報　告

Linguistic Anthropological Research on Spatial Cognition in European and Non-European Settings*

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要　旨

認知（認識）人類学における近年の発展の一端として，言語と空間認知のインターフェイスに関わる研究に焦点を当て，その推進者の一人，Stephen Levinson の提唱する空間指示枠（Frames of Reference）の分類と，日常生活における空間指示の可塑性を検証する。本論考では，Levinson の確立した 3 種類の空間指示枠（固有的 ‘intrinsic’／相対的 ‘relative’／絶対的 ‘absolute’ 指示枠）の特性を概観し，おのおのの指示様式を代表する言語を類型的に分類する。また，認識の中心とされる人間主体の（egocentric）空間認知様式は，各言語の文化的実践に照らして，従来当然視されてきたほどの普遍性が認められない点を指摘し，人間主体ではない（allocentric）慣例化した空間認知様式が思考に及ぼす影響を考察する。最後に，このような知見に基づく談話研究の現状に触れ，今後の談話分析の方向性を示唆する。

Keywords: cognitive anthropology, spatial cognition, intrinsic/relative/absolute frames of reference

キーワード：認知（認識）人類学，空間認知，固有的／相対的／絶対的指示枠

1. Introduction

This review paper is heavily motivated by a series of recent findings from cross-linguistic studies on spatial cognition in cognitive anthropology, and aims to confirm that human spatial cognition may not be so equally monolithic across cultures as has been generally assumed. This is also a partial report of LSA (Linguistic Society of America) Linguistic Institute 2001 at The University of California, Santa Barbara, where a class dealing with this issue was first officially taught by Stephen Levinson, Director of Language and Cognition Group at Max Planck Institute for Psycholinguistics. After a brief overview of the current investigation into space in cognitive anthropology, I will summarize and comment on the following points: 1) Levinson's notions of 'Frames of Reference' (hereafter FoR) and 'Untranslatability grid,' and 2) primacy of egocentricity and gravity in the Western concepts of space, and disclaimers against such a position. Finally, I will advocate a discourse-oriented approach to spatial cognition as one of the future paths toward the linguistic study of space.

1.1 Overview: Current Investigation of Space in Linguistic Anthropology

Concepts of space and researchers' focuses of attention differ according to disciplines. Traditionally, anthropological research on space has mainly been concerned with kinesics, place names, symbolic use of space such as sacred/polluted places, social organization, dwelling/migration patterns, *habitus* (a system of dispositions), etc. (see Lawrence & Low 1990 for an extensive review). Especially in linguistic and cognitive anthropology, current interests in space are largely devoted to the studies of language-thought interface in spatial cognition (e.g., Brown & Levinson 1994; Levinson & Brown 1994; Levinson 1996b, 1996b; Pederson 1995) and spatial mapping in speech and narratives (e.g., Hanks 1990; Haviland 1993, 1996; Farnell 1995; Bickel 1997).

Findings from these lines of research generally suggest that egocentricity of perspective-taking based on the human body may have been unduly emphasized in constructing a framework of spatial cognition. Such an egocentric space may be a default condition in representing spatial relations in everyday referential practice, but there are also many cultures that defy such an egocentric framework and employ indigenous, allocentric spatial anchors for the equivalent practice. In this sense, previous models of anthropological space may have been heavily skewed toward the Western concepts of space, and thus can be merely cultural constructs.

There also remains a long-standing question about the extent to which language and cognition can be separated or integrated; a recurrent discussion that has been taken up by such scholars as Humboldt, Weisgerber, Sapir, and Whorf—a thesis widely known as 'Sapir-Whorf Hypothesis' (see Hill & Mannheim 1991). Currently, some linguistic anthropologists uphold a neo-Whorfian view (e.g., Lucy 1992) that linguistic influence over cognition will be attested by confirming that, if semantic categories A, B, C. . . are shown to induce distinctly different responses A', B', C'. . . , linguistic representations reflect culturally and linguistically preferred modes of cognition and interactive patterns. If this condition is met, we can assume that languages select and arrange repertoires of particular cognitive styles made available by habitual linguistic use (see also Slobin 1987, 1996; Gumperz & Levinson 1996; Levinson 1996a, 1996b; Choi & Bowerman 1991; Inoue 1998; Pederson et al. 1998; Bowerman & Levinson 2000). In other words, a central theme there is that "linguistic patterns point to some systematic differences in the cognitive style with which individuals of different cultures deal with space, and it is these underlying cognitive specializations that may help us to integrate diverse spatial features within a culture. . . (Levinson 1996a: 356; also Levinson 1996b)."

In short, major topics of the spatial research in current linguistic/cognitive anthropology are: a) the degree to which the kind of linguistically encoded space correlates with non-linguistic features of thinking, b) relative demotion of egocentricity and corresponding emphasis of locally and culturally available frames of reference as human potentials for spatial cognition, c) neo-Whorfian findings that culture (or language) may influence cognitive capacity for language processing and the modes for encoding communicative intentions; and implicitly, d) relative demotion of verbal competence in representing spatial knowledge, and complementarily, recognition of other 'modalities' of mind which contribute to spatial cognition. The final point is not yet loudly articulated, but considering the current resurgence of the studies on gesture and sign language (McNeill 1992, 2000; Armstrong, Stokoe, & Wilcox 1995) and re-evaluation of 'Molyneux's Question' (Morgan 1977; Eilan 1993; Levinson 1996b)[1], there is no reason not to assume its emergence as a central issue of spatial cognition in linguistic anthropology.

In order to fully investigate these issues, we need a cross-linguistically valid framework, or a spatial 'etic' grid, for decoding spatial perspectives. Below I will delineate some basic concepts about a currently widely acknowledged model proposed by Levinson (1996a, 1996b), and point out a branch of research that utilizes the framework.

2. Frames of Reference and Untranslatability Grid

2.1 Non-coordinate vs. Coordinate

One way of conceptualizing the spatial world we live in is to view it as constitutive of two types of space: the world metrically perceived and the world topologically perceived, with degrees of integration between the two. The former is characteristic of spatial relations in terms of disengaged/objective modes of representation, such that actual physical volume, distance, and orientations in a spatially fixed grid are numerically computed, while the latter, in terms of engaged/egocentric ways of representing spatial properties, often measured by psychological and social factors. In other words, they are respectively the worlds based on objective, allocentric modes of representation and on subjective, egocentric ones.

Of particular concern in this paper are these two modes of spatial construction, roughly conceptualized as the 'coordinate' system and the 'non-coordinate' or 'deictic' system. Although, in fact, the research on the 'deictic' system has attracted a lot of attention from linguists and anthropologists, I will particularly look at the former 'coordinate' systems, and delineate the current conceptualizations of spatial description of static objects on the horizontal and vertical planes. (See Kataoka [1998, in preparation], for a more detailed account of 'deictic' systems.)

