SPATIAL ORIENTATION

Theory, Research, and Application

Edited by

HERBERT L. PICK, JR.

University of Minnesota
Minneapolis, Minnesota

and

LINDA P. ACREDOLO

University of California at Davis
Davis, California

PLENUM PRESS • NEW YORK AND LONDON

1983

HOW LANGUAGE STRUCTURES SPACE

Leonard Talmy

University of California
German Department
Berkeley, California 94720

I. INTRODUCTION

1. Aims of This Study

This chapter is concerned with the structure that is ascribed to space and the objects within it by linguistic "fine structure," that subdivision of language which provides a fundamental conceptual framework. The primary aim of the chapter is to characterize the general properties of this structuring and the linguistic-cognitive system in which it participates.

Previous linguistic space studies, by authors like Gruber (1965), Fillmore (1968), Leech (1969), Bennett (1975), and indeed, myself (Talmy, 1972, 1975), have laid a groundwork by isolating many of the basic geometric and dimensional distinctions that languages mark, and by recognizing the patterns that these form. The present study, however, aims beyond pure description of spatial categories to an account of their common fundamental character and place within larger linguistic-cognitive systems.

This aim is addressed in several ways. First, there is consideration of the foundational role played in linguistic space descriptions by schematization--a process that involves the systematic selection of certain aspects of a referent scene to represent the whole, while disregarding the remaining aspects. A range of schematization types is documented

in Part II, including some by which a scene receives its primary division into sub-parts and some which attribute to these parts certain structural conformations. The little recognized generic properties of schematization are then overviewed in Part III; these include idealization, abstraction, and a topological type of plasticity, as well as a disjunct character, which permits alternative schematizations of a single scene.

Second, the study addresses the cognitive processes attending schematization in communication, treating both the speaker's decision-making process concerning the alternative of schematization and degree of specificity he wishes to convey for a scene and also the listener's image-constructing process as it interacts with this selection (Part III, Section 8).

Finally, the findings on how languages represent space are taken as a particular case of the system by which language represents meaning in general, with the conclusion that this system is not so much "classificatory" in a strict sense as it is "representative," supplying the requisite schemas for a sufficiently dense and distributed "dotting" of semantic space (Part III, Section 9).

A few comments may be in order on the manner of presentation. Since this chapter is set in a cross-disciplinary volume, I have taken pains to make the material accessible to readers with non-linguistic backgrounds by reducing the use of technical forms and concentrating on English as my primary source of examples. Nevertheless, linguists can be assured that the analyses have been kept at full professional rigor and that the general applicability of examples--and such generality is the aim since this study's concern is with universal properties of languages-- is underwritten by my work with a range of languages. Lastly, since first-order observations must precede higher-level generalizations, Part II is primarily devoted to cataloguing certain major types of scene- and object-schematizations, while Part III abstracts their common properties and determines the larger system in which these take part. Thus, the reader more concerned with theoretical demonstration and systematic principles can skip directly to Part III and infer many of the

particulars described earlier.[1]

2. The Fine-Structural Level of Language

The fact that this analysis will focus on only one subdivision of language, its "fine-structural level," calls for some justification. In a study of how conceptual material is represented in language, one must distinguish two main levels, each with possibly distinct properties and organization. One of these is the macroscopic expository level. Here, within the scope of a sentence, a paragraph, or a whole discourse if need be, one can convey conceptual content of any sort, including feelings, local gossip, and practical medicine--or indeed, the organization of space, time and causality. The main resource for this level is a language's stock of open-class lexical elements--i.e., the stems of nouns, verbs, and adjectives.

The second level, which can be characterized as the fine-structural, is that of closed-class "grammatical" (as distinguished from "lexical") forms--including grammatical elements and categories, closed-class particles and words, and the syntactic structures of phrases and clauses.[2] These forms also represent conceptual material, but from a much more limited array. They do not refer to items of gossip or medicine. They represent only certain categories, such as space, time (hence, also form, location, and motion), perspective-point, distribution of attention, force, causation, knowledge state, reality status, and the current speech event, to name some main ones. And, importantly, they are not free to express just anything within these conceptual domains, but are limited to quite particular aspects and

[1]I am indebted to Herb Pick, Charles Fillmore, Jennifer Lowood, and Eileen Eastman for their editorial comments on content and style in earlier drafts of this manuscript.

[2]The linguistic term "open-class" refers to any set of elements, e.g., noun stems, that is quite large in number and can rather readily add new members. "Closed-class" is applied to a set of elements--e.g., verbal inflections for tense, pronouns, prepositions--that are relatively small in number and fixed in membership.

combinations of aspects, ones that can be thought to constitute the "structure" of those domains. Thus, the closed-class forms of a language taken together represent a skeletal conceptual microcosm. Moreover, this microcosm may have the fundamental role of acting as an organizing structure for further conceptual material (including that expressed by the open-class elements)--as if it were a framework that the further material is shaped around or draped over. More speculatively, this language-based microcosmic selection and organization of notions may further interrelate with--and even to some degree constitute--the structure of thought and conception in general. Hence, the importance of determining the fine-structural level's representation of various conceptual domains--and in particular that of space, under study here, which itself may play a central role by functioning as a (metaphoric) model for the structuring of other domains.

An illustration can be given of the exclusive nature of the fine-structural system--the fact that only certain notions and not others are permitted representation--with this example of spatial descriptions that one person might give to another while standing at the edge of a field:

(1) a. This field is plowed in concentric circles. Look at the middlemost furrow. There is a pit dug at one point of it. The plow you are looking for is in that pit.

Here, a complex set of spatial configurations and relationships are conveyed in an expository paragraph. That may well be the only way to do so. But now consider another expository description, one that seems comparable to (a) except that it is still more complex:

b. This field has two borders that are relevant to us. These two borders are roughly parallel and don't coincide. Any perpendicular line between them would run crosswise to the pull of gravity--i.e., would be horizontal. We're standing at one point of one border. There's a point on the other border that's roughly on a perpendicular line drawn from our point. The plow you're looking for is at that point.

What is special in this case is that all the spatial information can be equivalently conveyed in English by a single closed-class word, the preposition across, as in: (b') "The plow is across the field." Contrariwise, there is no word that represents the spatial information in (a), a word that

would function like the hypothetical preposition apit in: (a') "*The plow is apit the field."[3] Moreover, a search through the world's languages would probably turn up no cases of a closed-class element representing the (1a) configuration, whereas the (1b) configuration is clearly well represented. What is it about some spatial configurations, but not others, that makes them cross-linguistically suitable for fine-structural representation, and hence foundational status? This study will research the properties common to such special forms.

The fact that this study, for the sake of accessibility, draws mainly on English to demonstrate points about spatial fine-structure will necessarily involve us in a treatment predominantly of prepositions. However, the points made are selectively ones that apply generally to the comparable closed-class elements of other languages as well--hence, also to space-indicating noun affixes, postpositions, adpositional phrases based on a noun, affixes on the verb, etc.

II. BASIC SPATIAL DISTINCTIONS MADE BY LANGUAGE

3. The Primary Breakup of a Spatial Scene

One main characteristic of language's spatial system is that it imposes a fixed form of structure on virtually every spatial scene. A scene cannot be represented directly at the fine-structural level in just any way one might wish--say, as a complex of many components bearing a particular network of relations to each other. Rather, with its closed-class elements and the very structure of sentences, language's system is to mark out one portion within a scene for primary focus and to characterize its spatial disposition in terms of a second portion (as treated in this section), and sometimes also a third portion (treated in Section 5), selected from the remainder of the scene. The primary object's "disposition" here refers to its site when stationary, its path when moving, and often also its orientation during either state.

[3] For readers not familiar with the asterisk notation in linguistics, it indicates that an expression is somehow amiss, whether grammatically or semantically ill-formed, or inadequate to an intended meaning.

3.1 Characterizing One Object's Spatial Disposition in Terms of Another's

The spatial disposition of a focal object in a scene is largely characterized in terms of a single further object, also selected within the scene, whose location and sometimes also "geometric" properties are already known (or assumed known to an addressee) and so can function as a reference object. The first object's site, path, or orientation is thus indicated in terms of distance from or relation to the geometry of the second object. For example, in the sentences

(2) a. The bike stood near the house.
b. The bike stood in the house.
c. The bike stood across the driveway.
d. The bike rolled along the walkway.

the bike's site is characterized in (a) by near, in terms of distance from the house's location ("proximal"), and in (b) by in, in terms of the house's location and geometry ("co-locational" + "part of interior"). The bike's site and orientation are characterized in (c) by across, in terms of the driveway's location and geometry ("co-locational" + "one's length perpendicular to the other's width"), while the bike's path is expressed in (d) by along, in terms of the walkway's location and geometry ("co-locational" + "co-linear with the long axis"). Throughout characterizations of this sort, it remains implicit that the second object can be used as a reference only by virtue, in a recursive manner, of its own known spatial disposition with respect to the remainder of the scene. This is to say that those spatial characterizations that are expressed overtly (as with prepositions) ultimately rest on certain unexpressed spatial understandings.

The distinct referencing functions that have here been isolated for a scene's two main objects are seen generally, though not absolutely, to correlate with other property differences between the two objects. The alignment is as follows:

(3)

	Primary Object	Secondary Object
a.	has spatial variables to be determined	acts as a reference object with known spatial characteristics
b.	more movable	more permanently located
c.	smaller	larger

	Primary Object	Secondary Object
d.	conceived as geometrically simpler (often point-like)	taken to have greater geometric complexity
e.	more salient	more backgrounded
f.	more recently on the scene/in awareness	earlier on the scene/in memory

It might be argued for cases like (2) that language simply relates two objects in space without any inequality of status, i.e., without one serving as reference for the other. But the semantic reality of their functional difference can be demonstrated simply by interchanging their nouns in a sentence-pair like the following:

(4) a. The bike is near the house.
b. The house is near the bike.

