
Keywords: spatial cognition, intrinsic/relative/absolute frames of reference, linguistic relativity, lexical typology

1. Introduction

Stephen Levinson’s new book, Space in Language and Cognition, is a highly recommended, thought-provoking, and possibly controversial monograph for all who are interested in language and thought. This is the outcome of a decade of effort with regard to language and spatial cognition by the Language and Cognition (previously Cognitive Anthropology Research) Group at the Max Planck Institute (MPI) for Psycholinguistics (http://www.mpi.nl/world/index.html), of which Levinson has been the director since the inception of the project (see Inoue (1998) for earlier developments of the project). Given the strong nativist orientation in Japan, the research agendas and findings presented here may be full of surprises for many readers, but this book unquestionably tackles very important issues on language and spatial concepts—whether innate or acquired.

Although Levinson is widely known for his expertise on pragmatics and for his politeness theory, he takes a different direction in this pro-
ject, in which he conducts detailed cross-linguistic comparisons of spa-
tial cognition through numerous experimental tasks involving spatial
thinking. The findings of the project are plainly summarized as follows
(1) in Preface (xix):

(1) a. Different human groups use different spatial frameworks,
    often with distinctive sets of coordinate systems in both
    language and cognition.

b. The diversity of frame-of-reference systems can be orga-
nized in a universal typology that distinguishes just three
    major types, from which languages and cultures draw a
    subset.

c. There are robust correlations between frames of refer-
    ence used in language and frames of reference used in
    non-linguistic memory and reasoning, suggesting a major
    "Whorfian" effect of language on cognition.

d. Consonant with selected frames of reference, different
    human groups seem to use different types of "mental
    map," with consequent differences in many aspects of
    behavior, communication, and culture.

In effect, the consequences of these claims go so far as to raise a fun-
damental question about whether "culture and the biological foundations
for cognition have co-evolved and mutually adapted." (xx)

The content of the book can be roughly grouped into three major
divisions, the first of which (Chapters 1–3) focuses on the theoretical
foundations of the three "frames of reference" (hereinafter, FoR)—
intrinsic/relative/absolute—and their subtypes, which are to be brought
into alignment with different modalities of cognition. The second divi-
sion (Chapters 4–6) explicates the remarkable results of the group's
field experiments conducted in various languages using what they call
the Space Kit. The main focus is on non-European languages such as
Guugu Yimithirr, Arrernte, and Tzeltal, which are contrasted to
European languages like Dutch and English. The results clearly show
that speakers of each language group (classified in terms of the FoR
types) tend to share common features throughout other levels of non-
verbal coding of events, including gesture and mental mapping. The
final division (Ch. 7) picks up the initial theme and discusses the theo-
retical consequences of the relationship between FoRs and concomitant
cognitive capacities made available through distinct ways of capturing
and re-constructing the world. In the end, the author identifies different
stages of Whorfian effects in spatial cognition and beyond. Each chapter is followed by a lucid summary of the major claims and findings. Because the first division includes the foundational frameworks of the whole project, I will allocate relatively more space to it than to the following sections.

Generally speaking, this book is not an easy read. Some sections will compel intensive reading and even re-reading, due to the abstract nature of the issue, as well as to the author’s meticulous writing style. The discussion is often dense and thorough, attending to relevant issues and results from other studies. Thus, a full-fledged discussion is well beyond the scope of this review. Instead, I will attempt to provide an instructive overview for those who are not fully familiar with the recent developments and findings of the project, followed by my critical evaluations for future research.

2. The Overview of the Book

2.1. The Intellectual Background to Spatial Thinking

Chapter 1 starts with the premise that spatial thinking is engrained in, and reflects upon, almost every aspect of our lives, and that it developed the intellectual background that has led to modern scientific research. As an illustration of the current issue, the author introduces some anecdotes from his field experiences, which show totally unexpected reactions from native speakers of, say, Guugu Yimithirr and Tzeltal speakers, who predominantly speak (and even think) about the spatial environment in completely allocentric and absolute ways. The exoticity, if we should find it there, would be factual evidence that we, a relative population, are unconsciously submerged in the egocentric, relativistic, and anthropomorphic types of spatial thinking.

The author briefly traces the development of the major spatial concepts in Western philosophy, ranging from the early Greek distinction between space as material (e.g. Plato) and as a void (the Epicurean atomists), through Newton’s distinction between relative and absolute space (different concepts of relative/absolute FoRs in this book), Leibniz’s proposition of space as merely the relative locations of things, and Kant’s nativist idea of space as the matrix for engendering the three axes of spatial orientation (up/down, front/back, right/left). All of these, the author claims, have laid the groundwork for a “naïve human spatial conception which has been woven into two millennia of Western
thinking” (3), one that has been unquestioningly embraced and recursively reinforced in the scholarly explorations of the human mind. After reviewing this intellectual background, Levinson concludes that practically the same concepts dominate psychology, linguistics, the cognitive sciences, and even anthropology.

Levinson’s stance is quite the opposite of, and tilts toward a more adaptive view of, spatial cognition. Extending this idea further will accordingly lead to the possibility that varying modes of spatial reasoning exist in different cultures. The whole book is dedicated to elucidating the ways in which this attractive theme has been born out by a well-organized research methodology, which corresponds to that of Lucy’s (1992) important work on numeral classifiers in English and Yucatec Maya.1

Another notable methodology of the book is the author’s attention to ethnographic observations of actual usage in spatial tasks, which is not usually addressed in grammar or reference books. This research group’s merits lie in the fact that it comprises trained fieldworkers in uncommon, non-European languages. These methodologies—both experimental and ethnographic—give more credibility to the research methods and findings. The emerging picture of the results is intriguing and provocative—and apparently disturbing to some—because it strongly asserts that the human species is not cognitively uniform but rather inherently predisposed to adapting to the surrounding environment and the languages spoken by different populations. In principle, Levinson maintains that “... humans have co-evolved with culture, and ... culture has one great virtue over other kinds of adaptation, namely the speed with which it can change in response to new conditions. ... Linguistic and cognitive diversity is there because it has proved highly adaptive (p.

1 Levinson’s methodological criteria are as follows (p. 19)
1. Pick a domain (in this case, space).
2. Look at the linguistic coding of the domain in languages; sort languages into types A, B, etc., on the basis of differences in the coding of the domain.
3. Look independently at the non-linguistic coding of the domain in non-linguistic cognition in speakers of language types A and B, etc.

See also Imai and Gentner (1997), which examines different Whorfian effects of numerical classification on English and Japanese speakers.
This is a clear manifestation of opposition to some of the tenets in nativist linguistics and the cognitive sciences, and in fact it had to weather harsh criticism from those camps due to the potential threats it posed to their theoretical foundations.

2.2. Basic Concepts of Frames of Reference (FoRs)

Chapter 2 is an in-depth review of the notion of “frame of reference” (FoR) from cross-disciplinary perspectives, in which the author tries to reveal the sources of misconceptions across disciplines and remedy the incongruities by proposing his own model of FoRs. Attending first to the historical transition of spatial concepts, Levinson summarizes several types of binary and ternary distinctions of spatial perspectives as defined in various disciplines. Among these, his model of FoRs is fundamentally grounded in a psycholinguistic tripartite distinction of “viewer-centered” vs. “object-centered” vs. “environment-centered” (but with slightly different definitions, as summarized below).

