participate in messy, free association processes, they accord with novel metaphoric aspects of conceptual blending. Both are expected to co-exist and work in tandem in complex processes of conceptual integration. As MacLaury says of Zapotec meronymic mapping, it is “successful because its users accept imperfect fit, not because it fits the world perfectly” (1989: 146).

Levinson characterizes the Zapotec system of meronymic mapping discussed in Section 2 above as a model featuring free metaphorical processes. This may be true at the application level in any given instance; but system-internally the Zapotec model is quite constrained. In fact, the freest term in the Zapotec system is *roʔo* ‘mouth’, which might be mapped to somewhere in the ‘face’ region of an inanimate object model (as in the house diagram in Figure 1), between face and head regions of a model (as in a cargo trunk) or anywhere between the belly and the head of an object model (as in the pot diagram in Figure 1). Otherwise, “the complete design is transferred to any object as an irreducible set” (1989: 124); and even *roʔo* ‘mouth’, is not so free that it can be mapped lower than the ‘belly’ region of an object model. Thus, both the Zapotec system of global analogical mapping and the minimalist Tzeltal system of marked shape-vector analogies rely on both metaphorical and analytical modeling activities alike. Levinson disagrees with this point, as indicated above, arguing that Tzeltal meronymic mapping is “not done by any form of creative analogy, but by a precise geometrical algorithm” (1994: 791). As I have shown above, it seems likely that Levinson simply missed the creative analogy involved due to its analogical depths (in a primary modeling sense) relative to the transverse plane of upright posture that he neglects to consider.

What is more, from a semiotic perspective, creative analogical mapping and analytic vector mapping are continuous (vs. exclusive) modes of thought or modeling since both are species of diagrammatic reasoning. A diagram, in Peircean terms, is an “Icon of intelligible relations” (Peirce 1906) or a system premised on resemblances by which further insight can be gained into phenomena previously presumed to be unrelated. Diagrams can include standard schematics we tend to think of as such (e.g., subway maps, tree hierarchies, Venn diagrams), but diagrams also include more abstract relations like algebraic formulas, psychological gestalts and linguistic constructions at all levels (Stjernfelt 2007, Nöth 2008). What all diagrams have in common, according to Stjernfelt (2007: ix), is the representation of “the internal structure of [iconic] objects in terms of interrelated parts, facilitating reasoning possibilities.” This not only accords well with the body-based mappings that are focal in this paper and with the *modus operandi* of complex conceptual blending in general, it also brings us back to the contrast between vital semiotic diagrams and mere “structural templates”.

Roman Jakobson (1965[1987]) was the first to draw our attention to the important distinction in linguistics between the structural relations of Saussure and the diagrammatic relations of Peirce (see also Nöth 2008: 96). Structural relations tend to be characterized as binary, arbitrary and pre-determined, whereas diagrammatic relations are identified as gradient (on a continuum), iconic (based on perceived resemblances) and open (to processes of change and growth). Diagrammatic relations rely on oppositional relations, plus the identification and reconfiguration of marked and unmarked members involved in these relations (see Nöth 1994, Pelkey 2013b); otherwise, such relations fossilize as mere systems of difference or idealized symmetries. The Tzeltal reanalysis presented above provides a good example of the important role played by marked and unmarked relations relative to the transverse plane in the diagrammatization (or diagrammatic grammaticalization) of productive geometric meronym mapping.

With this in mind, we return to the domain general nature (and ontology) of “markedness”, introduced in Section 5 (see footnote 1) and assumed throughout this paper. In spite of the term’s widespread use in linguistics, and in spite of attempts by some (e.g., Nöth 1994, Heine 1997) to expand the scope of the concept into pre-linguistic domains, the status of markedness is now under fire. Haspelmath (2006) argues that the term’s problematic polysemy, coupled with his assertion that linguistic markedness can be fully accounted for in other factors like “frequency of use, phonetic difficulty, and generalized conversational implicatures” (2006: 27), should lead us to dispense with “markedness” as a concept altogether. Instead, he argues in favor of more basic terms like “abnormality” and “uncommonness” that do not require a separate theory. The case is compelling, but Haspelmath neglects crucial aspects of markedness that distinguish the phenomenon as a more general process irreducible to related dynamics.