One could have expected these sentences to be synonymous on the grounds that they simply represent the two inverse forms of a symmetric spatial relation. But the obvious fact is that they do not have the same meaning. They would be synonymous if they specified only this symmetric relation--i.e., here, the quantity of distance between two objects. But in addition to this, (a) makes the nonsymmetric specification that the house is to be used as a fixed reference point by which to characterize the bike's location, itself to be treated as a variable. These nonsymmetric role assignments conform to the exigencies of the familiar world, where in fact houses have locations more permanent than bikes and are larger landmarks, so that (a) reads like a fully acceptable sentence. The sentence in (b), on the other hand, sounds quite odd, and is thereby well flagged as semantically distinct from (a). Since the assertion of nearness is unchanged, the reason for the difference can only be that (b) makes all the reverse reference assignments, ones that in this case do not happen to match the familiar world.

It might at first be thought that certain grammatical constructions, e.g., the reciprocal, are means available in a language specifically to avoid assigning different referencing roles, which otherwise are inescapably imposed upon a basic proposition in formulations like (4). But in fact, the reciprocal does not abstract the symmetric relation common to the inverse asymmetric forms, but rather adds the two together. This is shown by the fact that the reciprocal for the preceding example:

(5) The bike and the house are near each other.,

sounds odd in just the same way as (4b) itself, i.e., because of the implication that the house is somehow a floating entity to be fixed with respect to a stable bike.

3.2 Figure and Ground

The distinct roles played by the "first" and "second" objects just described for linguistic schematization are, it is clear, closely related to the notions of "Figure" and "Ground" described in Gestalt psychology, and the same terms can appropriately be applied to them. Thus, in examples (2a, b), bike functioned as the Figure and house as the Ground. But for their specifically linguistic application, the Figure and Ground concepts must be given the following particular characterization:

(6) The Figure is a moving or conceptually moveable object whose site, path, or orientation is conceived as a variable the particular value of which is the salient issue.

The Ground is a reference object (itself having a stationary setting within a reference frame) with respect to which the Figure's site, path, or orientation receives characterization.

In a linguistic context, the term Reference Object may at times be more suggestive than Ground, and in fact will hereafter be used interchangeably with it.[4]

In a linguistic context, the Figure and Ground notions amount to semantic roles or "cases," in the sense of Fillmore's

[4]Other linguists working on space have described notions similar--though generally not identical--to these, and have employed different terms for them. Thus, Gruber's (1965) "theme" and Langacker's (1979) "trajector" are quite comparable to my Figure, while Langacker's "landmark" compares with my Ground. Fillmore's (1968) "Patient" includes, but is more general than, the present Figure notion, but he has no analog to my Ground, as discussed next.

(1968) "Case Grammar." The present notions, in fact, compete with those of Fillmore, and certain advantages can be claimed for them. Full comparison aside (see Talmy, 1978a, pp. 646-648), one main difference is that four Fillmorian cases--"Locative," "Source," "Path," and "Goal"--because they incorporate particulars of direction, fail to capture the crucial spatial factor they have in common, their function as reference object for a figural element, a function specifically delegated to our Ground notion. Further, because it names separate cases for several different incorporated directionals, Fillmore's system is open to question over how it can handle novel directional distinctions that some language might mark or directions that do not clearly fit any established case; for example, should the directionals represented by the prepositions in The ball rolled across the crack./past the TV./around the lamp. all be classed as "Path?" By identifying a core Ground notion, our system can set up a separate Directional component for the various attendant path types--one that can, within universal constraints, expand or contract and exhibit somewhat different structurings as appropriate for each particular language. This separation, moreover, corresponds to the usually encountered division of morpheme classes, where the Ground notion is expressed by a noun root (plus any modifiers) and the Directional notions by closed-class elements such as noun affixes or adpositions (including prepositions).

4. Figure and Ground Geometries and their Relations

The particular spatial schemas ascribed to Figure and Ground objects by closed-class elements of languages can be specifically termed "geometries," and their basic types and distinguishing features can be regarded as a map of the kinds of spatial discriminations language is concerned with.

One major feature of this "map" is that spatial elements generally characterize the Figure's geometry much more simply than the Ground's. The explanation for this can be found in our very mode--in large part presumably innate--of conceiving, perceiving, and interacting with the contents of space. In this mode, our predominant concern is with a smaller portion of focal interest within a broader field and, often also, with a determination of that portion's spatial relation to the

field, so that we can achieve direct sensory (or imaginal) contact with it. The very concept of the "location" of an object within space--with its implication of an immediate containing region itself cross-indexed within the space--owes its existence and character to this cognitive mode. And "localizing" an object (determining its location), in turn, involves processes of dividing a space into subregions or segmenting it along its contours, so as to "narrow in" on an object's immediate environment. Accordingly, elements like prepositions largely delineate a field and the reference objects therein with some particularity, while typically treating the focal object as reducible simply to a geometric point. Nevertheless, some spatial elements do indicate greater Figural complexity, and their types are analyzed in Sections 4.1-4.2.

A further general feature of the distinctional "map" is that objects are not characterized as to just any properties of physical configuration or makeup. Missing from the catalog of geometric types that follows, for example, are virtually all properties specific to metric spaces (including the Euclidean) such as particular size, length, distance, angle, or contour, as well as more substantive properties like texture, material, or identity. Instead, the objects are characterized almost solely by more qualitative or "topological" properties such as their type of structural conformation, degree of subdivision ("partiteness"), number of relevant dimensions, boundary conditions, and symmetry vs. distinguishability of parts.

4.1 The Geometry of a Figure and a Ground Related within a Scene

Though the seeming majority of spatial elements schematize the Figure solely as a point or related simple form, in contrast with the treatment given the Ground, there is a type that accords the Figure a full geometry, and relates it to that of the Ground. Elements of this type can in fact represent a quite elaborate spatial complex, simultaneously indicating a particular geometry for the Figure, another one for the Ground, the Figure's position or path with respect to the Ground, and the concurrent relation of the Figure's geometry to that of the Ground, i.e., its orientation thereto. An example of this type is the English preposition across, as in

(7) The board lay across the railway bed.

The preposition here indicates that the Figure (the board) is linear, that the Ground (the railway bed) is "ribbonal"--i.e., a plane bounded along two parallel edges--and that these two forms bear certain positional and orientational relations to each other, summarized as follows:

(8) (F = the Figure object; G = the Ground object)

a. F is linear (and generally bounded at both ends).
b. G is ribbonal (a 2-edged plane).
c. The axis of F is (and the axis of G is typically, but not necessarily) horizontal.
d. The axes of F and G are roughly perpendicular.
e. F is parallel to the plane of G.
f. F is adjacent to--not in--the plane of G.
g. F's length is at least as great as G's width.
h. F touches both of G's edges (without this stipulation, the conditions so far would also fit this contiguration | ┼).
i. Any extension of F beyond G's edges is not enormously greater on one side than on the other, nor than the width of G itself.

If one or the other of these factors fails to hold in a referent situation, then some preposition other than across must be used. For example, if the Figure is not adjacent to the plane of the Ground but is part of it, then the preposition in is more appropriate (9a); if the Figure's axis is not perpendicular to that of the Ground but rather parallel to it, then along is more suitable (9b); or if the Figure's length is not great enough to span the Ground's width, then on is more fitting (9c):

(9) The board lay (a) in (b) along (c) on the railway bed.

4.1.1 Relative Orientation

Prepositions of the across type can generally be used even in situations where a Figure's site is already known, in which case they shed their locating function and serve solely to indicate orientation with respect to the Ground. They are then equivalent to expressions like crosswise to, which always indicate orientation alone:

(10) The gate was set across/crosswise to the pier.
The gate was set along/parallel to the pier.

4.2 The Range of Geometries of the Figure Object

Looking over those linguistic elements that relate a full Figure geometry to one for a Ground, we find represented a certain array of Figural geometries more complex than just a point. One type here seems universal. Languages allow a term referring to a point Figure that is in motion, and therefore describing a linear path, to apply as well to a linear Figure moving co-axially along the same path, and sometimes also to a stationary linear Figure positioned in coincidence with such a path, as in these English examples:

(11) i) motion of a point Figure ii) co-axial motion of a linear Figure iii) co-axial location of a linear Figure.

a. i) The ball rolled... ii) The trickle flowed... iii) The snake lay... across the railway bed.
b. i) The ball rolled... ii) The trickle flowed... iii) The snake lay... along the ledge.
c. i) The ball rolled... ii) The trickle flowed... iii) The snake lay...around the tree trunk.
d. i) The ball rolled... ii) The trickle flowed... iii) *The snake lay...past the rock.
e. i) The ball rolled... ii) The trickle flowed... iii) *The snake lay...through the tube.
f. i) The car drove... ii) The stream flowed... iii) *The road lay...from Burney to Redding.

While a stationary linear Figure as such is excluded from some terms' reference, (as in 11d, e, f), it can be rendered suitable there if it is conceptualized as having a leading edge that is in virtual motion, or as being scanned along its length by one's focus of attention--as is generally indicated by verbs that unlike lie, suggest movement:

(12) This road runs past the factory/extends through the tunnel/ goes from Burney to Redding

Reference to a moving point or line may be considered more basic than reference to a stationary line because, to take just one indication, the terms in (11) with only one such reference apply to the motion case. Accordingly, we can reinterpret the linear-locative across case in (8), even with its elaborate features, as derived in some way from the moving case:

(13) A point moved across a bounded plane.
→ a line was-located across a bounded plane.

Although there is thus some question whether linear Figure geometry has any original (non-derivative) reference, at least by English prepositions, some of the latter do genuinely indicate other non-point Figural geometries. One preposition, over, in one usage represents the Figure as planar, further specifying that it is largely co-extensive with and everywhere touching a planar Ground (or a salient planar part of a Ground), as in:

(14) The tablecloth lay over the table.
The tapestry hung over the east wall of the living room.