This chapter carefully examines the ways in which different spatial perspectives may (or may not) be successfully brought into other disciplines, depending upon three levels of representation of FoR—perceptual, conceptual, and linguistic. Despite the bewildering terminological inconsistency across disciplines, Levinson has suggested capturing approximate commonalities, so that an “egocentric,” “viewer-centered,” and “2.5D sketch” perspective roughly maps onto the “relative” FoR; an “object-centered,” “3D” perspective maps onto the “intrinsic” FoR; and an “environment-centered” perspective corresponds to the “absolute” FoR.

The author then goes on to provide “linguistic” descriptions of the static array on the horizontal plane, as represented by coordinate terms such as front/back/right/left (FBRL) and north/south/east/west (NSEW). The application of these terms, he argues, is not as straightforward as it is

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2 This is a claim that reminds us of Tomasello’s (1999) thesis on the cultural origins for human cognition, in which he advocates “the ratchet effect” (“faithful social transmission (of creative intentions) that can work as a ratchet” (ibid., 5, 37ff.)) that enables, through cultural learning, rapid phylogenetic, historical, and ontogenetic adaptation and recapitulation of the species-specific cognition.

3 In fact, this sort of tripartite classification seems to be supported by distinct neural activations in the brain (Committeri, Galati, Paradis, Pizzamiglio, Berthoz and LeBihan (2004)).
often conceptualized by people who rely heavily on the “relative” frame of reference. For instance, Levinson and his colleagues’ findings show that many languages use an “absolute” FoR (e.g. “to the north of the chair” instead of “to the left of the chair”) and that those absolute notions appear as early as topological notions such as “in,” “on,” and “under.” This is surprising because some researchers (e.g. Pinxten (1976)) have proposed that topological notions should be typologically spatial primitives observed in most languages and that they are necessarily confined to developmentally earlier stages (as clearly articulated in the Piagetian tradition), while absolute notions appear in much later stages. Even more surprising is the fact that spatial lexicons such as “right/left” and “front/back” are fundamentally missing in some languages (e.g. Levinson and Brown (1994)). These findings call for a new typology of spatial FoRs that adequately covers unfamiliar situations in which angles and directions are specified in different ways from ours.

To make his model more accessible, I will use his examples in the Preface (sentences (a) to (c) in Figure 1) as a starting point.

(a) **Intrinsic FoR** (binary relation)
“The cat (1) is **behind** the truck.”
(The cat is at the place contiguous with the intrinsic back part of the truck: the coordinate system based on the “truck.” Origin: truck.)

(b) **Relative FoR** (ternary relation)
“The cat (2) is **behind** the truck.”
(The cat is on the occluded side of the truck from the standpoint of the viewer, and the truck is between the cat and the speaker: the coordinate system based on the “viewer.” Origin: viewer.)

(c) **Absolute FoR** (binary relation)
“The cat (1) is **to the east of** the truck.”
“The cat (2) is **to the north of** the truck.”
(The coordinate system based on cardinal directions or conventional absolute directions. Origin: truck.)

Figure 1. “The cat is _____ the truck.”
First, the sentence in (a) "The cat (1) is behind the truck" correctly describes the scene. The coordinate system employed here is called the *intrinsic* FoR because the cat's position is identified in terms of the truck's intrinsic back, derived from its default direction of motion. In this FoR, the spatial relation is "binary," or relating two objects/entities (cat and truck) in the immediate context.

However, another reading of the sentence is possible if the cat (2) is on the occluded side of the truck from the standpoint of the viewer. This ambiguity comes from another FoR—the *relative* one. In Levinson's framework, it is distinguished from the intrinsic FoR in that it is characterized by angular specifications computed based on the "ternary" relationship among *cat, truck, and viewer.*

In the *absolute* FoR, the referring practice can be simpler because this FoR only requires as an anchor the absolute directions such as "NSEW," "where the sun rises/sets," "uphill/downhill," "upstream/downstream," or any orientations based on fixed and stable geographic features. The relationship is thus "binary" between these absolute orientations and the referent. Accordingly, in Figure 1 an English speaker could describe the cat's positions with the sentences in (c), "The cat (1) is to the east of the truck." and "The cat (2) is to the north of the truck," although such expressions are highly marked because they require of the speaker the identification of compass directions in

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4 Note that in Levinson (1996a) and the present book the intrinsic and relative FoRs are differentiated in terms of binary and ternary relations. This motivates the distinction between the often-encountered confusion between relative and deictic reference, the latter being fundamentally binary and speaker-centered and often relying on non-angular specifications such as "here/there" and "this/that." As shown below ((i) and (ii): pp. 36–38), the intrinsic FoR is the prototypical case of the relative FoR in which there is no floatation of the speaker's viewpoint from the origin—i.e., Origin and Relatum simply overlap.

(i) *The ball is in front of me.*  
Coordinates: Intrinsic (and deictic)  
Origin: Speaker  
Relatum: Speaker  
Relation: binary

(ii) *The ball is in front of the tree.*  
Coordinates: Relative  
Origin: Speaker  
Relatum: tree  
Relation: ternary

Building on these definitions, Levinson maintains that "deictic and intrinsic are not opposed (p. 38)," and that "many relative systems can be thought of as derived intrinsic ones—systems that utilize relative conceptual relations to extend and supplement intrinsic ones (p. 46)."
The author then elaborates on the logical structure of the three FoRs, demonstrating the inherent constraints represented by the “(un)translatability” grid (p. 58). In constructing the untranslatability grid, Levinson (1996b) originally 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 a certain frame of reference?; and (2) If so, can representations in one frame of reference be translated (converted) into another frame of reference? (p. 57). Confirming that FoRs cannot freely be converted into one another, he posits that all mental “modalities” must utilize different FoRs available according to languages, but that those particular FoRs can be adapted to other modalities within the limited sets of translatable FoRs, suggesting a partial “yes” answer to Molyneux’s question.

In order to determine the nature of untranslatability, Levinson pre-established a particular spatial array consisting of two physical objects, BOTTLE and CHAIR, which were to be connected in the three types of FoR. His basic strategy was to map the possibilities of FoRs in the prescribed spatial configuration, in which a bottle is placed in the chair’s intrinsic front region. Figure 2 summarizes these (un)translatable relationships between FoRs. For example, if the spatial relation that holds between the bottle and the chair in the relative FoR is true (i.e., “the bottle is to right of chair”), it will also entail, or “translate into,” the intrinsic FoR (i.e., “the bottle is in front of chair”). However, even if the relationship that holds between the objects in the intrinsic FoR is true, it will not translate into the relationship in the relative FoR because the viewpoint is not fixed.

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

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5 William Molyneux was a Dublin lawyer and a friend and correspondent of John Locke. Locke asked in his Essay, “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 the notion, “No innate Principles in the Mind.”
“binary” and “intrinsic” relation because it is the relationship between the figure/referent (bottle) and the 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 thus “relative” relation because “the bottle” is spatially related to “the chair” through the viewer’s perspective.