In order to clarify the spatial relationship between objects by using the coordinate system, one conceptually ascribes to them such roles as *figure* (Fg) and *ground* (Gr) (Talmy 1978, 1983). These terms were originally coined by Gestalt Psychology to represent a perceptually salient entity (Fg) vis-à-vis the background entity which makes the figure emerge the way it is (Gr), as typically seen in the figure-ground conversion of the famous 'face or base' picture. This relation is conceptually equated with that between *trajector* (Tr) and *landmark* (Lm) in cognitive linguistics (Langacker 1987), or more generally, *referent* (Rf) and *relatum* (Rl) or *reference object* in philosophy and psychology. The definitions across these disciplines may be slightly different, but I will take these sets of pairs as conceptual equivalents for the current purpose, and use these sets of terms interchangeably throughout this paper.

2.2 Three Types of Frame of Reference in the Coordinate System

Here I will illustrate a functional typology of space proposed by Levinson (1996a), which classifies whole *static* spatial arrays in the following way.[2] This system is currently gaining a lot of attention from linguists and psychologists, and is becoming one of the standard systems in spatial description. (Note that this is the typological grid for 'linguistic,' not perceptual, encoding of space.)

(1) No coordinate systems employed (not discussed here):
- a. *prototype deixis*: e.g., Figure (Fg) is 'here' near speaker.
  "The apple is here."
- b. *contiguity*: 'topological' relations: e.g., Fg is 'on' Gr.
  "The apple is on the table."
- c. *named locations*
  "Jerry went to Woodstock."

(2) Coordinate systems or 'frames of reference' (FoRs) employed:
- a. *Horizontal*
  - (i) Intrinsic
    "The cat is behind the truck." (one meaning: see Figure 1. i) intrinsic)
    The cat (Fg) is at the place contiguous with the intrinsic rear part of the truck (Gr): the coordinate system based on the 'truck'
  - (ii) Relative (or deictic)
    "The cat is behind the truck." (another meaning: Figure 1. ii) relative)
    The cat (Fg) is on the occluded side of the truck (Gr) from the standpoint of the speaker: the coordinate system based on the 'speaker'
  - (iii) Absolute[3] (Figure 1. iii) absolute)
    "Canada is to the north of the U.S."/ "The cat is to the north of the truck."
    Based on cardinal directions or conventional absolute directions.
- b. *Vertical*
  Assumption: the same notions for 'horizontal' apply.

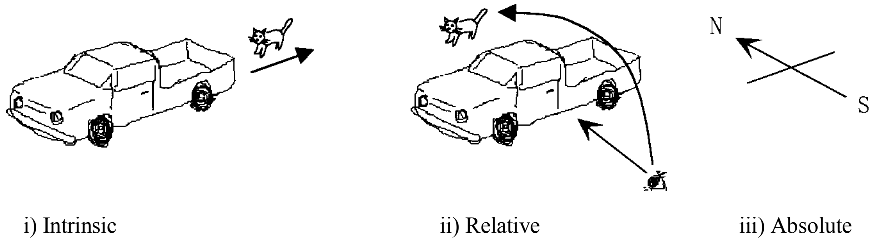


Figure 1. Three types of frame of reference: *The cat is (behind/to the north of) the truck*

Here the ‘non-coordinate’ system (1) refers to a system where no angular specification is provided for the objects related in the spatial array. For example, in describing an object in ‘deictic’ terms, *here* in “The apple is *here* (1. a)” does not include any angular specification from the speakers, nor does “The apple is *on* the table (1. b),” which is described with a ‘topological’ term, *on*. These are thus instantiations of a non-coordinate system. A third type of a non-coordinate system is ‘named locations’ (1. c), or place names, which serves as a context-independent means to identify a particular location by referring to a geographically defined space. Although it seems to be a simple referential practice, this is not so ideologically unproblematic: see Basso (1990) and Feld & Basso (1996) on place names, which are ethically, and sometimes morally evaluated. We don’t deal with these non-coordinate systems here.

In contrast, the ‘coordinate’ system (2) roughly represents a configuration where some kind of *angular* specification is given, and is comprised of three types of frames of reference: *intrinsic*, *relative*, and *absolute*. For example, if one says, “The cat is to the (left/right, front/back) of the truck,” *the cat* is located in a particular space such that it creates a certain angular configuration to the ground object, *the truck*, from which the position of the cat is talked about. To borrow Levinson’s words, you choose “a ground or landmark object in close contiguity with the object to be located” (Levinson 1996a). Now let us discuss each type of coordinate system in more detail (Figure 1).

First, the sentence “The cat is behind the truck (2a (i, ii))” is ambiguous. The ambiguity comes from different frames of reference applied to the spatial array. The *intrinsic* relation (2a (i)) is ‘binary,’ or relating two objects/entities in the immediate context (*cat* and *truck*), but the relative relation (2a (ii)) is ‘ternary’ because the three entities are related (*cat*, *truck*, and *Speaker*). Thus, the relative FoR involves the speaker’s viewpoint distinct from a ground object.

In addition to this ambiguity derived from the choices of FoRs, there is another source of complication according to the distinctions among *intrinsic* (coordinate), *relative* (coordinate), and *deictic* (non-coordinate) perspectives. Notice that, when the Ground or Landmark coincides with the speaker, the ordinary configuration of the context may also be represented in deictic terms. Thus, for the *intrinsic* context in 2a (i): “The cat is behind the truck (intrinsic, binary between *cat* and *truck*),” we could also say “The cat is to the right of the truck (relative, ternary among *cat*, *truck* and *speaker*).” Besides, the speaker could walk up to the truck, climb in, and say, “The cat is behind me/I see the cat behind me (deictic, binary between *cat* and *speaker*).” In the last case, the spatial grid of an intrinsic FoR and a deictic perspective are merged into one, allowing the two different systems to refer to the same figure object, *the cat*.[4] This fact indicates that these two systems are highly fluid, and may possibly overlap in everyday referential practices.

In the Absolute system, referring practice is more simple, because this FoR only requires as the anchor the absolute directions such as NSEW, ‘where the sun rises/sets,’ ‘uphill/downhill,’ ‘upstream/downstream,’ etc., usually based on fixed and stable geographic features. The relation is always binary between these absolute orientations and the referent. Thus, for the relative situation in Figure 1 ii), an English speaker could also describe the cat’s position by saying “The cat is to the north of the truck,” although such an expression is highly marked and requires a special context.

Other researchers in various disciplines have defined these notions using different terms as shown below (Table 1). To avoid confusion, I will use Levinson’s static spatial grid and his terminology as the point of departure.

Table 1. Concepts of spatial perspectives (based on Levinson 1996b, 2001 class notes)

Levinson’s FoRs	Intrinsic	Absolute	Relative
Psycholinguistics	object-centered	environment-centered	viewer-centered
Linguistics	intrinsic		deictic
Vision theory, imagery debate	3D models		2.5D sketch
Cognitive psychology	allocentric		egocentric
Visual perception	orientation-free	orientation-bound	

Levinson’s static spatial grid may also be a source for another type of grid: dynamic—probably we may conceptualize this as a series of configurations projected from various emergent vantage points. However, an analysis of such changing perspectives is beyond the scope of this current review, and is discussed elsewhere (Kataoka 2001, in preparation).