And a group of prepositional expressions characterizes the Figure as a distributed quantity--indifferently, either as a continuous mass or a composite aggregate. These expressions further distinguish the Figure as having a one-, two-, or three-dimension distribution in agreement with the dimensionality of the Ground:

			The Ground is:
(15)	There was milk	all along the ledge.	--linear
	There were droplets of milk	all over the table.	--planar
		throughout the aquarium.	--volumar

(Note that over and all over behave in the distinct ways outlined here and are not interchangeable).

4.3. The Range of Geometries of the Reference Object

In accordance with our mode of cognizing space, linguistic closed-class elements--while they usually treat the Figure as a point or simple extension thereof--mark an elaborate range of geometric distinctions for the Reference Object (Ground). Certain main types in this range are surveyed here and in the next section.

In one such type, the Reference Object's "partiteness" is marked, in degrees increasing from unity to comminution. Thus, in one series of English prepositions, the Reference Object is treated as a single point by near:

(16) a. The bike stood near the boulder.;
as a point-pair by between:
b. The bike stood between the boulders (i.e., two of them).;
as a set of points--more than two, but typically not very many--by among:
c. The bike stood among the boulders.;
and as an aggregate mass--i.e., a set of points that are numerous enough, and closely enough spaced relative to their size, to approximate or be conceptualized as a continuous mass--by amidst:
d. The toy bike stood amidst the wheatstalks.

As a kind of limiting case for this series, through in one of its motion usages characterizes the Ground as anything from an aggregate on up to a continuous mass, a range that can be generalized as forms of a medium:

e. The tuna swam through the minnows/the seaweed/the polluted water.

Another group of prepositions--usually referring basically to motion--represents the Reference Object as one or another kind of integrated geometric configuration. Thus, in approximate terms, the Ground is characterized by across as a bounded plane:

(17) a. The bike sped across the field.;
by through, in another of its usages, as a linear enclosure--i.e., as a kind of cylindrical form:
b. The bike sped through the tunnel.;
and by into as a surface so curved as to define a single volume:
c. The bike sped into the sports hall.

Languages other than English often mark different, sometimes additional, geometric distinctions for the Reference Object, ones that can seem quite exotic from our perspective. The class of space-characterizing elements in these languages is not always one of prepositions, or even postpositions, adjacent to the noun that indicates the Ground. Thus, Atsugewi, a California Indian language that I have worked on, has a set of suffixes appearing on the verb that mark some

fifty distinctions of Ground geometries and the paths that relate to them. Some dozen of these suffixes mark distinctions covered by, but finer than, the English preposition into (the "+" below indicates that the form must be further followed by a suffix indicating 'hither' or 'hence;' the superscript vowel represents a special phonological element of this language):

(18)

-iċt	'into a liquid'
-cis	'into a fire'
-isp -u· +	'into an aggregate' (e.g., bushes, a crowd, a rib-cage)
-wam	'down into a gravitic container' (e.g., a basket, a cupped hand, a pocket, a lake basin)
-wamm	'into an areal enclosure' (e.g., a corral, a field, the area occupied by a pool of water)
-ipsn^{u} +	'(horizontally) into a volume enclosure' (e.g., a house, an oven, a crevice, a deer's stomach)
-tip -u· +	'down into a (large) volume enclosure in the ground' (e.g., a cellar, a deer-trapping pit)
-ikn +	'over-the-rim into a volume enclosure' (e.g., a gopher hole, a mouth)
-iḱs^{u} +	'into a corner' (e.g., a room corner, the wall-floor edge)
-mik·	'into the face/eye (or onto the head) of someone'
-miċ$_{u}$	'down into (or onto) the ground'
-cis^{u} +	'down into (or onto) an object above the ground' (e.g., the top of a tree stump)
-iḱs	'horizontally into (or onto) an object above the ground' (e.g., the side of a tree trunk)

While perhaps reeling from the semantic pyrotechnics of a language like Atsugewi, we should not overlook the additional distinctions that English does mark, not with distinct forms, but with distinct combinations of and constraints on its forms. For example, in referring to entry of an enclosure, either in or into will serve:

(19) a. in(to): 'into [an enclosure]'
I ran in the house/into the house.

But there is a separate usage, referring to passage through an opening in an enclosure's wall, that can be expressed only by in, not also by into:

b. in: 'through {an opening} into an enclosure'
I crawled in the window/*into the window.

And there is a third usage, for which only into will serve, indicating impact with a solid object:

c. into: 'into collision with {an object}
I ran into the wall/*in the wall.

Moreover, while English has such geometrically encompassive forms as in/into--spanning geometric situations as different as immersion amidst liquid and encirclement by a curved plane--it does also possess forms with finer specifications, ones that thus more closely approximate the Atsugewi-type forms. For example, inside, unlike in/into, can refer to enclosures, but not also to liquids:

(20)

The ball {is in / fell into} the water.		*The ball {is inside / fell inside} the water.	
The ball {is in / fell into} the box.		The ball {is inside / fell inside} the box.	

4.4 Biased Reference-Object Geometries

While the preceding Reference Object geometries have all been in a certain sense "regular," with homologous parts or aspects not distinguished from each other, a major group of space-characterizing elements makes appeal to a Reference Object's having some form of asymmetry, or biasing, in its structure. Either it has structurally distinct parts--parts that in themselves are distinguishable from one another and can form the basis of spatial discriminations--or it has some kind of non-reversible directedness.

4.4.1 Biasing of Parts

The prepositions in Section 4.3 did not appeal to a Reference Object's having any parts with distinguishable identities. In the use of across with reference to a field, for example, there is no a priori singling out of one edge of the field as the starting point over the other edge as terminus; and in the use of through with a tunnel, one end of the tunnel is as good as the other. But in other cases, the important factor is distinguishable parts. Typically, objects have such parts in opposed pairs. Objects with only one such pair are a round clock with a front and a back or a silo with a top and a bottom. A three-way pair distinction is shown by a TV or a person or a building--all having a front and a back, a right and a left, and a top and a bottom. A partially different three-way pattern is usually ascribed to an object like a lizard, with a head (front) end and a tail (rear) end, an upper (dorsal) side and an under (ventral) side, and a right and a left. The types of objects that exhibit such differentiation of parts range from the integral forms just mentioned, to composite objects like a line of people, to objects of geographic extent like a fairground or the plane of the earth. A general way to characterize the present kind of geometry is that here (at least) one part of an object is uniquely identifiable without any external indicators--either because that part has its own distinguishing characteristics or because it has a distinct relation to the structure of the whole object.

Contact with a biased part. Expressions that refer to a Reference Object's parts in order to localize a Figure divide into three kinds according to the amount of separational distance that they indicate. In one kind the Figure is in contact with--either within the substance of or simply touching--the physical part singled out from the Reference Object. In English, the part thus named is treated as a regular noun and--because of its function within the noun phrase--therefore usually occurs after the:

(21) The mosaic is {on the front of / on the back of / on the (right/left) side of} the church.
The boy is in the front of the line.
The carousel is in the front of the fairground.

Adjacency to a biased part. The second type of expression uses a Reference Object's part to indicate the volume of space, or portion of terrain, immediately adjacent to it, and localizes the Figure within that region. In such expressions in English, the words front and back have no the before them:

(22) The bike is { in front of / in back of/behind / on one side of/beside / on the right/left of } the church.

The police officer is in front of the line.
The parking lot is in front of the fairground.

That these expressions indicate relative adjacency to the Reference Object is shown by the fact that they cannot be used to localize Figures that are at a greater distance. For example, a bike that is directly lined up with the front of a church but is three blocks away cannot be said to be "in front of" the church.

Notice that the human body, while no doubt the prototype for the ascription of biased geometries to many other objects, is not treated as any kind of special case in many languages, including English. Thus, in the examples above, the word church can be replaced by me without any disruption of the spatial indications or the expressions' grammaticality (except that perhaps a preferable alternative to on the right/left of me is on my right/left).[5]

[5]On the basis of a broader range of expression in English--such as on the east side of, on this side of--the word side in one of its usages can be considered a general term for referring to the region adjacent to a particular Reference Object part. Accordingly, the specialized expressions in (22) can be considered equivalent to fuller expressions containing the word side as follows:

in front of = on the front side of
in back of/behind = on the rear side of
on the right/left of = on the right/left side of

At some distance from a biased part. The third type of expression is like the second type except that the adjacency condition is removed. The Figure is localized in a particular quadrant by reference to some Reference Object part, but it is at any remove. The fact is that this type is poorly represented in English. Perhaps only to the right/left (note use of to), as in The bike is to the right of the church (anywhere from 3 feet to 3 blocks), really serve in this sense. Rearwards of might just work for the back direction, as in The bike is rearwards of the church, but forwards of will certainly not do for the front direction. In general, conveying these concepts requires lengthy expressions, and then ones that are not neutral to distance but in fact indicate non-adjacency, as in The bike is a ways off from the front of the church.

4.4.2 Biasing in Directedness

A non-symmetric directional sense can attach to some axis in an object whereby it is possible, within the object alone, to characterize a path of motion along that axis as occurring in one direction or its opposite. In some cases, a directed axis runs between a biased pair of opposed parts in the object, so that a path's direction can be characterized by either of the two biased systems. Thus, in equivalent formulations, ahead can make appeal to a queue's front-to-back directedness, while toward the front appeals to parts-biasing:

(23) a. John moved ahead in the line.
b. John moved toward the front of the line.

In other cases, an object has only some associated directional sense (or set of senses) lacking any real correlation with opposed parts. In one form of this, the object incorporates a unidirectionally moving portion that can serve as a reference for directedness, as in the case of a stream with its one-way flow of water against which another object's path sense can be indexed:

(24) John swam upstream.

(Here, any association with a stream's biased end-points--its source or mouth--seems semantically unrealistic in normal

usage.) Otherwise, directednesses associated with an object are distinguished by reference to the object's overall Gestalt, as in this next case.

4.4.3 The Earth as Reference Object with Biased Geometry

The earth is regularly used as a Reference Object in languages' systems for structuring space, and as such is--along with the human body--the most important case of a biased geometry. It generally encompasses a three-way opposition like that of English up and down, north and south, east and west.