![Diagram of spatial relations](https://example.com/diagram.png)

**Figure 2. The partial untranslatability across FoRs. (p. 58)**

This spatial configuration is characterized by different possibilities for “rotation.” When the whole array (chair + bottle) is rotated, only the intrinsic system allows/maintains the original acceptability (i.e., “the bottle is in front of chair”). When the viewer is rotated, the intrinsic and absolute FoRs retain it, and when the ground (chair) is rotated, the absolute and relative FoRs retain it, hence the rotation possibilities in Table 1, which also summarizes properties of the three FoRs introduced above. Levinson’s “static” spatial grid may also be a source for a “dynamic” one—i.e., we may possibly conceptualize this as a series of configurations projected from various emergent vantagepoints. However, he does not particularly consider this issue here. An analysis of
such changing perspectives is beyond the scope of the current review, but I will suggest in Section 3 some ways in which his framework can be applied to the analysis of discourse data.

Table 1. Classifications of FoR properties. (pp. 53, 55)

<table>
<thead>
<tr>
<th></th>
<th>INTRINSIC</th>
<th>ABSOLUTE</th>
<th>RELATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relation</td>
<td>Origin ≠ Ego</td>
<td>Origin ≠ Ego</td>
<td>Origin = Ego</td>
</tr>
<tr>
<td>Origin on</td>
<td>binary</td>
<td>binary</td>
<td>ternary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constancy under rotation of:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole array</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Viewer</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Ground</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Properties defined in discipline of:

<table>
<thead>
<tr>
<th>Psycholinguistics</th>
<th>Object-centered</th>
<th>Environment-centered</th>
<th>Viewer-centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linguistics</td>
<td>Intrinsic-perspective</td>
<td>Deictic-perspective</td>
<td></td>
</tr>
<tr>
<td>Vision theory, Imagery debate</td>
<td>3D models</td>
<td>2.5D sketch</td>
<td></td>
</tr>
<tr>
<td>Cog. psychology</td>
<td>Allocentric</td>
<td>Egocentric</td>
<td></td>
</tr>
<tr>
<td>Visual perception</td>
<td>Orientation-free</td>
<td>Orientation-bound</td>
<td></td>
</tr>
</tbody>
</table>

2.3. Linguistic Diversity of FoRs

Chapter 3 deals with the diversity of FoR usage and the lexical components from a cross-linguistic perspective. The first half of the chapter summarizes the accumulated findings about diverse linguistic representations for identifying locations in the three FoRs, while the latter half briefly surveys the group’s more recent endeavors in the area of lexical typology, especially with regard to motion verbs and morphosyntactic encoding of spatial information. By criticizing the assumptions that the most important aspects of spatial language are encoded in adpositions (e.g. Landau and Jackendoff (1993)) and that spatial cognition is the least likely area to look for fundamental variation in human thought (Li and Gleitman (2002)), Levinson argues for the vast diversity of human spatial cognition specialized for different language groups.

Levinson first sets up the framework for the linguistic encoding of spatial information (p. 66; Figure 3 below) by identifying two major systems (“coincidence” and “coordinate systems”) of describing static space on the horizontal plane. He leads us through basic features of these systems, but the focus is obviously on the latter. The most con-
spicuous difference between these systems, he claims, is the angular specification—the property that lacks in “coincidence”—constituted by the spatial elements (such as figure, ground, viewer, etc.) in the scene. Although the elements of coincidence (deixis and topology/toponymy) are often the main topics in other areas of linguistics, they are not pursued avidly here. Next, Levinson goes on to overview the variable designation of spatial relations on the horizontal plane in various languages.

For the “intrinsic” coding in the coordinate system, he identifies two types of exemplary machinery operating in Zapotec and Tzeltal: Zapotec has a “fixed armature,” with which the spatial relationships are superimposed depending upon the outer spatial frame of gravitational orientation, while Tzeltal relies on an “object-centered geometry,” in which the internal axes of an object assign the spatial relations. The final type is represented by languages like English, in which particular notions defined by “functional criteria” such as canonical orientations (e.g. the

![Diagram of spatial language subfields]

(*The vertical dimension shares the same major divisions into intrinsic, absolute, and relative.)

Figure 3. Major subfields in spatial language. (p. 66)
“front” of a car), functional orientations (the “front” of a desk), and/or functions of parts (the “front” of a church) largely determine the use of spatial relation terms.

The “relative” FoR is more problematic because the assignment of spatial terms (which are also shared by the intrinsic FoR but are differentiated by the ternary relation) varies depending upon the types of confrontation. It is a well-recognized fact that English and Japanese rely on the same spatial variables, in that both languages basically employ a “facing” perspective (2a) rather than an “aligned” perspective (2b) as in Hausa (C. Hill (1982); Levinson (1996a)). Here, R\textsc{l} represents “(oriented) relatum” such as “car,” and V, “viewer,” and the super-/sub-script R refers to the “right side” of R\textsc{l}. The dots represent V and R\textsc{l}, respectively.

\begin{equation}
\begin{array}{ccc}
V & R\textsc{l} \\
\end{array}
\end{equation}

\begin{enumerate}
\item a. English/Japanese: “facing”
\begin{center}
\begin{tikzpicture}
\node (R1) at (0,0) {$\cdot$};
\node (R2) at (1,0) {$\cdot$};
\draw (R1) -- (R2);
\end{tikzpicture}
\end{center}

\item b. Hausa: “aligned”
\begin{center}
\begin{tikzpicture}
\node (R1) at (0,0) {$\cdot$};
\node (R2) at (1,0) {$\cdot$};
\draw (R1) -- (R2);
\end{tikzpicture}
\end{center}
\end{enumerate}

A more variable use of coordinates ensues when the R\textsc{l} is a “tree,” which usually has no intrinsic orientations. Here the variable mapping styles of the secondary coordinate (on R\textsc{l}) may be captured as “subtypes” of the relative FoR, such as “reflection,” “rotation,” and “translation” (see also Weissenborn and Klein (1982) for an earlier formation.

Table 2. Possibilities of “translation,” “rotation,” and “reflection” onto the secondary coordinate (here, tree).

<table>
<thead>
<tr>
<th>English/Japanese (reflection)</th>
<th>Hausa (translation)</th>
<th>Tamil (rural dialect) (rotation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>((V \rightarrow R\textsc{l}: \text{tree}))</td>
<td>((V \rightarrow R\textsc{l}: \text{tree}))</td>
<td>((V \rightarrow R\textsc{l}: \text{tree}))</td>
</tr>
<tr>
<td>(L)</td>
<td>(L)</td>
<td>(R)</td>
</tr>
<tr>
<td>• (F) • (B)</td>
<td>• (B) • (F)</td>
<td>• (F) • (B)</td>
</tr>
<tr>
<td>(R)</td>
<td>(R)</td>
<td>(L)</td>
</tr>
</tbody>
</table>

![Diagram](image-url)
of the idea). We now know that English, Japanese, Hausa, and Tamil show variable possibilities for “translation,” “rotation,” and “reflection,” as diagrammed in Table 2 (see also Levinson (1996a: 370–371; 1996b: 143); Fillmore (1971)). In this case, the capital letters indicate the positions of the referent 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.”