2.3 Untranslatability Grid

In constructing the ‘untranslatability’ grid, Levinson (1996b) aimed to answer what is called ‘Molyneux’s question’ (see also Morgan 1977; Eilan 1993), and paraphrased it as comprising two specific issues: 1) do the different representational systems natively and necessarily employ certain FoRs?; 2) if so, can representations in one FoR be translated (converted) into another FoR? Confirming that FoRs cannot freely be converted into one another, Levinson claims that all mental 'modalities' must utilize different FoRs available according to languages; but those particular FoRs can be adapted to other modalities within the limited sets of translatable FoRs, suggesting a 'yes' answer to Molyneux's question.

In order to determine the nature of untranslatability, Levinson (1996b) examined linguistic spatial relations between two physical objects, BOTTLE and CHAIR, in the three types of FoRs; *absolute*, *relative*, and *intrinsic*. His basic strategy was to map the possibilities of FoRs in the prescribed spatial configuration, where a bottle is placed in the chair's front region. Figure 2 summarizes these (un)translatable relationships between FoRs. For example, if the spatial relation which holds between the bottle and the chair in the relative FoR is true (i.e., 'bottle to right of chair'), it will also entail, or 'translate into,' the intrinsic FoR (i.e., 'bottle in front of chair'). However, even if the relation that holds between the objects in the intrinsic FoR is true, it will not translate into the relation in the relative FoR.

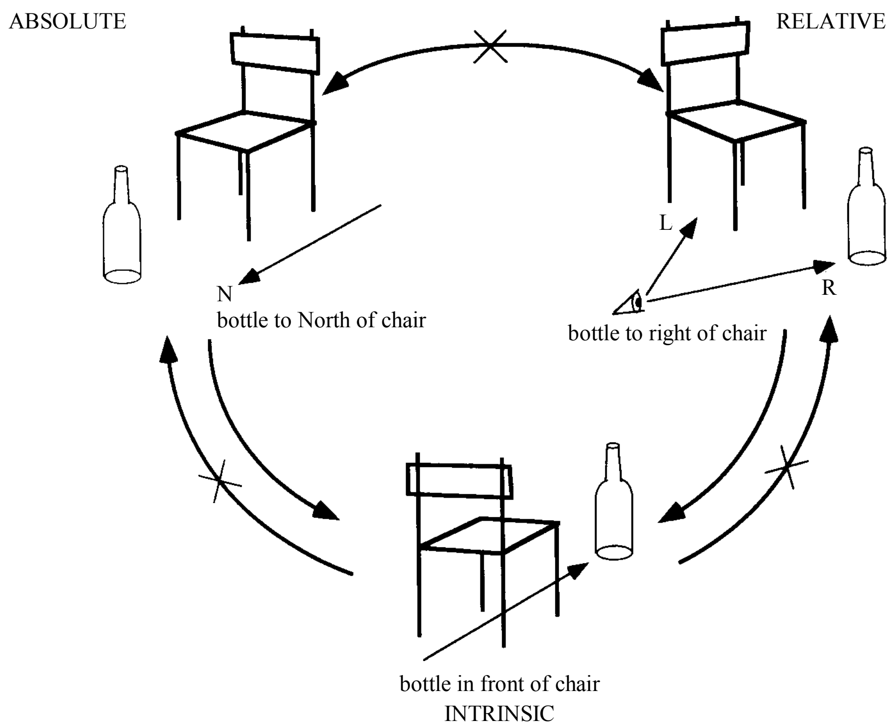


Figure 2. Untranslatability across FoRs (on the horizontal dimension)

To recapitulate the basic features of FoRs, the sentence "The bottle is in front of the chair (meaning 'in the chair's front')" represents a 'binary' and 'intrinsic' relation because it is the relationship between Figure/referent (bottle) and Ground/relatum (chair). On the other hand, "The bottle is to the right of the chair (seen from where I am)" represents a 'ternary' and 'relative' relation because 'the bottle' is spatially related to 'the chair' through the speaker's or viewer's point of view.

These relations represent interesting properties in the possibilities for 'rotation.' When the whole array (chair + bottle) is rotated, only the intrinsic system allows/maintains the original acceptability. When the viewer is rotated, intrinsic and absolute FoRs retain it, and when the ground (chair) is rotated, absolute and relative FoRs retain it, exhibiting the following rotation possibilities (Table 2: see Levinson 1996b for more detail).

Table 2. Spatial relations and rotation possibilities

		Intrinsic	**Absolute**	**Relative**
RELATION	relation:	Binary	Binary	Ternary
	origin on:	Ground	Ground	Viewer
ROTATION	whole array:	Yes	No	No
	viewer:	Yes	Yes	No
	ground:	No	Yes	Yes

These relations also lead to highly heuristic consequences in the cultural variability seen for the preferred uses of FoRs. Levinson (2000, class notes 2001) mentions that, even if speakers can theoretically use the three FoRs, not all languages use all FoRs to the same extent as the ordinary means of spatial description. Yucatec (Mayan) speakers use all three, but English and Japanese speakers usually rely on intrinsic and relative FoRs, while Tzeltal (Mayan) and Hai||om (Khoisan) speakers, on intrinsic and absolute FoRs. Amazingly, there are speakers who exclusively employ only one FoR, such as Mopan Mayan (intrinsic) and Guugu Yimithirr (absolute). However, as may be expected from the untranslatability grid, there seems to be a constraint that no (or possibly very few) languages exclusively use only Absolute and Relative FoRs. These facts tell us that preferred uses of FoRs are skewed toward either a Relative-Intrinsic or Absolute-Intrinsic combination, and one or all of them, with the Absolute-Relative combination rarely observed as a viable pair (see Figure 2). Given these findings, there is tremendous diversity in the availability of FoRs across languages, and universals in spatial cognition seem to exist only as constraints.

Also, we generally assume that the same three coordinate systems may be applied to the objects on the vertical plane. The (over-)determination of verticality in spatial description is a common basis for understanding spatial relations. For example, Levinson (1996b: 135) says, "… (T)he perceptual cues for the vertical may not always coincide, but they overwhelmingly converge, giving us a good universal solution to one axis." The same line of conceptualization of verticality dominates in linguistics. Lyons (1977: 690) also maintains that verticality is "physically and psychologically the most salient of the spatial dimensions: linguistically,… it is the primary dimension" (see also Langacker 1987: 263–7, 1991: 77 and Dirven & Taylor 1988 for 'verticality' per se). Given this framework, we may be able to identify similar constraints placed on the everyday use of space on the vertical dimension.

However, we may need to reconsider this thesis from a different angle. For instance, Levinson (Levinson & Brown 1994; Levinson 1996d, 1997) has indicated elsewhere that common-sense spatial notions, 'right' and 'left,' may be a cultural construct in the Western framework of space (to be discussed in more detail in Sections 3.1.–3.3.). If that is the case, an idea that the three spatial axes converge on the *ego-centric* perspective may also be a Western intellectual legacy of spatial concepts. Then, what about verticality based on *gravity*? Below I will briefly trace these widely shared epistemological concepts of space that persist in the Western intellectual tradition.