In theory, one could consider the biasing in these oppositions to be based either on distinguishable parts or on directednesses. Under the former interpretation, one would single out such reference portions of the earth as the north and south poles or an "East" and "West" (i.e., an eastern/western horizon, coast, land mass, etc.), so that in saying The balloon floated north(ward)/east(ward)/..., one would be referring to motion toward the north pole, toward the East, etc. Similarly, indication of an object's vertical motion in the air, as in The balloon floated up/down, might appeal to a concept of movement toward or away from the surface of the earth--while indication of an object that also moves within the ground, as in The oil drill moved up/down, might evoke the earth's center as a reference point. However, our everyday usage of earth-based geometry generally seems more to appeal to a sense for certain directednesses implicit throughout earth-associated space, or to a use of the familiar visual backdrop as a reference for such directednesses. Possibly even when the form of a spatial expression suggests singled-out reference points, a predilection for directionality could prevail, so that both John drove north and John drove toward the north would be felt equally as involving pure directedness.

The earth can also be used as a Reference Object to characterize not location or path, but the orientation of a Figure with a more complex (especially linear) geometry. Section 4.1.1 considered such orientations generally with respect to any Reference Object, with English here using expressions like along/parallel to, or across/crosswise to, that require indication of the particular Reference Object involved. When the earth provides the reference geometry, however, a language usually furnishes special locutions to indicate orientation, ones that do not call for explicit mention of the earth or its geometric delineations. Thus, instead of locutions like "parallel/crosswise to the (earth's) up/down direction," we find these special forms:

(25) The beam is vertical/horizontal.

5. Characterizing Location by More than One Reference Object

The spatial expressions so far have made their semantic indications with respect to a scenic division of only a first order of complexity. They have characterized a Figure's disposition on the basis of just a single Reference Object, whose internal characteristics alone sufficed for the task--whether involving a non-biased or biased geometry, as in:

(26) The bike is near/ in/ behind the church.

But language also permits easy reference to more complex Reference Object configurations. Most frequently, these involve the distinction between a primary Reference Object, one that has the same syntactic position and largely the same semantic role as the single Reference Objects studied up until now, and a secondary Reference Object, which in many cases is not explicitly named but merely implied by a particular spatial term. Such further Reference Objects are considered here under two categories: those that "encompass" the primary Reference Object and those wholly outside it. Only their capacity to localize a Figure is considered; Figural path and orientation arise by extension.

5.1 Encompassive Secondary Reference Object

One type of secondary Reference Object, generally with a biased geometry based on directedness, encompasses the

primary Reference Object; i.e., its directional senses permeate--can be referred to throughout--the environment of the primary Ground. A simple example of this type is a queue, with its back-to-front directionality, when it contains a primary Reference Object within it, as in:

(27) John is ahead of Mary (i.e., in a line).

To localize the Figure, John, we here need to know not only the location of a primary Reference Object, Mary, but also the directionality of a second object that is distinct from and, in the present case, encompassive of it, a queue. The prepositional phrase ahead of implies just such an exterior line-up and is, moreover, appropriate regardless of the direction "Mary" is facing. If there were no queue and Mary were the sole Reference Object, a more suitable spatial expression would be in front of, though now Mary must actually face John.

The commonest secondary Reference Object of the encompassive type is the directed space set up by the earth. This can be used to localize a Figure object at any of the three removes from the Reference Object discussed earlier, as in:

(28) The mosaic is on the east wall of the church.
(physical contact with a part of the primary Reference Object)
The bike is on the east side of the church.
(location in a region adjacent to the primary Reference Object)
The bike is east(ward) of the church.
(location at an unspecified remove from the primary Reference Object)

As with the contrast between ahead of and in front of, an expression like on the east side of implies the presence, relevance, and identity of a secondary Reference Object, whereas an expression like on the left side of--despite the

identity of syntactic form between the two--makes no such implications. The "left" expression makes appeal to nothing outside the primary Reference Object itself, referring only to one of its distinct parts in order to narrow down the locale of the Figure. The "east" expression, however, requires looking outside the main Reference Object, to the arrangement of the earth's orientations, in order to effect a comparable narrowing down of locale. In this process, it still, however, does not name the earth overtly, as ahead of mentioned no queue, and the earth's axes are indicated much less saliently than the primary Reference Object, without their own independent noun phrase. The vertical axis plays a comparable backgrounded role as a secondary Reference Object in a whole paradigm of English expressions, those in (29). Together, these constitute another series, like those in Section 4.3, where the primary Reference Object varies along some dimension. As arrayed from left to right here, these expressions imply a decreasing relevance of the primary Reference Object's other--non-verticality-related--characteristics to the localization of the Figure.

		(a)	(b)	(c)	(d)	(e)
(29)	upward directed	on the top of	on top of	over	above	higher than
	downward directed	on the bottom of	under-neath	under	below	lower than[6]

[6]The major contrasts between these forms can be outlined as follows. The forms in (a) do not strictly belong to the present paradigm because they make no direct appeal to earth-based verticality as a secondary reference. They refer to intrinsic parts of the primary Reference Object regardless of the object's current orientation (though these parts are named for their canonic orientation with respect to the earth) Thus, a fly that is "on the top of" a TV that happens to be lying on its side now flanks the TV rather than being uppermost on it. A fly that is "on top of" this TV--using (29b's) the-less expression--would be uppermost on it, resting on its side panel.

Footnote 6 (continued)

The forms in (b) indicate a Figure's physical contact with the primary Reference Object, in particular with that portion of it that is most extreme, in either direction, with respect to the earth-based vertical dimension--e.g., The seagull is on top of the boulder, which indicates that the bird is touching the uppermost part of the rock. The forms in (b) share with those in (c) and (d) the indication that the Figure and the Reference Object are vertically aligned--i.e., that a single up-down line could be drawn through the two objects--but it differs from them in indicating physical contact, which they both deny.

The (c) forms differ from those of (d) in seeming to suggest a location that is closer to the Reference Object, a location that is somehow more related to or "in the sphere of" the Reference Object, and one that is in a direct line of sight with the Reference Object without other objects in the way. Thus, The seagull is over the boulder seems to suggest that the bird is closer to the boulder or is about to relate to it in some way (e.g., alight on it or pick off some food from it) than the same sentence with above would do. The use of above in The seagull is above the fog bank would be preferable to the use of over when the idea to be conveyed is that the bird is clear of the fog, and thereby out of relation to it. And the use of above is mandatory in The sixth floor is above the first floor, because there is intervening matter.

The (e) forms differ from the preceding three groups in that they do not necessarily indicate vertical alignment. Thus, The seagull is higher than the top of the tree does not require that the bird be directly over the tree. All these four groups of forms tend to exhibit "slippage" toward the right. For example, while underneath predominantly suggests physical contact, it can also be found functioning like under. And above is often found used like higher than with the indication of vertical alignment relaxed.

Here, as in all semantic analysis, care must be taken not to confuse separate senses of a word. Thus, the 'surface-covering' meaning that over has in Hang the calendar over the hole in the wall, which would be lacking if above were the preposition used, is a distinct sense described for over in Section 4.2 and should not be confounded with its verticality sense. This latter reappears when the context is changed to render the surface-covering meaning impossible, as in Hang the microphone over (= above) the large hole in the wall.

Again, spatial expressions that at the surface appear entirely similar--like the English single-word prepositions in and over can be of quite different semantic types. One type characterizes location in terms of the geometry of a single object, e.g., in the box appeals only to the box's defining of an interior space. The other type uses two objects, e.g., over the box appeals not only to our knowledge about the box--in this case, not its geometry, only its location--but also, though less saliently, to our knowledge about earth-based upward directedness.

A number of spatial terms are extremely covert in their incorporation of a secondary Reference Object role for earth-based orientations, in particular for the vertical dimension or its complement, the horizontal plane, as in (30). For some terms, e.g., (30d), the implication of a secondary reference is so subliminal, that one is surprised to learn of its having any role at all. Because of these additional covert references, terms like in and across that were earlier treated, in a simplified way, as not looking outside the primary Reference Object must be seen as actually somewhat more complex.

(30) a. across: The plane can have any orientation, but the path must be horizontal.: The fly walked across the tabletop./across the blackboard from right to left/*across the blackboard from bottom to top.

b. past: The path must be horizontally to one side of, not over, the primary Ground.: The bullet flew past my head, grazing my temples./*grazing my pate. (contrast Italian passare, which is indifferent to this horizontal/vertical distinction).

c. around: The path involves a horizontal deviation from straightforward horizontal motion--complementing over/under's indication of a vertical deviation from such a motion.: I went around versus over/under the fence.

d. in: The primary Ground object that surrounds the Figure cannot merely enclose it but must also contain it--i.e., also provide a support underneath it counter to gravity. The egg is in the bowl sitting face up on the table./*The egg is in the overturned bowl (--under is required here).

5.2 External Secondary Reference Object

The other type of secondary Reference Object is one that is wholly outside the primary object, exhibits a range of often non-biased geometries, and is generally expressed by an independent nominal, thereby exhibiting a degree of salience comparable to that of the primary object. One type of such an external secondary Reference Object functions like a geometric point that singles out the particular portion of the primary Reference Object that is nearest to it, where this portion in turn serves to localize an adjacent Figure:

(31) a. The bike is on the side of the church toward the cemetary.
b. The bike is on the cemetary side of the church.

This type of secondary Reference Object can also be the body, in its current location, of the utterance's speaker him/herself, a case for which English (among many languages) provides specialized locutions:

(32) a. The bike is on this side of the church. (on the side toward me).
b. The bike is on the other side of the church. (on the side opposite the side toward me).

Another type of external secondary Reference Object involves a localizing process similar to that of the encompassive forms. In all expressions of the type John is ahead of/east of/over Mary, the location of the Figure ("John") is ascertained by--conceptually, perceptually, or with physical motion--beginning at the primary Reference Object ("Mary") as a starting-point and then proceeding along a path determined by the secondary Reference Object ("ahead in a queue"/"toward the east"/"upward") until encountering the Figure. In a similar fashion, an external point-object can be used as a guide by which to establish a Figure-encountering path:

(33) a. The bike is toward the cemetary from the church.
b. The bike is this way (i.e., towards me) from the church.