Finally, the “absolute” FoR could be based on invariable axes or on such environmental features as a solar compass, hillsides, river directions, coastal features, wind directions, etc. This may be by far the most elegant solution for the angular specifications, but there are at least two catches here: (1) such systems do not capture egocentric constancies, and (2) in using such systems, speakers and addressees must be constantly and correctly oriented with respect to the locally fixed bearings (p. 91). The cognitive consequences for the second problem motivate the unexpected human cognitive diversity to be discussed in the following chapters.

Another revealing fact is the intricate patterning of linguistic coding of space. Given the unexpectedly broad diversity in the use of FoRs in various languages (p. 93), it seems unlikely that only one FoR is innately endowed to us—i.e. the “relative” one as has been typically assumed in the Western framework of spatial concepts to be the primary form of conceptual encoding of spatial information. Likewise, each FoR is variably conceived and instantiated in the lexicons and grammars of languages, both intra-linguistically and cross-linguistically, especially in the subdomains of location and motion expressions. Since this topic will

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6 It is also notable that Tamil speakers show complex, dialect-dependent variability (Pederson (1993, 1995)). The assignment of left/right orientations varies according to the regionally dominant mode of projection. Pederson observed that urban Tamil speakers mainly use the relative FoR for everyday spatial expressions but that rural Tamils, in contrast, tend to rely on the absolute FoR, drawing on the habitual use of spatial reference.

7 For instance, location and motion expressions essentially involve some ground notions, typically realized as location, source, and goal. Levinson suggests that these categories constitute an implicational scale in terms of the degrees of inclusion of ground notions. In some languages, all of the three ground notions are subsumed under a single case or adposition, but if there are two markers for them, goal and location are the ones to be conflated, with source being fractioned out. If there are just three distinct markers for the ground, they will be location, source, and goal.
be fully discussed in the companion volume, *The Grammars of Space* (Levinson and Wilkins (to appear)), interested readers are encouraged to refer to it.

2.4. How Does Absolute Mind Work?

The second division (Chapters 4–6) deals with the experimental results from the group’s fieldwork. Chapter 4 starts out with the assumption that language serves as the primary medium for integrating the public and internal representation systems of space, with the focus on the differential coding in absolute and relative FoRs. The global hypothesis here is that individuals in a community should prefer to use just one FoR across modalities—language and non-verbal media like gesture, and non-linguistic spatial memory and spatial reasoning—“constructing for each community a specific ‘cognitive style’ of spatial representation (p. 113).”

For this purpose, Levinson exclusively looked into two unrelated linguistic communities, Guugu Yimithirr (GY for short) speakers in Northern Queensland, Australia, and Tzeltal speakers of Tenejapa in highland Chiapas, Mexico. Each forms an “absolute” community, in that they predominantly use the absolute FoR for ordinary spatial reference. GY is characterized by such features as the complete absence of relative terminology and a restricted set of topological and intrinsic expressions, while Tzeltal has, in addition to the absolute FoR, a rich topological system that extends into the intrinsic FoR.8

As mentioned above, to speak in an absolute language, it is essential for people to “dead reckon” or constantly calculate their current location correctly according to the (indigenous) cardinal directions. This suggests that relevant speakers must have an extremely keen sense of orientation, as was first introduced by Levinson’s numerous anecdotes and

This way, the patterns of case/adposition marking constitute a composite category in an implicational manner like color terminology. Although succinctly articulated, this is a major claim for the importance of lexical typology in the study of spatial cognition.

8 GY and Tzeltal both have the ergative/absolutive case-marking system, and the cardinal directions (4 [north/south/east/west] in GY, and 3 [uphill/downhill/across] in Tzeltal) are marked by the derivational suffixes on spatial-nominals.
casual surveys from field experiences (see Chapter 6 for detailed treatment of the issue).

Motivated by Lucy's (1992) seminal treatment of a non-linguistic memory survey in the field, Levinson and his colleagues conducted various interactive tasks or "games" (e.g. the animals-in-a-row task, men and tree games, a chips recognition task, and a maze recognition task) in absolute communities such as GY and Tzeltal. The basic assumption here is that we, relative FoR users, continuously rotate our coordinate systems as we move around, while absolute populations do not, because they rely on the absolute coordinates and apply the cardinal directions to whatever tasks are at hand.

Figure 4 shows the basic design and how the "animals-in-a-row task" was conducted and evaluated. Here the subjects were trained to memorize an array of (miniature) animals, all heading the same direction, in Table 1, and after turning around 180 degrees, they were requested to rebuild it "exactly as it was" in Table 2. Because this was intended as a non-linguistic task, researchers paid utmost attention to the linguistic cues, making sure that the instructions included no directional expressions, as in "Remember just how it is," or "Point to the pattern you saw before."

Based on the paradigm in Figure 4, 11 field experiments were conducted for GY speakers, but only two are discussed in Section 4.1: the chips recognition task and the maze task. The overall results are sur-
prising but convincing, generally showing the same pattern for the series of experiments. For example, in both tasks GY informants showed consistent preference for the absolute coding of spatial scenes, while the control Dutch informants were consistent relative coders of the reported events—statistically, the informants' responses were significantly different (GY vs. Dutch: p = 0.0000 on Fischer’s exact test). These results indicate that GY speakers not only speak a language that requires as a prerequisite the storage and calculation of absolute orientations, but they also think in a way concordant with the absolute FoR habitualized and regimented in the language. This idea poses a greater theoretical claim than a notion called “thinking for speaking” (Slobin (1996)) does because the latter only posits that a particular language requires of the speaker a special way of thinking “at the time of speaking.” The results from other types of tasks on the Tzeltal speakers (Section 4.2) echo the same claim and add more convincing pieces of evidence for the initial hypothesis, followed by interesting inquiries into possible consequences of illiteracy and cultural factors (see Danziger and Pederson (1998), and Pederson (2003) for further discussion).

All of these results confirmed the hypothesis that “there is a tight correlation between coding in language and coding in non-linguistic memory and reasoning (p. 168)” and indicated that the effects of language on human thinking are not so transient a process as merely putting one’s thoughts into line with the local language on-line (e.g. Slobin’s “thinking for speaking”). Instead, language has deeper impacts on the modes of coding spatial arrays in memory and inference.

2.5. Diversity in Mind Across Languages

In Chapter 5, Levinson introduces a more refined methodology and some well-thought-out experiments in order to articulate and corroborate the claim put forth in previous chapters—i.e., “(t)he frames of reference appropriately used in a language to describe specific situations are likely to correlate with the use of the same frames of reference in the non-linguistic coding of the same scenes for memory and reasoning (p. 171).” The major contrast here is between the relative and absolute FoRs, with a focus on the subsequent correlational tendencies in solving non-linguistic tasks.

As his methodology, he introduces a procedure called “the RA (relative-to-absolute) gradient” in order to adequately incorporate the infor-
mants' inconsistent performance in the tasks. The languages surveyed for the absolute category this time were Mparntwe Arrernte (a Pama-Nyungan language of central Australia), Longgu (an Austronesian language of the Solomons), Belhare (a Tibeto-Burman language of Nepal), one Tamil subsample (subjects from rural settings in Tamilnadu), Hai//om (a Khoisan language of Nambia), and Tzeltal (N = 85). These populations were contrasted with those who use relative coordinates for small-scale arrays (N = 99), such as speakers of Dutch, Japanese, Australian English, and another Tamil subsample (urban subjects who use relative coordinates). Five tasks were used in the experiments on these populations, of which only the results of the animal recall task (Figure 4) are presented below.