3. Primacy of Relative Egocentric Space and Gravity in European Intellectual Tradition

3.1 Tacit Assumptions

Concepts of space have always been a major issue in the philosophy of human knowledge and perception, and despite numerous theories on this issue, one common consensus is that they are basic building blocks of epistemological understandings of the world (Eliot 1987; Van Cleve & Frederick 1991; Jammer 1993). If one asks, "what is the most stable dimension on the vertical plane?," the answer seems self-evident. Almost everyone, on a brief reflection, would say it is the gravitational vertical, or the Absolute (here read as 'up/down') FoR. In fact, verticality is distinguished from laterality (left/right) and anteriority/posteriority (front/back) in terms of its stability of perception—verticality is 'impermeable' to the agent's movements. That is, verticality always points to the same direction, like the geographic N-S orientations (Figure 3), leading a hierarchy of conceptual stability on the horizontal plane: 'up/down > front/back > left/right.' The same hierarchy is reported for the ease of accessibility to naming recalled objects in terms of the response times (Bryant, Tversky, & Franklin 1992: Logan and Sadler 1996).

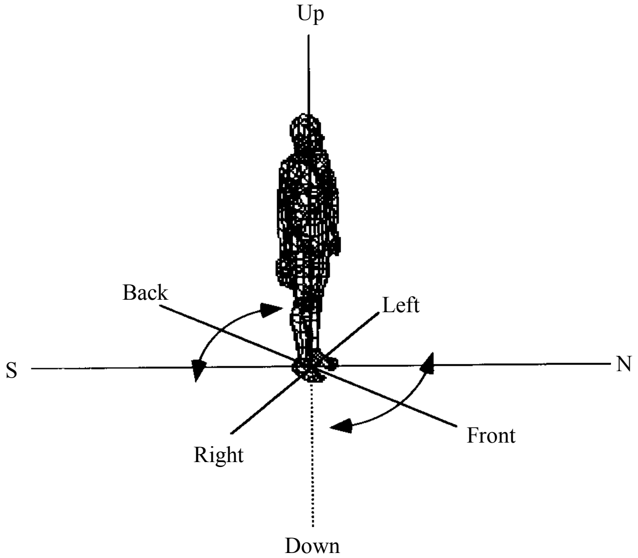


Figure 3. Asymmetry of coordinates on the horizontal plane

This legacy of putting undue emphasis on the egocentricity of a referential anchor point is traditionally dated back to Kantian philosophy, which maintains, based on Newtonian 'absolute' space, that egocentric conceptualization of external phenomena in the world is the precursor to other kinds of knowledge.[5] This egocentricity of spatial perception is seen in Kant's early exposition:

> In physical space, on account of its three dimensions, we can conceive three planes which intersect one another at right angles. Since through the senses we know what is outside us only in so far as it stands in relation to ourselves, it is not surprising that we find in the relation of these intersecting planes to our body the first ground from which to derive the concept of regions in space. The plane to which the length of our body stands perpendicular is called, in reference to us, horizontal; it gives rise to the distinction of the regions we indicate by *above* and *below.* Two other planes, also intersecting at right angles, can stand perpendicular to this horizontal plane, in such manner that the length of the human body is conceived as lying in the line of their intersection. One of these vertical planes divides the

> body into two outwardly similar parts and supplies the ground for the distinction between *right* and *left*; the other, which is perpendicular to it, makes it possible for us to have the concept of *before* and *behind*. (Kant 1991 [1768]: 28–29).

Also assumed by Kant and contemporary cognitive scientists is the primacy of gravity in spatial perception. Kant, prior to his influential work on 'incongruent counterparts (e.g., right and left hands and shapes like '_| |_'), is said to have sought "to prove that the very existence of space is due to gravitational force, and that its three-dimensional character is a consequence of the specific manner in which gravity acts (Kemp Smith 1991 [1918]: 43)." This dominance of gravity and egocentricity is assumed to be the criterion for defining the vertical and horizontal planes and still seems to exert a persistent influence on the conceptualization of spatial relations in cognitive science and linguistics. The following quotes are representative examples of this line of thinking:

> The extensive apparatus we have to tell us how we are oriented in the gravitational field is precisely an apparatus to tell us which way is up. Of course, the reason this matters to us is the pervasive influence of gravity on every aspect of our ordinary actions. So here we have an egocentric axis which is not defined as a natural axis of the body. Of course, there is such a thing as the long axis of the body, but that is not the same thing as 'up' and 'down', which continue to be defined in terms of the gravitational field even if one is leaning at an angle (Campbell 1993: 75).

> The up/down axis is determined by our recognizing the direction of the pull of gravity, and is therefore not to be explained in terms of egocentric or anthropocentric predispositions of language users (Fillmore 1982: 36–7).

In cognitive science in general, researchers assume that these concepts are theoretically applicable across languages and thus universal (Miller & Johnson-Laird 1976; Lyons 1977; Regier 1995; Logan 1995). In most cases, it has been tacitly agreed that the relative, egocentric FoR defined by gravitational orientation is the default or dominant system, and it is only when the subjects are 'instructed' otherwise or they have difficulty in (re)constructing the perspective under discussion that they come to rely on other frames of reference.

However, there are studies that indicate this is still an over-simplified view. For example, Kataoka (2000), based on the actual usage of Japanese vertical terms, *ue* 'up' and *shita* 'down,' proposed that the 'subjectified' (Langacker 1991) vertical dimension can conceptually override the actual vertical dimension defined by gravity, suggesting that the value placed on the vertical dimension and its dominance in spatial coordination may have been overestimated in notional frameworks of space. Probably gravity is the dominant factor in establishing the absolute (vertical) FoR, but the potential ease/difficulty in staying in or moving out of the frame may vary across languages, as will the sensitivity and boundedness to gravity in spatial lexical assignment.

3.2 Contextually/Culturally Variable use of Coordinate Systems

The notions of space based on egocentricity and gravity may serve as a default condition for spatial perception and description. However, habitualized linguistic practice may induce the speaker to unproportionately utilize certain modes of spatial reference and FoRs. Even if speakers cross-linguistically have equivalent words for 'up/down,' 'right/left,' and 'front/back,' what these terms actually refer to are not exactly the same, or rather, can be quite divergent. To examine this issue, let us take for example the following encounter situation (Figure 4), in which Viewer (V) and the relatum (Rl; here Tom) stand facing each other. This scene is usually called the 'canonical encounter' (Clark 1973). Here, the referent (Rf; ball) may be differently described according to the point of reference, which may or may not succumb to cross-linguistic relativization.