The implication of locutions such as these is that the Figure is located somewhere along the line between the primary and the secondary Reference Objects. While we can here still distinguish which object is "primary" and which is "secondary" on the basis of syntactic homology with the cases where this is clear:

(34) X is east of Y (=primary Reference Object)
X is toward Z from Y (=primary Reference Object),

the distinction is here beginning to blur, since both objects receive comparable prominence from their equal expression as nominals. The external object and the Figure-encountering path that it determines can be geometrically more complex than just a point and a straight line towards it. In English, virtually the whole range of Ground and path geometries with terms to specify them can also be used as external secondary references:

(35) The bike is across the street/down the alley/around the corner from the church.

Moreover, such geometric indications can be strung together in a sequence to make up a quite complex Figure-encountering path:

(36) The bike is across the street, down the alley, and around the corner from the church.

The implication in locutions of the (35) and (36) type is that the Figure is at the end-point of the specified path; some special phrase, like somewhere (along the way), must be added to counter this implication. In reaching locutions such as these, we can perhaps no longer speak of a "primary" or a "secondary" Reference Object, but now must speak in terms of a starting point and a multiply-determined path, all together functioning as a Reference Complex by which to localize the Figure.

5.3 Generation of an Exterior Reference-Frame by a Secondary Object

Considering again the case of a point-like object acting as a secondary external reference, a special further circumstance can hold where the object has a biased geometry. This biasing can be conceptualized as radiating out beyond the object, thereby defining a reference frame. Where the object is movable--the usual case--the reference frame is relative to the object's current position and orientation. The commonest object of this sort is a person, especially one of the participants in a speech event. The clearest illustrations emerge where there is no geometric interference from the primary Reference Object--i.e., where this object itself has no biasing in the relevant dimensions, like a silo or a tree with no intrinsic front, back, right, or left. Thus, in a sentence like

(37) The bike is to the right of the silo.

it is the speaker or hearer whose intrinsic front/back/right/left extends out and defines a framework by which the Figure is localized with respect to the primary Reference Object (the silo). Notice that the framework thus generated by an external point object behaves, with respect to the way that a localization is effected, just like the permanent encompassive type of secondary reference discussed in the previous section.

5.4 Imputed Biasing--From a Secondary Reference Object to a Primary One

We just saw that the reference-frame generated by an external object--the speaker or hearer--can have its left-right (lateral) orientation applied to a primary Reference Object, e.g., a silo, in sentences like The bike is to the right/left of the silo. Now what about the front-back orientation? A perfectly consistent extension of the pattern for right/left would be to place the bike on the opposite side of the silo from the speaker/hearer with the sentence

(38) a. The bike is in front of the silo.

and between the speaker/hearer and the silo with

b. The bike is behind the silo.

This consistent use of the generated reference-frame is in fact exactly what some languages, e.g., Hausa, employ. In English, however, a spatial phenomenon wholly distinct from any seen so far is involved. Rather than simply sitting amidst an external orientational frame, the primary object has a biased geometry imputed to it, one that is derived by mirror-image reversal from the secondary object (the speaker/hearer). It, in effect, has acquired its own front and back, and its front now faces that of the donor object. With this additional factor, The bike is in front of the silo now means that the bike is between the silo and the speaker/hearer. Notice that this phenomenon takes place only for the front/back axis, not also for the lateral one, which remains as described earlier.

The distinction in how these "in front of"/"in back of" references are conceptualized--with the primary Reference Object as "facing" or "aligned" with the speaker or hearer--has been studied cross-culturally by Clifford Hill (1975). He has used test situations like placing a glove, a ball, and a bat in a row extending away from the subject and then asking "What is in front of the ball?" His findings are that 2/3 of school children and 90% of graduate students in America respond as if considering the primary Reference Object to face toward them, while 90% of Hausa subjects treat the object as facing away from--i.e., aligned with--them.

6. Further Distinctions: Four Imaging Systems and an Additional Dimension

The descriptions I have presented so far in Part II represent just one part of a much broader complex in language for structuring the domain of space-time. A brief outline here can help to indicate further parts of the complex. I have succeeded in identifying four systems in language, encoded at the fine-structural level, that characterize different kinds of relationships among entities within space or time. These can be called language's four "imaging systems." These systems are largely independent, with each adding a distinct conceptual dimension to those of the others. Each system offers a range of alternative structural characterizations, among which a speaker chooses so as to convey a particular conceptualization of a scene. The first system, the one dealt with in this chapter, specifies geometries: abstract geometric characterizations of objects and their relationships to each other within different reference frames.

f. A point move "alength" a bounded extent, in a bounded extent of time.
(The ball rolled across the rug/ through the tube in 10 seconds.)

f'. A point move from-to a point-pair, in a bounded extent of time.
(The ball rolled from the lamp to the door/ from one side of the rug to the other in 10 seconds.)

f". A point move a distance, in a bounded extent of time.
(The ball rolled 15 feet in 10 seconds.)

g. A point move along-to an extent bounded at a terminating point, at a point of time/in a bounded extent of time.
(The car arrived at the house at 3:00/in 3 hours).

h. A point move from-along an extent bounded at a beginning point, since a point of time/for a bounded extent of time.[7]
(The car has been driving from Chicago since 3:00/ for 3 hours.)

The second imaging system specifies "perspective point"--the point within a scene at which one conceptually places one's "mental eyes" to look out over the rest of the scene--and characterizes its location, distance away, and mode of deployment. A scene's geometric structuring, set by the previous imaging system, is largely independent of these perspectival indications. One ready illustration here involves the difference between a steady-state long-range perspective point with synoptic scope of attention, and a moving close-up perspective point with local scope of attention. The former of these is indicated in a sentence like There are a number of houses in the valley by the use of such closed-class elements as the plural -s with its agreeing are, the preposition in, and the presence of a quantifying constituent (a number of). The latter perspectival mode, on the other hand, is expressed in There is a house every now and then through the valley by

[7] The Spanish prepositions hasta and desde exactly capture these (g) and (h) notions--for both space and time--of motion or temporal continuation along an extent bounded at only one end, so that hasta Chicago means 'as far as/up to Chicago' and hasta 3:00 means 'until 3:00,' while desde Chicago means 'from Chicago and onwards' and desde 3:00 means 'since 3:00.'

While I have discussed only those characterizations that apply to physical objects within space, by looking at the distinct dimension of time, we can see that language applies much of the same "geometric" structuring to that dimension as well, as evidenced by these spatial-temporal homologies in English:

(39)

	Space	Time
a.	A bird sat along the ledge.	I sneezed (once) during the performance.
	a point located on	a bounded linear extent
b.	Birds sat all along the ledge.	I sneezed all during the performance.
	points distributed	over a bounded linear extent
c.	This road goes as far as Chicago.	He slept until she arrived.
	a linear extent bounded by a point at its further end	
d.	This road extends for 3 miles.	The performance lasted for 3 hours.
	a bounded linear extent measured for length	

The temporal dimension viewed in its integral functioning with the spatial domain yields the special conceptual complexes of "stationariness" and "motion," only partially dealt with earlier. See Talmy (1975) for fuller treatment. In analysis of this conjunction, a certain small set of primitive station/motion formulas--ones that seem to underlie all more complex characterizations of stasis and movement in language--appears to emerge universally, formulas that can be represented schematically as:

(40) a. A point be-located at a point.
(The ball lay on the rug/in the box.)

b. A point move to a point, at a point of time.
(The ball rolled onto the rug/into the box at exactly 3:05.)

c. A point move from a point, at a point of time.
(The ball rolled off the rug/out of the box at exactly 3:05.)

d. A point move via a point, at a point of time.
(The ball rolled across the crack/past the lamp at exactly 3:05.)

e. A point move along an unbounded extent, for a bounded extent of time.
(The ball rolled down the hall/along the ledge/around the pool for 10 seconds.)

its elements, the singular a with its agreeing is, the preposition through, and a temporally distributive constituent (every now and then), with the indication that one is to cognize this identical scene as if with a temporal sequence of close-up inspections. This latter type, with movement of a perspective point rather than of an object within a scene, has already been noted twice, once in (12) over the virtual-motion effect of expressions like This road extends through the tunnel, and once in Section 5.4's discussion of localizing a Figure by means of a Figure-encountering "path," as in expressions like The bike is down the alley from the church. It is possible that a treatment of perspective point should also include the obverse of this moving scan over a stationary scene, namely the "freeze-frame" phenomenon, where one fixes on a "snapshot" taken from the path of an actually moving object. This is seen, for example, in expressions reporting on a courier's progress: He's through the tunnel!, past the guardhouse!, into the bunker!, where the path-point fixed upon is the one that follows immediately after completion of the path indicated by the preposition.

The third imaging system specifies the particular "distribution of attention" to be given to a referent scene from an indicated perspective point. It affords alternative patterns of primary and secondary, etc., as well as minimal, focus upon different elements within essentially the same scene. This system is the one responsible for establishing among selected objects within a scene the roles of Figure, primary Reference Object, and secondary Reference Object, treated at length above. It also involves setting the particular level--out of several hierarchically nested levels that can be present--upon which to place main focus in attending to a Gestalt, e.g., that of a freckled boy, as in:

(41)

	Main focus is on:
a. There are freckles on the boy's face.	--the level of finest detail
b. The boy's face has freckles on it.	--the mid-scope level
c. The boy has freckles on his face.	--the framing level

This system also functions to indicate that minimal focus should be directed to some portion of a scene. It does so by

omitting explicit reference to that portion under conditions where its presence is nevertheless fully implied, as in (42a) where the middle portion of a path is de-emphasized, and in (43a) where an obviously necessary agent is excluded from the framing of a scene:

(42) a. The crate fell out of the plane into the ocean.
(beginning and end of path)
b. The crate fell out of the plane, through the air, into the ocean.
(full path)

(43) a. My cufflink finally turned up at the bottom of the hamper.
(event alone)
b. I finally turned my cufflink up at the bottom of the hamper.
(event plus agency)

(The second and third systems here are discussed further in Talmy, 1978b, though a full treatment awaits exposition).