Again, the results were very clear—the predicted difference between the language groups (i.e. absolute vs. relative speakers) was significantly

Figure 5. RA gradients for the Animals task by linguistic category.

(p. 184)

9 The RA gradient was calculated as follows: each “absolute” response was given “1” point and each “relative” response “0” points, while each “untypable” trial received “0.5” point, indicating that it was neutral with regard to the two extremes of the absolute and relative poles. These values were then added up and divided by the total number of responses, producing a 33% absolute tendency for the above imaginary case (i): p. 177).

(i) Outcome of trials rel abs rel unt unt rel
Coding of trials 0 1 0 0.5 0.5 0
RA gradient (3 \times 0 + 2 \times 0.5 + 1 \times 1)/6 = 2/6 = 0.33
Estimated absolute tendency 33%
high in the animals task (Mann-Whitney U-Test = 1,453, p < 0.001), as well as in other types of tasks, which confirmed the hypothesis that language is a good enough predictor of non-linguistic performance on such non-verbal tasks (Figure 5).

However, there still remain possible catches for the validity of individual and linguistic differences because the above results were simply based on the total mass of the different language groups, without any specific considerations being made for individual and group-internal differences. In other words, it must also be confirmed that (1) there are substantial differences between any pairs from the different language categories (i.e. one from the absolute and the other from the relative language group, such as “Arrernte vs. Dutch”), and that (2) there are also non-significant differences between any pairs from the same language category (e.g. “Dutch vs. English”). Thus, they conducted pairwise comparisons between samples. The results also confirmed the prediction, and adequately supported the hypothesis that reliable correlation exists between FoRs available in languages and those utilized in non-linguistic memory and inference tasks.

Other issues discussed, including gender, literacy, and cultural conservatism, are also intriguing, but I will leave it to readers to explore these individually due to the spatial constraints of this review.

2.6. FoRs in Wayfinding and Pointing

In Chapter 6, closer attention is given to (1) comparing human dead-reckoning abilities across language groups, and (2) “gesture as a special window in underlying spatial cognition (p. 216).” First, instead of focusing on a small-scale space like a tabletop, Levinson introduces some experimental results from larger-scale arrays and mental models constructed in the real outdoors, comparing three absolute communities (Guugu Yimithirr, Hai//om, and Tenejapa) with two relative communities (Dutch and British).10 In this chapter, Levinson shows that navigation

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10 Although human wayfinding abilities have been given intensive attention by psychologists (e.g. Hart and Moore (1973); Thorndyke and Hayes-Roth (1982)), anthropologists (e.g. Hutchins (1995); Nonaka (2004)), and geographers (e.g. Golledge (1999)), more attention has been given to non-human navigation by birds, bees, and ants, which are claimed to have specialized sensory equipments for places, distances, directions, and time (e.g. Poucet (1993)).
can be a highly cultural matter and that human groups may vary enormously in their abilities and systems of navigation, to the extent that “varieties of human navigation may exceed the range of types to be found across a wide range of animal species ... (p. 218).” Here, the underlying assumption is that speakers of absolute-coding languages should be better dead reckoners, while those of relative-coding languages should be poor dead reckoners.

To test the prediction, he and his colleagues conducted a series of informal “pointing” experiments in the field. In these experiments, the participants from the Guugu Yimithirr and Hai//om populations were ordinary civilians (N = 11 and 10, respectively), and the measurements were taken opportunistically on bush roads to some destinations. Tzeltal samples (N = 12) were taken in a house where the researchers were staying. The Dutch population (N = 5) consisted of members of a Dutch wild-mushroom pickers’ club, who were assumed to be used to wandering around in the woods. The data for the British population were based on a large-sample survey previously conducted and published by Baker (1989).

As far as these results show, the mean vector lengths by “circular statistics” for GY and Hai//om speakers were very high (above 0.900)—even higher than for homing pigeons, and considerably higher than for the relative speakers. Given this, “speaking such a(n) (absolute) language is thus a sufficient, although not necessary, condition for being a good dead reckoner (p. 243: parenthetical addition mine).”

The following sections focus on the empirical consequences induced by the relative or absolute coding and examine how these features share causal relationships with the particular FoRs in terms of gesture.

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11 The methods used there were as follows: (1) transport participants to unfamiliar places with restricted visibility; (2) ask each subject individually to point to a range of named familiar locations near and far; (3) assess the accuracy of the pointings using a prismatic compass lined up along the pointing arm, together with an estimate of the current location based on the Global Positioning System (GPS) or other equipment, or a survey map; and (4) assess the trends in a sample of individuals from a specific population using the special techniques of “circular statistics” (adopted from Batschelet (1981)).

12 Circular statistics calculates the accuracy and concentration of estimates of direction in the pointing experiments and is represented by the “mean vector length,” which ranges from 0 to 1, where “1” means the total conversion of estimates.
(Section 6.2) and mental maps (Section 6.3). One major issue concerning absolute languages is their relation to types and qualities of gestures concurring with speech. Here Levinson focuses on the gestures made by Tzeltal and Guugu Yimithirr speakers (absolute gesture system), which was to be contrasted with those of American English speakers (relative gesture system), based on published work by David McNeill and his colleagues (McNeill (1992); see also Haviland (1993) for an extremely suggestive co-variation of the absolute FoR and gestural performances in narrative). Although the conclusions here are based on vast participant observations, a large sample of video recordings, and close analysis of the relevant phenomena, this section includes, as Levinson himself admits, numerous hypotheses and speculations that need to be seriously addressed in future research.

The basic assumption is that, at least at one level of contrast, different gesture systems are a reflection of different FoR types, absolute or relative. The areas of contrast are such features as "sensitivity to cardinal directions," "size and expansion of gesture," "hand use (one hand or both hands)," "reference to the space behind the body" (or "disembodied" spatial reckoning), "use of gesture and gaze," "occurrence of body torque," and so forth. For example, our (relative) gestures are egocentric in nature, are mostly small and in front of us (utilizing an imagined, flat "2-D scratch pad" with shallow depth), and are normally accompanied by a turning of the trunk when referring to an object behind. The pointings are usually associated with gaze, and pointing to one's chest often means "the self."

In contrast, absolute gestures show discernible differences as extensively summarized below in (3) (pp. 265–266).

(3) a. Gestures are large.
b. Two hand are more often involved.
c. The systems are full 3-D systems, with gestures pointing through the "transparent" body and behind it.
d. Complex sequences of exact vectors may be indicated in a single gesture.
e. Such gestures allow not only for correct fixed bearings but also, by elevation, for distances, so that overall "maps" remain correctly maintained.
f. Gaze can be released from orientational functions.
g. For the same reason, the trunk is relatively stable in such "disembodied" systems of spatial reckoning.
h. Iconic and orientational information can be fused without idealization of direction.
i. There are detailed parallels in conventionalization across such systems.
j. Such systems play a demonstrable role in interactional communication, as measured by various further features (such as gestural correction).