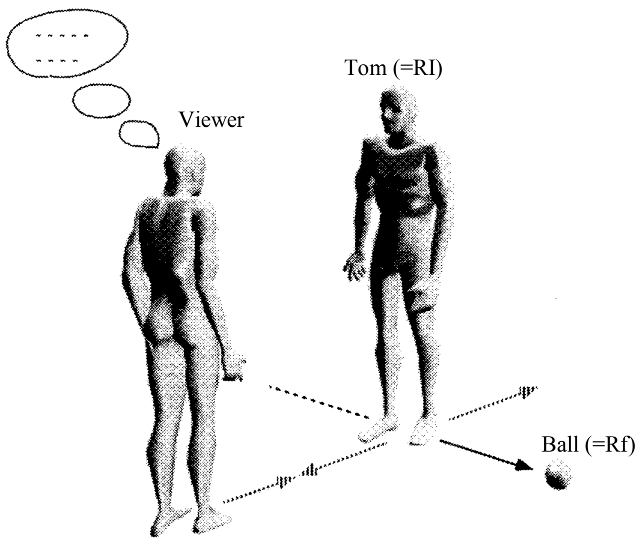


Figure 4. "The ball is to the left/right of Tom."

It is a well-recognized fact that English and Japanese rely on the same spatial variables such that both languages employ a ‘facing,’ rather than an ‘aligned’ perspective like in Hausa (C. Hill 1975, 1982; Levinson 1996a)—super/subscript ‘R’ refers to the ‘right side’ of Rl, Tom:

(3)

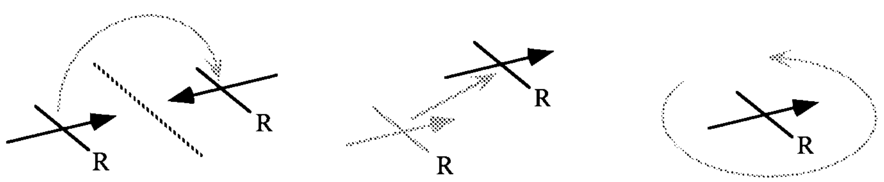
		V Rl
English/Japanese	‘facing’	$(\bullet_R \rightarrow\leftarrow {}^R\bullet)$
Hausa	‘aligned’	$(\bullet_R \longrightarrow \bullet_R \rightarrow)$

Thus, in English and Japanese, ‘the ball’ in Figure 4 is described as “The ball is to the left of Tom,” meaning ‘on Tom’s left’ based not on the viewer’s ‘primary’ coordinate but on Tom’s rotated, ‘secondary’ coordinate. Whereas in Hausa, ‘the ball’ will (dominantly) be referred to as ‘to the right of Tom’ based on V’s coordinate.

A more variable use of coordinates ensues when the Rl is a ‘tree,’ which has no intrinsic orientations. We now know that English/Japanese, Hausa, and Tamil show variable possibilities for ‘translation,’ ‘rotation,’ and ‘reflection’ as diagrammed in Table 3 (see Levinson 1996a: 370–371; 1996b: 143; Fillmore 1971). The dots represent ‘V’ and ‘Rl’, respectively, and the capital letters indicate the positions of Rf and how it will be referred to (i.e., F(ront), B(ack), R(ight) or L(eft)) when given a matrix sentence “The ball is (in _____ /to the _____) of the tree.”

Table 3. Possibilities of ‘translation,’ ‘rotation,’ and ‘reflection’ onto the secondary coordinate (tree)

English/Japanese (reflection)	Hausa (translation)	Tamil (rotation)
(V → Rl: tree) L • F • B R	(V → Rl: tree) L • B • F R	(V → Rl: tree) R • F • B L



Reflection Translation Rotation

More confusing is the fact that the possibilities for these operations not only show inter-linguistic but also intra-linguistic variability according to the type and function of the reference object.[6] In English/Japanese, for example, what 'the right' refers to varies for 'person,' 'car,' 'desk,' and 'tree.' As we have just seen, the right/left succumbs to projection for 'person' based on his/her secondary coordinate, rather than on V's primary coordinate.

For a 'car,' which has the intrinsic front/back regions, the judgment of 'the right' is ambiguous because it may mean 'the car's right' or 'in the region to the right from the car, where "the right" is found in the viewer's front view in relation to the car.' For a 'desk,' the situation is similar to the car, but not necessarily the same. Because 'desk' has a functionally defined 'front' and 'right', even if the speaker does not face the desk, 'to the right of the desk' will be more likely to mean 'the desk's (intrinsic) right' rather than 'to the right from the desk seen from the viewer.'

Finally, for a 'tree,' 'the right' will always refer to the region defined in relation to the viewer because 'tree' does not usually induce rotation in English/Japanese. However, it may be possible that an object like a tree may be metaphorically identified as a human-like object and project the secondary coordinate as for 'person,' as seen in Tamil. This possibility is highly language-specific.

Tamil speakers also show complex, dialect-dependent variability (Pederson 1993, 1995). The assignment of left/right orientations varies according to the regionally dominant mode of the FoR rotation. Pederson observed that urban Tamil speakers mainly use the *relative* FoR for everyday spatial expressions, but rural Tamils, in contrast, tend to rely on the *absolute* FoR, drawing on the habitual use of spatial reference. This result indicates that people in the rural area tend to suppress the use of 'right' and 'left,' depending instead on the absolute directions, whereas other Tamils may use 'right' and 'left' depending on the body-coordinates. Furthermore, preference for particular FoRs may also be cross-linguistically variable even among European languages. For example, Carroll (1993) found that English speakers tend to take an 'objective (or object-centered)' perspective in describing physical objects, in contrast to German speakers who are likely to adopt a 'subjective (or viewer-centered)' perspective for the same task.

There is tremendous variability in terminological transfer even for the vertical dimension terms, which are ordinarily thought to be most resistant to such variation. One of the "ego-centric" languages, English, can even fall to such transfer to some extent

(Figure 5). Shepard & Hurwitz (1984) argue for the vertical origin of such horizontally applied expressions as “Look who’s coming *down* the street,” meaning “coming closer to the speaker along the street”—an exception is a metaphorical case like “She walked right *up* to me,” where *up* implies the direction toward a salient and/or important object or place. They basically maintain that what *up* can mean in spatial cognition may be conceptually regulated, constituting roughly a four-stage continuum, ranging from the ‘most gravitationally conferred upright’ direction (canonical ‘up’) to the ‘most horizontal’ extension of the meaning (‘come *down* the street’).[7]