The fourth imaging system indicates "force dynamics," i.e., the ways that objects are conceived to interrelate with respect to the exertion of and resistance to force, the overcoming of such resistance, barriers to the exertion of force and the removal of such barriers, etc. Such indications, which seem mostly to reflect our kinesthetic/somesthetic sensory modality are additional to and largely independent of the other three systems' indications, which together mostly reflect our visual modality. This system's operation is seen, for example, in the difference between a force-dynamically neutral expression like The ball rolled along the green., which depicts an instance of motion simply as an autonomous occurrence, and a force-implicational expression like The ball kept rolling along the green, for which one reading suggests that the ball had a natural tendency toward rest that was being overcome by an external force toward movement (such as a breeze). See Talmy (1976) for some elaboration, though a full description of this extensive system awaits subsequent writings. As this brief outline indicates, the material in Part II should be taken as only part of a much broader description of language's structuring of space and analogical dimensions.

III. SCHEMATIZATION IN THE REPRESENTATION OF SPACE

We have just seen some of the basic geometric concepts that are distinguished by the spatial expressions of language, and therefore are now in a position to investigate the more abstract properties that govern this representation. As indicated in the Introduction, a fundamental character of the way that space is represented at language's fine-structural level is that it is schematic. That is, only particular selections of all the aspects present in spatial scenes are actually referred to by linguistic elements, while all the other aspects are disregarded. These remaining aspects can vary indefinitely without any effect on the choice of linguistic elements to represent the scenes. Thus, every fine-structural spatial expression actually represents a family of spatial configurations that all share certain abstractable characteristics.

7. The Basic Properties of Individual Schemas

The particular schematic abstractions that are represented by individual spatial expressions, such as English prepositions, can be called schemas, and their properties can be investigated at three levels. The first is that of the components that go to make them up. The present chapter is too limited to treat this level adequately, so I simply note here that schemas are largely built up from such rudimentary spatial elements as points, bounded and unbounded lines, bounded and unbounded planes, and the like, and that these elements are governed by properties pertaining to their combination, coordination, cancellability, etc. The second level, treated in this section, is that of the properties pertaining to the behavior of whole individual schemas. The third level, treated in Section 8, involves the relationships that individual schemas have to each other within the larger system of schema usage.

7.1 Idealization

The actual, "literal" referent of any spatial expression, such as an English preposition, is a particular assemblage of primitive geometric components in the form of an abstract schema. This schema, however, must be conceptually applied to a full, repletely detailed referent. The term idealization will refer to this process of "application," where a referent

spatial entity is conceptually idealized in terms of a schema applied to it. Idealization, thus, includes the process by which familiar objects, in all their bulk and physicality, are differentially "boiled down" to match ascribed schemas. The cognitive nature of these processes must yet be worked out for the operation of language in particular, but they will no doubt resemble processes of Gestalt-psychological functioning or those operative in the drawing of stick-figures by children.

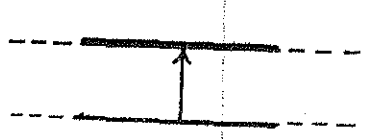
Some typical cases of the linguistic idealization process are these: Idealization occurs where a physical object with one dimension much greater than the other two, say a pencil or a person or a skyscraper, is conceptualized as a line--as when used with the preposition along (An ant crawled along the pencil./The snake slithered down along the performer./ The outside elevator rose along the skyscraper.); or where a bulk form with some concavity in it, such as a birdbath or a volcano, is conceptualized as a planar enclosure of volume--as when used with the preposition in (the water in the birdbath/the lava in the volcano); or where a roughly equidimensional bulk, e.g., a boulder or a planet, is conceived as a single point--as when used with the prepositions from or near (a pelican 20 feet from the boulder/an asteroid near the planet).

Idealization can be illustrated more fully with the schema specified by across in its usage referring to a path of motion. As an approximate verbal characterization (consult the diagrams in 45), this is:

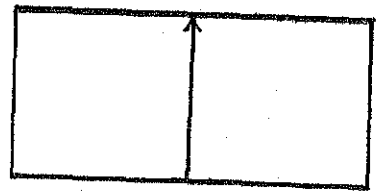
(44) across schema: (motion along the whole length of) a horizontal path-line that runs perpendicularly from one edge to the other of a planar object bounded by two opposite parallel edges, where this plane is "not laterally collapsible."

The last phrase in this characterization refers to the relative lengths of the plane's two dimensions. The dimension running parallel with the two edges cannot be so short, compared to the path-line dimension, that it can be conceptually collapsed into that line itself, leaving the plane regardable as one-dimensional. Thus, the edge-aligned dimension may be indefinitely long, as in the case of a river being crossed, schematized in figure (45a). Or it can be about the same length as that of the path-aligned dimension, as with a tennis

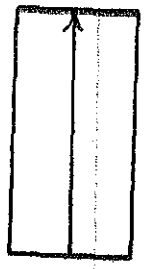
(45)



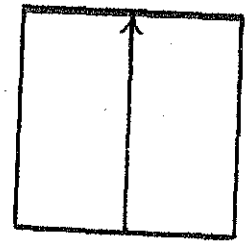
a. across the river



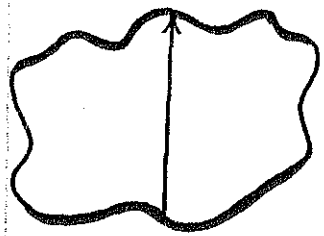
b. across the tennis court



c. *across the pier



d. ?across the swimming pool



e. across the lake

(For each plane, the two opposite edges that the path touches are drawn with bolder lines.)

court being crossed, diagrammed in (45b). But it cannot be relatively short, like the narrow dimension of a pier that is being traversed in the longer direction (45c). Such an arrangement makes the referent object more idealizable as a line that is co-oriented with the path, a configuration for which the schema associated with along is more appropriate. The critical range within which the edge-aligned dimension becomes "too" narrow is a matter yet to be worked out. Within normal usage, it may well be that the across schema becomes inapplicable where the edge-aligned dimension is at all perceptibly shorter than the path-aligned dimension, as in the case of a pool being swum in the longer direction, depicted in (45d). Taken as an abstract whole, the across schema thus requires that a physical object be idealizable--in accordance with a path made with respect to it--as a plane with certain orientational and boundary conditions and with dimensions whose relative lengths obey certain constraints. This case thus shows that a schema can act like a filter passable to only some physical objects--i.e., an integrated set of factors that test for an object's reducibility to a particular complex of schematic elements.

7.2 Abstraction

"Abstraction" is one way to name the complementary property to idealization. While idealization involves finding within a physical object the delineations that correspond to a particular schema, abstraction involves ignoring the rest of the object. Thus, in the use of across, it is of no consequence whether a referent object lacks side boundaries, as in the case of a river (45a above), or has them, as with a tennis court (45b). Equally irrelevant is whether the plane is a liquid layer (the river) or a solid surface (the court). Thus, the characterizability as a two-edged plane, that across calls for, classes together a multifarious set of objects. The difference between these objects is abstracted away from--hence, can be disregarded for this particular categorization.

7.3 Topology

The degree to which language's spatial schemas abstract away from physical characteristics is even greater than suggested so far. Not merely does a schema attend only to geometricized delineations within a physical object. Not

merely are physical bulk forms within an object idealized down to the points, lines, planes, etc., of the schema (with the remainder disregarded). But also a schema abstracts away from any specificity as to shape (curvature) or magnitude for these points, lines, and planes--and hence, also from any specificity as to angles or distances between them as they relate within the schema. This sort of further abstraction is characteristic of the spatial relations defined within the mathematical field of topology. It is metric spaces, such as classical Euclidean geometry, that observe distinctions of shape, size, angle, and distance. Distinctions of this sort are mostly indicated in languages by full lexical elements--e.g., square, straight, equal, plus the numerals. But at the fine-structural level of conceptual organization, language shows greater affinity with topology. (One might further postulate that it was this level--and its counterparts in other cognitive systems--that gave rise to intuitions from which the field of topology was developed). We can illustrate linguistic topology now under two of its characteristics. See Talmy (1978b) for further discussion.

7.3.1 Irrelevance of Shape

It is easy to see that spatial elements generally permit wide ranges of shape variation. For example, the use of in requires that a Reference Object be idealizable as a surface so curved as to define a volume. But that surface can be squared off as in a box, spheroidal as in a bowl, or irregular as in a piano-shaped swimming pool; it can be open over a whole quadrant as in the preceding examples, or closed to form a complete enclosure as in a shed; and it can be an unbroken solid as in the previous examples, or have gaps, like a cupped hand, an open-work basket, or a house with its doors and windows open. As we see, none of these variations of physical manifestation affect the use of in. Likewise, the two edges called for by the across schema need not be neat parallel lines. One can also swim "across" a lake, where the opposed "edges" are highly curved and full of irregularities, as suggested in Figure (45e).

Freedom of shape applies not only to the Reference Object itself but also to paths characterized with respect to it.

Consider through in its use referring to a linear path within a medium. Not only is the "medium" free to range from a fluid ("through the water") to a dispersed aggregate ("through the timber"), but the path can take most any contour:

(46) I arced/zig-zagged through the woods.

That is, regardless of whether the path constitutes a straight line, an arc of a circle, or a set of zigs and zags, no change of preposition is called for. Through suffices for them all, simply because the abstraction that it refers to is insensitive to such further properties.

7.3.2 Irrelevance of Magnitude

To a large extent, languages distinguish the same spatial characteristics for small objects and distances as for great ones. This is not simply a necessary fact, one just to be presumed. It would be very easy to imagine that objects capable of fitting in one's hand and broad geographic terrains, say, might have very different spatial characteristics of relevance to humans and that language forms would reflect such differences. Yet, the evidence is that very much the same spatial structures are distinguished all along the size spectrum, a fact which then testifies to the overall unity of our linguo-cognitive spatial system. To illustrate, consider these two sets of sentences:

(47) a. The lamp stood in the box.
The man stood in the barn.
The building stood in the valley.
b. The ant crawled across my palm.
The man walked across the field.
The bus drove across the country.