These different styles of bodily enactment reflect "a psychological style that is a crucial intervening variable between cultural forces and the physical comportment of the body. That is why a cognitive typology has some predictive power with respect to bodily use (p. 270)."

In the next section, Levinson starts with the predicted differences between the absolute and relative wayfinding systems as follows: speakers of relative languages would primarily use what Tolman (1948) called "strip-maps," which consist of (a) views of landmarks linked by (b) turns and (c) paths, and they heavily exploit spatial memory correlated with visual/motoric systems. On the other hand, speakers of absolute languages would primarily use "survey maps," which consist of metric angles and distances between landmarks calculated by systematic bearings, by decoupling spatial memory from visual/motoric actions. To put it another way, "relative coordinate systems may favour 'piloting' navigation by constant reference to familiar landmarks, while absolute coordinate systems favour true 'dead-reckoning' types of navigation (p. 274)." In effect, different coordinate systems will induce variable constructions of spatial imagery and encourage qualitatively different modes of mental scanning of an experienced/recalled/imagined environment.

2.7. The Relationship Between Language and Thought

Chapter 7 tries to integrate the above findings into a larger picture by connecting language with other cognitive modalities. First, Levinson heuristically illustrates the whole project with the following analogy: "(to) trace the course of an underground river system by dumping dye into a river before it goes underground, so by focusing on exotic semantic parameters and seeing where they turn up in 'inner space'... we can perhaps find out something important about our inner languages or representations and how they talk to one another (p. 280)."

In the cognitive domain of space, we have already seen that different language groups based on absolute or relative coding consistently exhib-
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ITED DISTINCT FEATURES IN OTHER ASPECTS OF NON-LINGUISTIC COGNITION SUCH AS LONG-TERM MEMORY, RECALL, RECOGNITION, AND LOGICAL INFERENCE OF SPATIAL RELATIONS. Thus, a central question would be how far down the distinction between absolute and relative FoRs can penetrate into our mental faculties. Levinson suggests that it can do so nearly all the way down, which naturally makes a fundamental counterargument against the "(strict) modularity of mind" thesis presented by Fodor (1983), among others. This position obviously contradicts many of the central theses of nativist linguistics/philosophy and cognitive linguistics, in which the semantics of language is assumed to be directly equivalent to a conceptual structure of humans. Levinson argues instead that "linguistic representations cannot be identical to the representations in which we do our central thinking, and yet nevertheless they have to be in some respects similar, since the 'languages of thought' must, directly or indirectly, support linguistic distinctions ... (p. 292)."

Following this line of argument, Levinson tries to repair theoretical ruptures in current linguistic theories in order to adequately deal with the surface semantic diversity. If it is the case that there are no semantic representations distinct from conceptual representations—as Fodor, Langacker, and others claim—that line of thinking could (ironically) lead to a rather strong claim for Whorfianism because, given semantic diversity, there would be as much cognitive diversity. According to Levinson, those theorists have escaped this line of criticism by taking one of two routes. "One way out is to assume that every concept in every language is part of the universal mental endowment of all humans, from which individual languages only draw a tiny subset for their vocabulary. Another way out is to presume that our universal mental endowment is much more modest, but that it is nevertheless rich enough to offer a set of primitives from which all complex semantic concepts can be constructed (p. 297)." Although he is rather laconic on the first position, he assumes that the second was the way taken by Jackendoff and Langacker in terms of lexical decomposition. Levinson's way out is neither of these, but rather a third approach, which attempts to connect Fodor's "psychic unity of mankind" thesis to Miller's (1956) theory of dual-level recoding of semantic concepts—as typically seen in the "recoding" of an incomprehensible sequence fbiibmlseeec into the familiar acronyms FBI, IBM, LSE, and EEC. Levinson seems to believe that, taken altogether, these positions can be integrated into an attuned amalgam that leaves enough room for
Whorfian effects to work on human cognition.\(^{13}\)

At this point, he identifies variable Whorfian effects in accordance with a time line along which three different stages of coding a scene appear, at the times of (1) experiencing something, (2) speaking about it, and (3) remembering it after it has been coded in language (Figure 6). Roughly speaking, the first strand of Whorfian effects, which would translate into a stronger version of Whorfianism, has been rigorously investigated by linguistic anthropologists (e.g. Lucy (1992); Gumperz and Levinson (1996); and this book), while major studies on the second and the third stages have been done by (developmental) psychologists (e.g. Slobin (1996)), coupled with philosophical investigations that support the idea of parallel (and multiple) computational systems of the brain.

\[\begin{array}{c}
\text{Experience-time:} \\
\text{Non-linguistic coding for memory}
\end{array} \quad \begin{array}{c}
\text{Speaking-time} \\
\text{Thinking-for-speaking}
\end{array} \quad \begin{array}{c}
\text{Coding after speaking} \\
\text{Spoken thoughts}
\end{array}\]

\textbf{Figure 6. Distinct types of “Whorfian effects.”} (p. 303)

There is a widespread belief in the cognitive sciences that there are innate concepts or “natural” categories for children’s acquisition of space, so that children are naturally destined to end up with a certain FoR like a relative one. Levinson revealed, however, that the frames of references are no such “natural” categories. Recent well-documented results in developmental psychology (e.g. Bowerman and Choi (2001);

\(^{13}\) In fact, Fodor himself has never denied the possibility of the facilitatory effects of language on human thought: “I am not committed to asserting that an articulate organism has no cognitive advantage over an inarticulate one. Nor ... is there any need to deny the Whorfian point that the kinds of concepts one has may be profoundly determined by the character of the natural language one speaks” (Fodor (1975: 85); cited in p. 300).
Brown (2001)) have shown that children tend to acquire, at a very early stage of development, certain semantic features and concomitant lexical categories that are conceptually compatible with a particular FoR dominant in indigenous cultures. A choice of one of these variants as the primary FoR can have cognitive consequences.

Although languages vary in their semantic organization, the variation is not indefinite but rather within limited constraints. Levinson thus pushes forward an eclectic third way to mediate diversity and unity of cognition “in terms of a systematic interaction between structure in the environment and structure in the mind (p. 316).” He thus upholds a different kind of innateness, unlike that conceived of by Pinker or Fodor. Instead, he believes in “partial constructivism” in human cognition, which will enable domain-specific learning constrained by innate biases and cognitive diversity. His statement near the end of the book clearly manifests this belief: “(T)he end result is that frames of reference as we see them in language are bio-cultural hybrids, just as is language itself. The universal elements in this domain are constraints and biases. The cultural traditions work within the constraints and tend to bend to biases, but they can transcend them, and always construct specific instantiations of frames (p. 324).”

3. Critical Evaluations for Future Research

Levinson’s project has the potential to have enormous impact on the ways in which we understand spatial concepts and human thought, but some reservations need to be addressed before we can fully accept the current theses. In the following, I will raise several arguable issues concerning the current claims by giving additional findings from other languages, including Japanese. Those issues are (1) the possibility of the context-dependent salience of non-dominant FoRs, which is opposed to Levinson’s tenet of a single dominant FoR in each community; (2) the lack of pragmatic considerations of FoR use; (3) the reconsideration of the robustness of another absolute orientation—gravity-defined verticality; and, relatedly, (4) competing motivations for the absolute orientation.