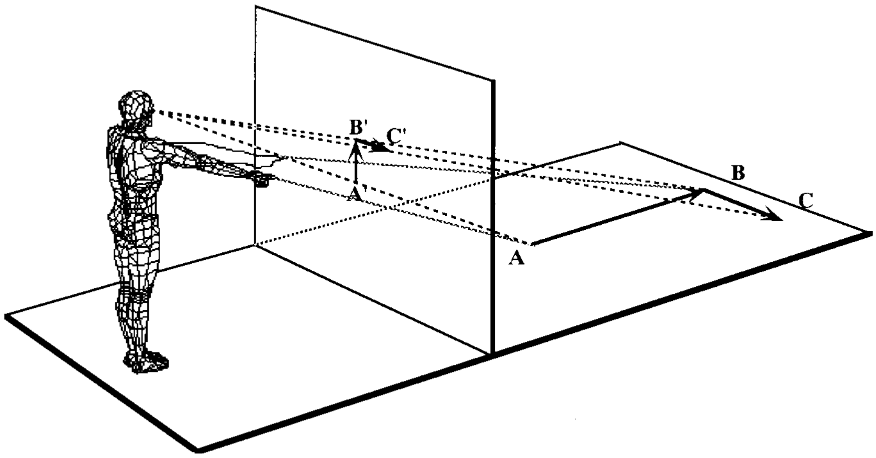


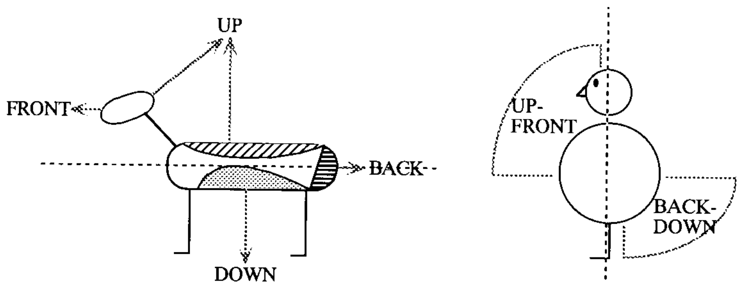
Figure 5. Shepard & Hurwitz’s ‘Vertical Origin of Horizontal Projection’

Note: “A schematic illustration that a point B that is further ahead of another point A on the horizontal ground is also ‘higher’ than that point A from the perspective of the canonically above-the-ground viewer. Also illustrated is the related fact that a right turn (toward a point C) projects to the right from the ‘top’ of the line leading into that turn within the viewer’s egocentric frame of reference (Shepard & Hurwitz 1984: 167).”

Although I have so far treated spatial terminology as if it has its own semantic concept, it often cannot be separated from the orientation and function of the human (and animal) body. Heine (1997: Ch. 3) proposes that five reference points of deictic orientation generally come from a limited number of source domains: ‘up’, ‘down’, ‘front’, ‘back’, and ‘in’. (He further expounds the chain of grammaticalization of spatial terms from the body to space in terms of the following sequence: ‘human body → back of thing → rear of thing →

space behind thing' (and vice versa).)

According to Heine, there are three major domains as the source models for spatial orientation: *body-part terms* (e.g., 'head' for 'up' and 'buttocks' for 'down'), *landmarks* (e.g., 'sky' for 'up' and 'earth' for 'down'), and *dynamic concepts* (e.g., 'go' for 'front'). Among these, body-part terms are the major source domain for spatial orientation, which can also be subdivided into anthropocentric and zoomorphic models (Figure 6). Although there is some regional variation concerning the preference between the two models, the dominant patterns of the spatial projection of the body-part terms he found are as follows:



(a) The zoomorphic model (b) The anthropocentric model

Figure 6. Two major models for projection of body-part terms (Heine 1997: 41, 46)

Based on these models, Heine (1997: 46) states that the "human body in its upright positions is not perceived as being absolutely vertical but rather as leaning forward—that is, the way it is situated when one is running or walking, rather than when one is standing." These claims indicate that a human-based, egocentric vertical model is not necessarily a universal principle for linguistic descriptions, and needs to be mediated with the cultural basis of grammaticalized spatial cognition. Now, a recurrent question is whether or not such a linguistically mediated spatial grounding can in return influence spatial cognition itself—an ever-lasting Humboldtian legacy in the study of language and thought.

3.3 Cognitive Variability Based on Habitualized Language Use

Given the contextual and cultural variability of the frames of reference shown above, dominance of a relative FoR and gravity are highly contestable. Concerning egocentricity, recent findings from cognitive anthropology point out its subsequent bias toward ethnocentric universalism. Levinson & Brown (1994) showed that Tenejapans exhibit a remarkable indifference to the right and the left, or 'incongruous counterparts', which is the source of Kantian claim for the egocentric basis of spatial perception and his argument against Leibnizian notion that space is merely a network of relations among material objects.[8]

Brown & Levinson (1993) also suggest that language may constrain the cognitive categories, but not vice versa. In Tzeltal, there seems to be a tendency to avoid a relative, egocentric FoR, and to describe objects according to their dispositions in space. These dispositions are largely specified in terms of the 'shape' and 'orientation' of the referent, rather than through the projection of point of view onto other relativized 'origos.' Thus, they serve an intrinsic motivation for engendering spatial terms. For example, Tzeltal has numerous nouns which originated from human body-part terms. The term 'head' of a human is projected through analogy onto a relatively pointed part of a 'pear' in terms of an axial orientation. Likewise, the cusp of pointy shapes is termed a 'nose,' and a hollow opening on the top part of an object, a 'mouth' (Levinson 1994). Therefore, Tzeltal speakers need to pay utmost attention to the shape information in situ in order to correctly name things, rather than to 'what and where' (cf. Landau & Jackendoff 1993).

A more drastic finding about cognitive differences between speakers of absolute-FoR-oriented language and Relative-FoR-oriented language was given by Levinson and his colleagues (Pederson et al. 1998). In one of their numerous experiments, they found a persistent cognitive influence of spatial language in non-verbal tasks. In what they call 'Recall Memory Task (Animals-in-a-Row Task),' they first aligned on a table three kinds of small figures of domesticated animals in a particular order (e.g., *pig-sheep-cow*, from the subject's left to right), and asked, without using directional terms, the subjects to remember the scene. After this, they had the subjects turn around 180 degrees to another table, on which the two rows of animals were displayed: 1) *pig-sheep-cow*, or 2) *cow-sheep-pig*. They then asked the subjects to choose from the two options what they thought was the same one they saw before. Since they were turned around 180 degrees now, if a subject chose the first option (*pig-sheep-cow*, his/her left to right), it meant that his/her perspective was based on the relative FoR. On the other hand, if s/he chose the second option, the absolute FoR. The result was amazingly clear. Tenajapans (absolute population) dominantly chose the second, and the Dutch counter group showed the opposite tendency, as shown in Figure 7.

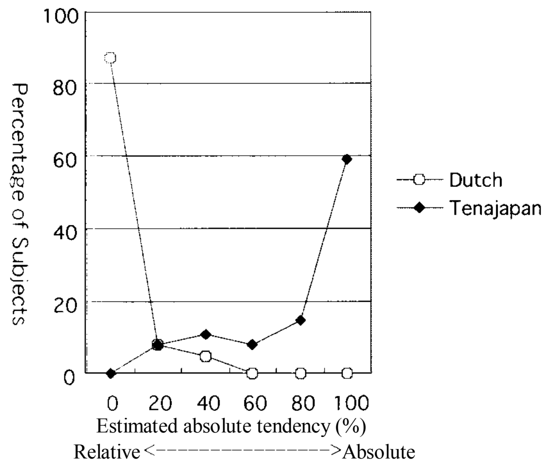


Figure 7. Recall Memory Task (Levinson 1996b)

They repeatedly found the same tendency in various experiments such as 'Recognition memory tasks,' 'Motion-to-path transformation & recognition tasks,' 'Transitive inference tasks,' etc. They thus claim that, since the Tenejapan subjects were not given the instructions in any directional terms, the habitualized linguistic practice in organizing their spatial world in absolute terms has influenced their cognitive performance in these non-verbal tasks designed to test perception, memory, and inference—a clear Whorfian effect.