Here, the range in the size of a Reference Object, from a palm to a country, and the corresponding range in the length of the path travelled, are irrelevant to the choice of schema-specifying preposition.

Comparably, the use of the spatial terms this and that--indicating objects relatively nearer and farther from the speaker--can be equally used in the two sentences

(48) This speck is smaller than that speck.
This planet is smaller than that planet.

Again the difference in size between a speck and a planet, and the difference in the distances involved--from millimeters to parsecs--is irrelevant to the use of the spatial terms.

8. Relationships Among Different Schemas

We have been looking at the properties of single spatial schemas considered in isolation. But every language makes available not one, but many schemas, all constituting different configurations within the same conceptual domain, that of (objects in) space. What are the principles that govern the speaker's selection from among these schemas to make a particular reference? What are the semantic relations between the different schemas? And what relation does the schema-set bear to the spatial domain as a whole? These questions are now explored.

8.1 Alternatives in Schematization

Because of the nature of idealization as applied to a physical entity--i.e., where all those characteristics of the entity not pertinent to a particular schema are disregarded as irrelevant--it is generally the case that among those very characteristics will be some that are relevant to other schemas. Thus, different schemas can usually be applied with equal appropriateness to the same physical configuration, capitalizing on different sets of characteristics contained in the configuration--and, correspondingly, disregarding different sets. We can observe two forms of such alternative schematization.

8.1.1 An Object Participating in Different Spatial Configurations

In one form, a single physical entity can be participant in several different spatial configurations and thereby be subject to alternative schematizations. Thus, a single box can have a dish on it, a ball in it, and a doll 20 feet away from it (whether on different occasions or concurrently). The dish's 'on' relation requires of the box that it have a horizontal plane uppermost on its bulk, but disregards any other features of that bulk--in this case, e.g.,

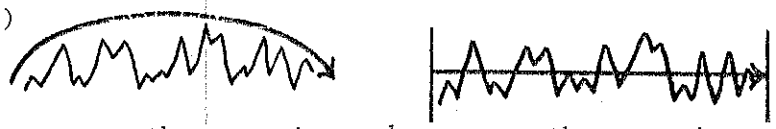
it cares not at all that the box has an interior space. By contrast, the ball's 'in' relation requires this latter feature of the box, but is neutral to whether or not one of the box's sides (as opposed to its open face) is turned topmost so as to provide a surface for something to be 'on.' The doll's 'away from' relation to the box is indifferent to either of the preceding two spatial conformations and is sensitive only to whether the box's bulk is localized enough, rather than overly distributed--relative to the separational distance involved--that it can be treated as a single point.

8.1.2 A Single, Invariant Spatial Configuration

In the second type of case, the same physical configuration, without any variation in its contents, is nevertheless open to alternative schematizations. Consider the example of a wheatfield with a man going from one side of it to the other. This configuration is complex enough to allow different schematizations. If we say that the man went across the wheatfield, then we are abstracting forth one aspect of the wheatfield complex, the fact that it has a horizontal bounded land parcel, and are disregarding the fact that there is wheat growing atop this land. If, on the other hand, we say that the man went through the wheatfield, then the wheatstalks, conceived together as constituting a medium, are abstracted forth from the whole physical complex, and now the presence of a land surface underneath, horizontal and bounded, is irrelevant.

The flexibility afforded by the linguistic processes of idealization and topology allow even further latitude for imaging a physical configuration in more than one way. Consider, for example, a cluster of mountains and a path that goes from one edge of the cluster to the opposite edge. If the mountains are thought of in terms of their elevation above the ground, the preposition over is best used, coding for a path schema something like that diagrammed in (49a). If, however, the mountain crests are thought of as defining a sort of plateau within which the path resides, then the preposition across is wholly appropriate, as indicated in diagram (49b). In either case, we should note the immense degree of abstraction from the actual physical details present for such a situation--an index of our cognitive capacity for idealization.

(49)



a. over the mountains b. across the mountains

Another case of alternativity falls directly out of section 4.4's discussion of biasing types. The arrangement where an object with intrinsic biasing is positioned within the earth-based reference-frame automatically permits alternative characterizations of location. Thus, a bicycle that is to a church's right might alternatively be characterized as located east of the church.

Two non-obvious examples of alternativity now can round out our characterization. A person standing some five feet away from and pointing to a bicycle in a driveway has the option of saying either "Get this bicycle out of the driveway!" or "Get that bicycle out of the driveway!". This and that, in effect, set up a conceptual partition in space and suggest that an indicated object is on the same side of the partition as the speaker, or on the opposite side, respectively. The point here is that the single spatial configuration of speaker, bicycle, and driveway allows for the imposition of either of these two partitioning schemas, in accordance with the speaker's conceptualization of the scene.

And, referring to the single situation of a bin full of cabbage heads, one could say either "The cabbage in the bin is all turning brown" or "The cabbages in the bin are all turning brown." That is, this particular physical configuration allows schematization either as a mass quantity, conceived of without internal differentiation (indicated by use of the grammatical singular for the Figure), or as a set of discrete items, conceptualized with a network of divisional spacing running throughout (as indicated by the grammatical plural form).

In the cases of alternativity just reviewed, it is the speaker that selects one schema over another from those available and applicable, and it is thus the speaker that determines the highlighting of one group of factors or of another. In this choice, the speaker is presumably responding to preferences of emphasis or viewpoint, or to some sense of differential importance or salience among the features of a configuration. But the determiners of, and the degree of consciousness involved in, the selection await investigation.

8.2 Culture or Language "Pre-Selecting" among Alternative Schematizations

While in the preceding cases it was in the speaker's province to select among alternative schemas that could all equally be applied to a given spatial situation, in certain cases the culture or the language requires one particular way of looking at the situation over other possibilities. In effect, the option of selecting a preferred emphasis or viewpoint is removed from the speaker in these cases--a linguo-cultural "pre-selection" among the potential alternatives has already been made.

For example, the spatial relations of a passenger to a car or to a bus seem enough alike that for either vehicle a speaker should have the option of imaging the passenger as being either in the vehicle as a whole (an enclosure) or on some surface within it (a platform--e.g., seat or floor). But for everyday speech, English requires that a car be schematized as an enclosure, so that a rider necessarily is in or gets into or out of this vehicle, whereas a bus is schematized as a platform, so that a passenger must be on or get onto or off of it. This latter idealization has some historical appropriateness, since it was originally applied to topless carts and stages, but it has since frozen into a fixed image inflexibly imposed on the new object. True, the use of the bus floor as a walkway is a salient part of the bus scene, lacking in that for a car, which might perpetuate its schematization as a platform. But this is not necessarily a determining factor--German has also pre-schematized cars and busses, but treats them both as enclosures. And in any case, the point demonstrated by the bus case is the necessity (in everyday speech) of using the platform schema over the enclosure one, and the pre-selectivity on the part of English that this shows.

While the preceding case showed a contrast of schematization within a single language/culture, some pre-selections of schematization are so pervasive throughout the local context that they can easily go unnoticed until one steps over to another language/culture. Thus, our linguo-cultural view of a table has us regard the tabletop as comprising the table's essential geometric character, with the legs merely as incidental appendages. Thus, a ball thrown across from one person to another between the legs of a table is said to be thrown under the table. In Atsugewi, by contrast, a table can be

regarded as tabletop plus legs all taken together as a volumar configuration, so that the same ball would be said to be thrown through the table. The option for such an idealization is not present for English speakers--and may rarely have even been envisioned. Similarly, we saw above that English gives the option of referring either to a Reference Object's inherent geometric biasing, or to the earth's, to localize a Figure: A bicycle on the church's right side or east side. But the option to refer to earth geometry turns out to be available only where the primary Reference Object is permanently positioned, as a church. Localization done with respect to a mobile object like a person can generally make appeal only to the object's intrinsic biasing and not also to compass points:

(50) a. the bicycle just to my right/*just east of me
b. the itch on my right arm/*on my east arm

By contrast with English, the Native American language Wintu is reported to avoid reference to any intrinsic right/left laterality, even for mobile objects, and instead to refer in fact to earth-based geometry (Harvey Pitkin, personal communication). That is, the speakers of this language would say "My east arm itches."

It is difficult to resolve whether "pre-selection"--i.e., constraints on options in schematization--is a purely formal aspect of a language's rule system or is always originally due to some psycho-cultural exigency that has become conventionalized in language usage. It may be that there are cases of both types. Thus, we would probably want to appeal to different cultural emphases in mode of perception to account for the distinct understandings of the phrase "in front of" generally found among Americans as opposed to Hausas (Section 5.4). The case for culturally different emphases is supported by Hill's (1975) observation that individuals' understanding of the phrase is not uniform throughout each culture, but is a matter of proportion, one that in fact varies according to age. On the other hand, one might want to ascribe to pure linguistic formalism the fact that the option for viewing cabbage as either a mass or a discrete aggregate--The cabbage(s) in the bin is (are) all turning brown (Section 8.1.2)--is not available for celery, which has only the 'mass' option (i.e., without resort to expressions like "stalks of"), nor for Brussels sprouts, which has only the 'aggregate' option:

(51) The celery in the bin is/*The celeries in the bin are
*The Brussels sprout in the bin is/The Brussels sprouts in the bin are
--all turning brown.

That is, it may seem that at issue here is purely the formal assignment of particular lexical items to one or another noun-type (to the "mass" or the "count" noun-type). Even here, though, the psycho-cultural question enters. The assignment of lexical items to noun-types might not be simply arbitrary, as "purely formal," implies but rather reflect cultural norms of imaging physical material--norms that respond to an object's size, its frequency of occurring together with other like objects, its resolvability into some substance-like homogeneity, and so forth.