3.1. Context-Dependent Salience of Non-dominant FoR(s)

First, one predictable and inevitable concern would be methodological issues surrounding the field experiments because, in their experimental
environments, it is practically impossible to achieve the same degree of control on informants and settings as could be done in a university laboratory. However, I generally support the group’s methodology because the type of “cognition in the wild” (Hutchins (1995)) that Levinson and his colleagues are investigating could only validly be tested in the informants’ indigenous environments informed by, for example, geographic, botanical, and meteorological conditions.

So far, the most critical methodological and theoretical challenge has come from Li and Gleitman (2002), who held that the significant absolute tendency is not relevant to the cognitive coding types but rather is a methodological fallacy. They claimed that absolute coding can be induced even among a relative population by simply providing an adequate context—e.g. an outdoor environment—because, they assume, all humans tend to use absolute coding in such a setting. Thus, Section 5.6 is dedicated to refuting their critique by proving that their experimental results were irreplicable (even in a task with heavier memory load: Section 5.6.1) and by conducting a novel experiment (90-degree, instead of 180-degree, rotation). In order to further corroborate his claims, Levinson demonstrated step by step that what Li and Gleitman claimed to be absolute coding (for the “Animals with a duck pond” task) was in effect intrinsic coding, and that their results simply indicate that English speakers can be induced under some circumstances to use an intrinsic FoR instead of their predominant relative FoR (see Levinson, Kita, Haun and Rasch (2002) for detail). Thus, Levinson’s argument for salient cognitive differences between relative and absolute populations has been adequately sustained.

My question, instead, concerns the robustness of his presumed dichotomy between relative and absolute populations because the variable use of FoRs in a single language is mostly out of consideration in this book. I still think that the contextual and environmental issues surrounding the use of a particular FoR should be given further attention and that a relative population should be versatile enough to allow for variable instantiation of the absolute FoR in some contexts—and possibly vice versa. In spite of the inherent “untranslatability” between these FoRs (see Figure 2), this possibility was clearly indicated by covert indigenous variability between relative and absolute FoRs in Tamil (Pederson (1993)) and Japanese (Inoue (2002), Kataoka (2005)).

For example, in Japanese (a relative language by definition: see Mainwaring, Tversky, Ohgishi, and Schiano (2003)), wayfinding activi-
ties on the road (such as GPS navigation) rely heavily upon an egocentric, relative perspective to identify the destination, and they employ such expressions as (4a). However, intrinsic and absolute expressions (such as (4b)) are also possible candidates to refer to the same destination.

(4)  

a. (To get to XXX Clinic,) go straight (relative), and take a right (relative) at the second intersection. You will find it right away on your left (relative).

b. (XXX Clinic is) to the north (absolute) of the YYY intersection, and in front of the ZZZ station (intrinsic).

The latter may seem rather marked, but such phrases (especially absolute ones) are in fact heavily utilized as wayfinding expressions in Japanese. Supporting evidence comes from Kataoka (2005), who investigated, with Levinson’s tripartite typology, FoR expressions used on commercial signboards in suburban areas of Nagoya. In effect, he found that the absolute FoR was the most preferred choice (43.4%) in that domain of use and that preferences for different FoRs systematically varied depending upon distinct geographic features of the route and the environment. Specifically, as the geographic scale and/or route complexity increased, there emerged a general tendency away from intrinsic descriptions, through relative descriptions, to absolute descriptions despite the general low usage of the absolute FoR in modern Japanese. Accordingly, Levinson’s major distinction between the relative and absolute populations might better be taken as a matter of degree rather than as a mutually exclusive one.

3.2. Lack of Pragmatic Considerations

Another question arises with regard to the author’s focused attention on lexical semantics and typological generalizations. Although it is true that grammar and perspective-taking have become a major area of linguistic inquiry and that semantic analyses of direction terms/motion verbs/locative phrases are also very often seen, it is practically rare, as in this book, that coordinate expressions are seriously examined with respect to the FoR use in interaction. To many readers, including myself, Levinson’s total lack of concern for pragmatic uses of spatial language is surprising given his career as a leading scholar in the field. Admitting that the “socio-centric” (Hanks (1990)) use of spatial language mainly concerns deixis—Levinson’s “coincidence” category (Figure 3), “coordinate systems” also project immense pragmatic conno-
tations in indigenous cultures (see, for example, Bennardó (2000), which deals with an indigenous, culturally loaded use of "front").

In addition to people's variable reliance on a non-dominant (absolute) FoR presented above, it has been shown that the choice among available FoRs may teleologically shift according to different experiential and social stances to which discourse participants are affiliated (Kataoka (2003, 2004)). Further, such differences in social and experiential stances may be highlighted and negotiated by different FoRs, in conjunction with other "indexical" tokens like tenses and the "floor" management patterns (see Silverstein (2004)).

For instance, in Kataoka's (2003, 2004) discourse study on rock climbers' use of deictic verbs of motion, an expert climber who knew the area under discussion quite well depicted a series of the scenes with only iku 'go,' taking a wide-range, gaze/survey perspective (similar to the absolute FoR) based on his schematic mental map constructed through previous experiences (e.g. nobotte iku 'go climbing' => torabaa-su shite(i)ku 'go traversing'). On the other hand, novice climbers not familiar with the area systematically connected the landmarks with iku 'go' and kuru 'come,' and resorted to an egocentric, route perspective (similar to the relative FoR), with his or her perceptions being restricted to the immediate environment (e.g. nobotte itta 'went climbing' => (kara) kita 'came (from)'). It was observed, however, that as the novice members gradually gained the knowledge of the surrounding environment through interaction with the expert, they came to converge on the expert's (i.e. epistemic authority’s) perspective in terms of tense-like forms (-ru/-ta), switching from their experience-laden -ta form (e.g. nobotte itta 'went climbing,' kita 'came') to the -ru form (e.g. migi ni iku 'go right,' kuru 'come'), which represents a factual, omniscient view indexed by its non-past tense. Therefore, the merging and/or switching of FoRs could carry out social/interactional functions in addition to reducing the cognitive load required to achieve a certain communicative task (see Tversky, Lee, and Mainwaring (1999) for further suggestions of possible motivations for frame-shifting).14

14 Tversky et al. (1999) also suggested that such factors as cognitive load, salience of referent object, ease of reference terms, and the "near" bias may come into play to offer the most effective perspective for the task at hand.
3.3. Reconsideration of Gravity-Defined Verticality

Another comment concerns the author’s treatment of the vertical (thus, absolute) dimension, although it is not a main topic of the book (but see Brown (2001)). Postulating that the frames in the vertical dimension are “massively overdetermined and unproblematic (p. 75),” Levinson assumes that “the three frames of reference can equally be distinguished on the vertical axis (ibid.).” This itself seems to be a fair evaluation of the vertical axis, but considering the actual use of the vertical lexicon, things are not that straightforward.

Even a casual examination shows that there seems to be a continuum for vertical terms based on the degree of commitment to the gravitational force. For example, spatial expressions such as “under (here meaning “behind”) the screen” and “climb over the roof (which sticks out horizontally)” are largely accepted even though the up-down relation therein is not compatible with the canonical, gravitation-defined vertical relation. This observation indicates that “under/over” may be contextually compatible with rotated vertical planes, in contrast to more strictly gravity-oriented prepositions/adverbs like “up/down” and “above/below,” both of which largely defy the applicability to rotated verticality: “??above/??up(on) the screen” in describing the situation represented by “over (= on this side of) the screen.”