In other words, a speaker of a certain language must remember the spatial relations in the whole array depending on what FoR is predominantly used in his/her language. Just as Guugu Yimithirr and Hai||om speakers remember things in absolute terms, so do English and Japanese speakers in relative terms. That is, speakers with different FoRs as their predominant coordinates will think differently about spatial scenes and relations. This phenomenon consequently requires the 'absolute-FoR' speakers to be always aware of their spatial orientations. Amazingly, the absolute populations such as Guugu Yimithirr and Hai||om were shown to exhibit extremely accurate 'dead-reckoning' skills comparable to homing pigeons (!), in contrast to Dutch and British English speakers who showed very weak sensitivity to absolute directions. (Levinson 1996c; see also Widlok 1996)

Although there are no experimental data available for the following, similar *absolute* systems are reported to exist in Saulteaux (Hallowell 1955), Truk (Goodenough 1966), Central Australian Aboriginals (Lewis 1976a, 1976b), and many others. Haugen's (1957) seminal work on Icelandic identifies two types of orientation, complementarily distributed: 'proximate' (corresponding well with the absolute directions) and 'ultimate' (directions along a line of travel, based on the four quarters of Icelandic geography), and a similar effect is reported for Belhare in Nepal (Bickel 1997). Given this, ego-centricity in spatial cognition seems only to be a cultural construct of some 'dominant' cultures rather than the universal principle for spatial perception and representation.

3.4 Innate and Universal?

In neuro-physiology, the biological basis of perception of absolute directions has also attracted the interest of researchers. Traditionally, images stored in the relative, egocentric space based on gravity are held to 'generate' the absolute, allocentric system, but not vice versa. The counter evidence was soon presented. Tolman (1948) and his colleagues conducted a series of experiments, in which they familiarized rats with a maze, then blocked one or more of the paths. In spite of the contemporary response learning perspective (i.e., the rats would choose a short but incorrect path), they chose a longer path which correctly led them to the expected goal. This fact suggests that the rats are place learners, rather than response learners, internalizing the whole schema of the maze. This idea has been widely surveyed and most clearly articulated by O'Keefe and Nadel (1978):

> Most authors attempt to derive all psychological notions of space from an organism's interaction with objects and their relations. The notion of an absolute spatial framework, if it exists at all, is held by these authors to derive from prior concepts of relative space, built up in the course of an organism's interaction with objects or with sensations correlated with objects.
>
> In contrast to this view, we think that the concept of absolute space is primary and that its elaboration does not depend upon prior notions of relative space. . . [there] are spaces centred on the eye, the head, and the body, all of which can be subsumed under the heading of *egocentric space*. In addition, there exists at least one neural system which provides the basis for an integrated model of the environment. This system underlies the notion of absolute, unitary space, which is a non-centred stationary framework through which the organism and its egocentric spaces move. (O'Keefe & Nadel 1978: 1–2, cited in Campbell 1993: 76).

O'Keefe & Nadel developed the theory that the organization of the brain may hold a place for processing spatial information. They assume that it is the hippocampus, which provides us with an a-priori basis for the Euclidean framework for our conception of the outer world. In a sense, this notion is closely analogous to (early) Kantian a-priority of space concept (see also O'Keefe 1993). As shown above, Levinson (and his colleagues) (1996c) found that Guugu Yimithirr speakers can make extremely accurate judgments about allocentric orientations (even after being blindfolded and turned around), in contrast to the poor performance of the Dutch speakers in the same task. This implies the existence of biological potentials for the perception of cardinal directions.

However, Levinson & Brown (1994) explicitly oppose the early Kantian view of 'right-left' asymmetry, which is based on the premise that Newtonian 'absolute' space is fundamental for the recognition of the difference, and it exists independent of, and prior to, objects and their sensations. (Note that Newtonian 'absolute' space is an entity in its own right, like a physical space, hence a different notion than Levinson's 'absolute' relation.) In other words, Levinson accepts human potentials for perceiving 'absolute' (not Newtonian) spatial orientations, but declines the possibility of physical universality of space derived from the anthropocentric dimensions such as right/left.

Finally, one of the most powerful denominators for spatial cognition is assumed to be the distinction between 'what' and 'where' systems (Landau & Jackendoff 1993, Landau 1994). Landau & Jackendoff (1993) claim that vocabulary filters out particular information suitable for a particular language but any language typically draws on spatial representations of object (what) and place (where), which remind us of a 'Figure-Ground' distinction. However, other researchers have suggested that there exist languages whose 'where' system incorporates more 'shape' information than has been proposed by Landau & Jackendoff (1993). As shown above, in Tzeltal, one strictly draws on 'shape' via a precise geometric algorithm for describing locations of objects and mapping body-part terms onto parts of inanimate objects, rather than through metaphor or the 'what/where' system (P. Brown 1991, Levinson 1994).

Also, Choi & Bowerman (1991) and Bowerman (1996) maintain that English and Korean children have specific ways of encoding spatial and movement information from the earliest stages of child language development, rather than constructing the same semantic mapping in terms of the distribution and sequence for encoding object and place. For example, Korean children are shown to share with English children the tendency to 'under-differentiate' referent events—they differentiate less among actions of 'separation' than among actions of 'joining'—the semantic structure of the input language constrains its semantic distinctions of corresponding verbs. Thus, it suggests that object (what) and place (where) are much more differentially encoded in lexicon in different languages than have been assumed.

Recent collaborative work by Levinson's and Bowerman's groups has shown illuminating results in linguistic coding of space (Levinson 2001 class notes; Bowerman & Levinson 2000). Based on comparative semantic studies of adpositions and positional verbs in various Western (e.g., English, Dutch) and non-Western languages (Korean, Arrernte, Kilivila, Marquesan, Likpe, Rossel, Inuktitut, etc.), they have started to find vast variability in encoding spatial semantic notions into these elements. At the same time, highly systematic, but limited generalizations (or universals, if they can be maintained at all) began to emerge.

According to their studies, such universals are focused not on the ubiquity of the what/where system, but on 1) constraints on the semantic space, 2) attractors in space, and 3) order in which attractors fractionate out. In other words, adpositional maps and positional verb distinctions, when compared across languages, respect the same organization of space, and do not allow widely different distributions of spatial elements. They are just differentially preferred and bundled up to be realized as adpositions and positional verbs for particular spatial configurations. In this sense, languages are constrained in terms of their possible ways of cutting up space. Besides, although the most widely observed concepts, *IN* and *ON*, are not adpositional universals—e.g., Tzeltal preposition fails to distinguish them—languages have certain spatial 'attractors' that tend to be coded first before other adpositions or positional verbs are derived, in such a way that color terminology evolves on an implicational hierarchy.

Given these findings, linguistic universalism based on innateness, or more precisely, formal linguistic universals modeled on the limited introspective data and the negligence of the different mappings of semantic properties, do not seem to hold for many of the non-Western languages.