A full treatment of the issue is beyond the scope of this paper, but one instructive gateway into the critique would be a more careful consideration of two sources that are curiously absent from Haspelmath’s review of the literature: Shapiro (1983) and Andrews (1990). Relevant arguments in both sources hinge on the role of functional/intentional habit⁴ in the identification and interpretation of marked and unmarked relations. In other words, insofar as markedness is tied to relative frequency of occurrence, it is also tied to that which the relative frequency prepares an individual to interpret. Thus markedness relations go beyond mere (in)frequency and (ab)normality into the realm of the semiotic. Markedness relations are also integrated with each other for such purposes. They are, in other words, “diagrammatic” in the sense discussed above.

With this in mind, as the analysis in this paper illustrates (see Pelkey 2017 for further discussion), linguists like Haspelmath (2006) who call into question the theoretical validity of markedness due to the term’s polysemy, would also do well to consider the possibility that the polysemy of the term might actually be grounded in variations of experience at the level of primary modeling. The anatomical planes and the experiential relations they introduce (as illustrated above) are a potential source of this polysemy. Sagittal markedness at the level of embodied experience has more to do with lateralized opposition, in which the right side is dominant while left is subordinate. This corresponds with structural marking. Transverse markedness, on the other hand is not concerned with dominant/recessive relations. We cannot say (pace

⁴ I.e., the Peircean “interpretant”.

Heine 1997) that the upper body is unmarked and the lower marked. We can only identify the purposes for which one or another set of paradigmatic relations is marked or unmarked above or below the waist. The lower limbs are unmarked for mobility, for instance, while the upper limbs are unmarked for manipulation. This corresponds with functional marking. Further research along these lines may well discover further systematic correspondences between grammatical categories, theoretical constructs and *embodied modeling* relative to the anatomical planes.

10 Conclusion

The synthesis proposed in this paper is less concerned with theoretical consolidation than it is with the identification of lived syntheses that might themselves serve as theoretical grounding—body-based conceptual integration at the level of basic Umwelt modeling afforded by the evolution of upright posture and the untold roles it has played in the emergence of the “semiotic animal” (à la Deely 2010). The integration of partonym paradigms across the transverse plane also serves to blend (accounts in terms of) metaphorical and analytic mapping. The two emerge from and come together in the oppositional paradigms of *embodied meronymic mapping* which can be best accounted for semiotically. From the perspective of sign relations, both analogic mapping and analytic operation are modes of diagrammatization. This account accords with Bohnermeyer and Tucker’s (2014) identification of “general-purpose meronyms that are assigned across arbitrary classes of objects according to the geometry of the parts and the whole.” I have shown, further, that the geometry in question is an Umwelt geometry, projected both visually and experientially according to inverse oppositional patterns that underlie human meaning construal.

These patterns are universally available but will be conceptualized, lexicalized or grammaticalized differently from culture to culture. Thus, the patterns provide further grounds for a prior synthesis within cognitive semiotics, affirming the presence of both universal tendencies and relative cultural productions. The patterns are, nonetheless, organized into paradigm sets (whether deliberate or latent) according to various planes of contrast that bisect the human body image. These contrasts may be experienced sagittally (involving left-right oppositional modeling), or coronally (involving front-back oppositional modeling), but especially transversely (involving upper-lower oppositional modeling). If selected for conceptual organization, these models will be mapped onto objects and areas spatially in ways that are both metaphorical and analytic. Finally, the metaphorical and the analytic are reconciled by focusing attention on marked vs. unmarked values that hold between intra-field (experiential) and inter-field (mapped) meronymic relations.

Acknowledgements

This research project was initially made possible thanks to travel funding from the Faculty of Arts, Ryerson University, enabling me to participate in a seminar entitled “Meronymy across Languages: Lexicalization, Semantics, Morphosyntax”, hosted by the *Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México*, Mexico City, Mexico, 27–28 September 2013, under the direction of Jürgen Bohnermeyer (SUNY Buffalo). My appreciation goes to Jürgen and to other members of the seminar for opening up this line of inquiry to me and for offering helpful ideas on the first draft. Later development of this research relied in part on a grant from the Social Sciences and Humanities Research Council of Canada (SSHRC-IDG #430-2015-01226), entitled “Steps to a Grammar of Embodied Symmetry”, for which I am also grateful. Final appreciation goes to two peer reviewers and to two of the editors of this special issue, Jordan Zlatev and Sune Vork Steffensen, for many key insights and corrections on the submission draft.

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