For instance, a strong gravitational orientation of “above” was experimentally confirmed by Carlson-Radvansky and Irwin (1993), who found that, in cases where “above” is assigned to situations with non-canonical vertical axes, the deictic (or ego-centric) frame of reference did not contribute at all to the assignment of the term. However, Carlson (1999) later proposed the Multiple Frame Activation Hypothesis that all the FoRs are active and involved online before the assignment of a direction with a spatial lexicon in a certain FoR.\(^{15}\)

Such multiple activations of FoRs may induce variable assignments of vertical terms, though largely metaphorical, to non-canonical contexts. A similar possibility was raised for “up/down” by Shepard and Hurwitz (1984). They argued for the vertical origin of horizontally applied

\(^{15}\) In this sense, highly suggestive are Friederici and Levelt’s (1990) findings that, on Earth, their astronaut subjects were heavily skewed toward confounding egocentric and (absolute-like) environment-centered FoRs for spatial term assignment, but they tended to rely on an egocentric (viewer-centered) representation when gravity was absent.
expressions such as “Look who’s coming down the street,” meaning “coming closer to the speaker along the street.” There also 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 thus proposed 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”).

In natural discourse, the vertical lexicon could show greater versatility which is not metaphorical extension. Kataoka (1998) looked critically at gravity-based verticality by drawing on discourse data from Japanese rock climbers, proposing that the absolute value assigned to the vertical lexicon may have been overestimated in European conceptualizations of space. He showed that the “subjectified” (Langacker (1991)) vertical dimension, contextually constructed within the speaker’s cognitive space, can override the gravitational orientation.

For example, in Figure 7, moving into the positions of object A and B respectively establishes canonical “in front” and “down/below” relationships in English with respect to the relatum (Rl). However, it was observed that Japanese climbers, if given an adequate bodily context, assigned semantically incongruent terms to those situations, although in a principled manner; “in front” to B and “up” to A, respectively, rotating 90 degrees along the sagittal plane. Overall, 2D horizontal, projec-
tive/coordinate relations (in a Piagetian sense) such as mae ‘front’ seemed to succumb to rotation relatively easily in Japanese (and perhaps marginally in English). But the mapping of vertical 3D relations onto another FoR (i.e. ue ‘up/above’ to A) was observed in Japanese, but rarely in English. 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 (see also Roth and Lawless (2002) for the performative use of a vertical lexicon in science classes). Given all these results, semantic values attached to these spatial terms should at best be seen as idealized ones, and they can be reconceptualized in a pragmatic and performative light.

Related to the variable loyalty to gravity is the etymological bias with regard to vertical terms and the possibility (and stages) of the grammaticalization chain of the spatial terms. In principle, three major domains have been postulated as the source models for spatial orientation (Heine (1997)): 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, especially vertical, orientation, which can also be subdivided into anthropocentric and zoomorphic models. For the vertical terms of body-part origin, it can be assumed that they are heavily affected by the intrinsic, bodily defined orientations, which are conceptually more versatile than the gravitational direction. That is, there is always a danger in discussing purely gravitation-defined orientation and that of body-origin on an equal status, because the latter invites more presupposition and association with distinct canonical orientations, so that quadruped animals’ “back” and “buttocks” [body-part terms] can be up and back [direction terms], respectively, while humans’ “back” and “buttocks” can simply be back and down. Given this, it seems that the absolute “up/down” relations also succumb to etymological and functional variation.

3.4. Competing Absolute Orientations

Another intriguing line of research, though related to 3.3, is the validity of Levinson’s claims regarding other types of absolute systems not examined here. Absolute systems such as Saulteaux (Hallowell (1955)), Truk (Goodenough (1966)), and Icelandic (Haugen (1957)) are not necessarily based on the same orientational criteria (such as NSEW
and "uphill/downhill," which are discussed here), but instead may depend upon "the direction from which ancestors originally immigrated," "upriver/downriver," etc. For example, Haugen's (1957) seminal work on Icelandic identifies two types of orientation that are complementarily distributed: the "proximate" system (corresponding well with the NSEW directions) and the "ultimate" system (the orientation of the coordinate calculated by the direction of the ultimate goal). Given these co-existent absolute systems, it is not yet clear if we would obtain the same results for these absolute populations (see also Bickel (1997) on Belhare).

In other possible cases, the absolute orientations may quite frequently change as in "sea-ward" vs. "mountain-ward" on a round island since, as one circumnavigates the island, the axes of the cardinal direction also change—unlike, say, the Guugu Yimithirr case, in which the absolute orientations are rigidly fixed in the larger geographic context. In fact, Levinson (p. 49) admits the degrees of priority concerning which direction is viewed as primary (and secondary) among named orientations, and thus the cognitive consequences for such speakers is an intriguing topic yet to be examined.

4. Concluding Remarks

To recapitulate Levinson's major claim, the dominant FoR in a language has an overarching effect on the cognitive style, which eventually rides into other types of modality. The current line of argument is convincing, but it is yet to be determined where the dominant FoR originally comes from and the extent to which such dominance affects the indigenous use of spatial language in each culture and community. And his treatment of FoRs, due to the author's indifference to pragmatic issues, is quite narrow in terms of actual language use.

Setting aside these shortcomings, this book offers brilliant insights for principled accounts and formalizations of how humans conceptualize space and realize it linguistically. Even though Levinson opposes the idea of establishing the "etic grid" for the functional distributions and cognitive consequences of indigenous spatial lexicons, it is true that he has established a well-structured framework for the study of spatial language. As Levinson has argued, spatial frames of reference carry heavy theoretical baggage worthy of utmost attention. A possible next step would be a study of cross-cultural and cross-linguistic differences
in ongoing realizations of FoRs in naturalistic contexts, with the goal of achieving a better understanding of dynamic space management.

As has been repeatedly claimed here, space is integral to human cognition. Levinson has now shown that spatial cognition is clearly related to other modalities of mind, which are constitutive of human faculties in general, both innate and acquired. Because of this, Levinson and his colleagues' work firmly occupies a place in the broader framework of the study of the human mind. Their rigorous efforts have made us realize that what we had previously thought of as natural concepts of space may be cultural (and especially Western) constructs, and that there could be other valid, and possibly more efficient, ways to conceptualize the outer world and adapt to indigenous environments.

REFERENCES


Neuroscience 16, 1517-1535.
Inoue, Kyoko (1998) Moshimo 'Migi' ya 'Hidari' ga Nakattara (If There is no "Right" or "Left"), Taishukan, Tokyo.
Inoue, Kyoko (2002) "Zettai to Sootai no Hazama de: Kuukan Shijiwaku niyoru Komyunikeeshon (In between the Absolute and the Relative: Communication


University of Chicago Press, Chicago.


Weissenborn, Jürgen and Wolfgang Klein (1982) “Introduction,” Here and There:
Cross-linguistic Studies on Deixis and Demonstration, ed. by Jürgen Weissenborn and Wolfgang Klein, 1–12, John Benjamins, Amsterdam.

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