4. Concluding Remarks

The research findings above show that general notions of space, which have been conceptualized as stable in both perspective-taking and cognitive categories, need to be given more culturally and linguistically flexible accounts, and that universals (or constraints) seem to emerge from those vastly variable ways of representing space through language, which may in turn influence cognitive performance of humans. All these suggest other possibilities of local logic of space than those of the Western one for putting space into actual use in various linguistic contexts. The most important clue to such local logic lies in the habitualized referential practice most compatible with the indigenous spatial world. Such an approach provides us with an immense possibility in expanding our understanding about how the spatial world around us is constructed, and how it can influence our thought and behavior.

Finally, as an addendum, there are currently various linguistic anthropological approaches that aim to explicate the covert relationship between language and space. Such studies include, for example, the *socio-centric* referential practice in Yucatec Maya (Hanks 1990, 1992), the *action-centered* representation of space in Plains Sign Talk (Farnell 1995), a narrative/discourse analysis of spatial experience (Payne 1984, Mondada 1996, Kataoka 2000, 2001), conversation analysis of negotiated spatial arrangement (Goodwin 1995; Nishizaka 2001), mental spaces (Fauconnier 1994; Rubba 1996), and gesture and spatial mapping (McNeill 1992, 2000; Kita 1993; Haviland 1993, 1996, 2000; Armstrong, Stokoe, & Wilcox 1995; Emmorey & Reilly 1995), to name only a few.

As most efficiently represented in Haviland's studies (1993, 1996, 2000), there is an emergent need for, and a heuristic value in, discourse-oriented approaches that investigate cognitive consequences of particular FoRs used in everyday language. Culturally inscribed spatial knowledge not only affects our cognitive performance but also predominantly guides our linguistic and non-linguistic coordination of the body and the verbal performance. We have recently seen more of such analyses coming onto the center stage of discourse analysis and psychological experiments of space conducted in new contexts using non-Western informants. Also, a growing number of researchers have come to recognize that spatial knowledge and imagery are heavily utilized in speech, serving as guiding principles for spatial orientations, arrangements, and calculations.

Orientations and objectives of these studies vary, but I firmly believe that these approaches have a tremendous potential in revealing the mysteries of the indigenous knowledge of people (whether it is space, color terminology, kinship terms, or noun classification), and for that purpose, collaboration and exchange of ideas, methods, and findings from relevant fields will eventually provide us with a better understanding and more acceptable theories of the mind.

* Acknowledgement: This review article and some of my studies cited here are supported by Grant-in-Aid for Scientific Research (C) (2), (No. 12610566). I also thank Mr. Michael Depoe for his careful reading of the final manuscript.

1 William Molyneux was a Dublin lawyer, and a friend and correspondence of John Locke. Locke mentions his question in his *Essay*, and the question is "whether a blind man, on recovering the use of his sight and being presented with a cube and a globe before his eyes, would be able to name them correctly. In other words, would the experience he had gained by touching these objects enable him to name them correctly when they were placed before his eyes? (Morgan 1977: 6)." Molyneux's answer was 'No,' to which Locke also agreed: they upheld a notion, 'No innate Principles in the Mind.' On the other hand, Eilan (1993) and Levinson (1996b: 157) answered 'Yes,' suggesting that other (cognitive) modalities have the capacity to adopt or adapt to other frames of reference, enabling cross-modal (or 'amodal,' rather than modality-specific) mappings.

2 It seems that the non-coordinate system in Levinson's spatial array is roughly equivalent to the first and second stages of Piaget's developmental sequence of children's spatial conception, and his coordinate system, to the third, Euclidean space (Piaget 1956: summarized in Pinxten 1976).

Three Developmental stages of space are:

1. from birth until two years (0–2): sensorimotor or perceptual space, with 'topological' segmentation; no representation, no symbolization
2. from two until seven/eight years (2–7/8): 'topological' space concept; representation and symbolization of the 'topological' notions gradually develop
3. from seven/eight until twelve/thirteen (7/8–12/13): systematic and parallel elaboration of the 'projective' and 'Euclidean' system; even here, the basic notions of 'projective' space are genetically slightly primary to those of 'Euclidean' space.

(See Appendix A for detailed explanations of 'topological,' 'projective,' and 'Euclidean' spaces.)

3 Levinson's notion of 'absolute' space is distinct from Newtonian absolute space, the concept which is more widely acknowledged. Newton's concept is abstractly based on the astronomical location of the universal center of gravity as the reference point. Apparently, the absolute directions based on this universal center constitute vertical orientations and may or may not coincide with the 'absolute' directions defined by the Earth's geomagnetic orientations (compass directions) or indigenously established absolute directions on the horizontal plane (see Jammer 1993: Ch 4).

4 Levelt, in one of his classic studies on spatial descriptions (Levelt 1982), defined *intrinsic* in terms of this merging of the speaker's perspective with that of the moving entity's in a given experimental environment. Instead, he preserved the use of *relative* only for the speaker's objective perspective, which covers the whole schema of motion events. In other words, it is a distinction between an *object-centered* or a *viewer-centered* perspective. Levinson (2001 class notes) recently proposed a more refined, four-way criterion for distinguishing the perspective taken, 1) *ground* (deictic or non-deictic), 2) *origo* based on ground or viewpoint, 3) *coordinate system*, and 4) *the type of coordinate system*.

5 Kant's theory of space evolved chronologically from 'space as absolute' through 'space as

intuitive' to 'space as mind-dependent' (Van Cleve & Frederick 1991: viii). Our discussion utilizes Kant's first treatment of the topic.

6 An interesting example is seen in Noda (1987), who reports a diachronic change of *tate/yoko* perception among older and younger generations of the Japanese. *Tate* and *yoko* of a object is defined along the sagittal line of the speaker and the perpendicularly traversal line to the sagittal line, respectively. Japanese basically allows two types of writing directions: traditionally, vertically from top to bottom and from right to left, and more contemporarily, horizontally from left to right and top to bottom (like English). Thus, shown a tilted rectangle (like a letter pad), younger generations, who are more accustomed to the Western style of writing, tend to associate the longer sides of the rectangular with *tate*, while older generations, the shorter sides with it.

7 It should be noted that their distinction between 'metaphorical' and other rather cognitively motivated extensions from the vertical and the horizontal is not always so clear. They consider 'the direction toward a significant reference object or location' as the only case of a 'metaphorical' one: e.g. "She walked right *up* to me." However, what is generally conceptualized as metaphorical extensions may not necessarily be metaphorical in every culture (Levinson 1994).

8 Kant claims that space is endowed with a reality of its own. He observed that the intrinsic relations that apply to the right hand is similar to those found for the left hand, and yet that the right hand cannot substitute for the left hand. If this difference cannot be explained as being merely the appearance of different relations with respect to each other (and it can't, because we cannot put a right-handed glove on the left hand), we must postulate different dispositions in terms of absolute space (see Van Cleve & Frederick 1991 for detailed discussions).

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