8.3 Disjunctiveness of the Alternative Schematizations

A fundamental characteristic of schematization at the fine-structural level is its disjunct, rather than continuous, mode of representation. Thus, a language can have nothing like a "schema continuum"--i.e., an array of directly expressible schemas, with each differing from its neighbors by only one feature or feature value in a fairly continuous way. Rather, each language uses a small set of "quantally" separated schemas with which to represent all possible spatial configurations. Each schema in such a set differs from the others by a number of features simultaneously. This lack of "in between" forms is not a flaw in the organization of language, but an apparently necessary--perhaps even superior--design feature that is compensated for by other properties, as discussed below.

The lack of ready expressions for the whole range of interstitial spatial configurations means that a speaker does not have the expressive freedom at the fine-structural level to convey just the right schematization with just the right emphases for his current way of conceptualizing a particular spatial form. At this level, therefore, languages exhibit a failure of precision. Particular instances of such failure can be grouped into two types: cases of overspecificity, where the closest available schemas specify more than what the image in the speaker's mind calls for, and cases of underspecificity, where the nearest schemas specify less than the speaker would like to indicate about his image.

8.3.1 Overspecificity of the Closest Available Schemas

To illustrate overspecificity, one spatial configuration for which all the prepositionally indicated schemas in English are too specific is: a linear path located on only a portion of a roughly horizontal plane without boundaries in the region of consideration. The path can, for example, be that of a man taking a walk, and the plane can be a prairie. How is one to express this configuration using a preposition? One cannot with full appropriateness say "He walked across the prairie" because across implies the presence of two opposite borders and a path that spans the full breadth between them--a physical arrangement lacking in the present case. Similarly, one cannot say "He walked along the prairie," which implies a narrow-strip shape for the plane, nor "He walked over the prairie," which implies an upbulging curvature to the plane, nor "He walked through the prairie," which implies the presence of a medium atop the plane (compare the wholly appropriate "He walked through the sage-covered prairie"), nor finally "He walked around the prairie" (comparable to "He walked around the track"), which implies a narrow-strip plane with a curvature in the horizontal. In fact, the present configuration falls "in the cracks" between the schemas represented by English prepositions, all of them too specific for it. What would be needed is a new English preposition, say, "aflat" as in "He walked aflat the prairie," that refers to nothing more property-laden than a path located on a plane.

Another example of a configuration "in the cracks" in English is a path extending from one end to the other of a narrow-strip shaped plane, such as a walk from end to end on a pier. It is not wholly appropriate to say here "He walked along the pier" because along implies the absence of end points to the path--this sentence would normally be understood to involve walking only a partial distance along the pier. Again, a new preposition would be needed to capture the exact configuration involved, for example that in "He walked alength the pier."

8.3.2 Underspecificity of the Closest Available Schemas

An immediate example of the underspecificity circumstance can be seen in the earlier case of the "wheatfield" (8.1.2). One spatial configuration into which this object can be idealized is a horizontal bounded plane with an associated medium atop it. But there is no single English

preposition that captures the relationship of a horizontal path to this relatively complex configuration. A speaker using either of the two closest prepositions, as in "He walked across the wheatfield" or "He walked through the wheatfield," must choose between omitting reference to the bounded plane character of the object or to its medium-like character. To specify the more complex schematic referent, we would again need a new preposition, one like that in "He walked through-cross the wheatfield."

For a more elaborate example, consider the diverse possible configurations of points on a plane. English has two ready expressions to schematize these. One, consisting of a quantifying term plus the preposition on, indicates the number of points present, but not their spatial distribution:

(52) There is a dot-- // There are several/some/many/fifty dots--
--on the board.

The other expression, involving a simple plural plus the prepositional phrase all over, as in There are dots all over the board, cannot be used with a quantifier to indicate number: *There are several/some/...dots all over the board; but it does indicate a certain range of spatial distributions--roughly, those for which every subregion of the plane has at least one point in it, with the size of subregion used for this assessment depending on the total number of points present. Notice that the all over schema does not require a great density of points--at the lower limit, just a few will suffice as long as they have the requisite distribution. Contrariwise, numerosity alone does not ensure that the all over schema will apply--a multitude of points could be present, but all concentrated in one region of the plane, thus lacking the necessary distribution. Now, between these two expressions, all possible configurations of points on a plane are encompassed: there are no "cracks" in the coverage. But this broad applicability is won by giving up greater specificity. There is no direct way to indicate both number and all-over distribution at once. And there are no direct expressions to indicate any distribution other than the all-over type, such as when points on a plane occur in clusters, or in concentric circles, or in some density gradient.

8.4 Means for Getting "In Between" Disjunctive Alternatives

We have seen that any language has only a small set of closed-class elements that code for a similarly small set of schemas. These cannot possibly refer directly with precision to the myriad of conceptualizations of spatial configuration that a speaker can have in mind to convey. We must therefore ask what processes there might be by which a listener can come to form some of the same conceptualizations that the speaker has. I point to four such processes here.

8.4.1 Cancelling Features of Overspecific Schemas

An overspecific schema includes one or more features that are inappropriate to a speaker's understanding of a particular spatial configuration. In a case where all the available schemas are overspecific, one procedure available to the speaker is simply to proceed with the use of one of the schemas regardless, without making any additional correctives. The listener's understanding of the spatial configuration, derived in part from the context to that point (see "Image-Constructing Processes" below) can engender a cancellation or suspension of the schema's non-fitting features. Thus, on hearing "He ran across the boulevard for 5 seconds, and then stopped in the middle," a listener can gather from the context that the runner's path did not reach the opposite side of the street. That is, he understands that everything about the across schema applies to the referent configuration except the feature 'path terminates on opposite border.' Similarly with the earlier "prairie" example, a speaker could simply settle on using across to say "He walked across the prairie" and count on the hearer to suspend all three inappropriate features: 'the plane has two opposite boundaries', 'the path originates on one boundary,' and 'the path terminates on the opposite boundary.'

Note that where a schema is too specific for what a speaker desires to convey about some spatial configuration, but nevertheless is wholly appropriate thereto--i.e., has no non-fitting features--it cannot be used with the expectation that the hearer will suspend the undesired features. No feature-cancellation will occur--the speaker must use other means. Thus, a speaker wanting to remain inspecific about which of a trip's two end-points was the start and which the finish cannot use from...to, as in "She drove from San Diego to San Francisco last night," and expect the hearer to feel

ignorant about the direction of the trip. He may instead take advantage of the availability of another spatial expression, one that is specifically origin- and terminus-neutral, that in: "She drove between San Diego and San Francisco last night."

Significant to the understanding of language organization is the fact that the use of a word that expresses an overspecific schema, and hence that calls for feature cancellation, can sound forced or awkward. This contrasts with the full acceptability of a word whose schema has been involved in processes of idealization or topological shifts, as described earlier (7.1-7.3). That is, language is apparently so organized that the processes involved in feature-cancellation are not as free to operate as are "flexibility"-type processes, though it must nevertheless be recognized that there is some structural provision for them to occur.

8.4.2 The Use of Open-Class Elements

A major linguistic means for the expression of spatial configurations, outside of the possibilities of the closed-class elements, is in fact afforded by a language's open-class elements. While these may not play a fundamental structuring role at the fine-structural level, they do provide hundreds of particular, sometimes idiosyncratic characterizations of space. English examples of such forms are nouns like zig-zag and spiral, adjectives like concentric and oblique, or verbs like ricochet and streak ("Paint streaked her cheeks"). Their use can be integrated into the regular constructions involving closed-class elements, as in a sentence like "There's a spiral of dots on the board," or can figure in distinct constructional types of their own, as in "The board is streaked with dots."[8]

[8]To this open-class group in English belong a number of "dispositional" verbs that characterize how certain complex geometric objects, including the human body, enter a variety of configurations and, in some cases, relate spatially to further reference objects: bow, bend, crouch, squat, kneel (on), lie (on), sit (on), stand (on), lean (against), hang (from), huddle (together).

8.4.3 Image-Constructing Processes in the Hearer

At the comprehension end of communication, surely the most important means for arriving "between" morphenes' disjunct specifications is the hearer's "image-constructing" processes (no purely visual connotation is intended here)--occurring at what was called the "macroscopic level" in the Introduction. Uncovering the nature of these processes is one of the most significant tasks awaiting cognitive-linguistic research. What can be said so far, however, is that the hearer somehow combines the reference ranges of a sequence of grammatical and lexical elements with each other and with his understanding of the world and of the current speech situation in a way that there emerges a fairly detailed image, one taken to be close to what the speaker wanted to convey. The image may go through revisions as more is heard or more is called up from general knowledge. Of note here, though, is that this image will in general be of considerably greater specificity than the explicit linguistic references themselves. For example, person A hearing from person B that "There are dots all over the board" may combine his sense of the configurational range allowed by the all over schema with general expectations of how dense such a dotting might be (no one is likely to have applied hundreds of such marks) and with a knowledge of person B's tendency to become upset over minor matters and so to exaggerate, so as to come up with an image of a few chalk marks located here and there over parts of the board.

8.4.4 Elaboration of Descriptions by the Speaker

Within the domain of the speaker, surely the main property of language that enables finer characterization of a spatial configuration is that language permits an elaboration of references made to the same configuration. Such an elaboration can consist simply of a concatenation of descriptive specifications, such as "There are dots all over the board, and they increase in density toward the bottom edge." Or it can consist of bits of separate indications scattered through a discourse. Two theoretical points stand out about this elaborative property of language. The first is that while this property may be so taken for granted that it rarely draws explicit recognition, the fact is that it is not in principle a necessary aspect of linguistic organization. One can imagine a communication system in which every designation of a spatial configuration would be limited to a single

characterization by one of a small set of prepositions, and that would be all that could be expressed about that referent. The fact that a speaker can refer repeatedly and from different perspectives to the same referent is a positive, not a neutral, feature of language organization. Second, these elaborative processes for the speaker are not in principle symmetrically tied to the listener's image-constructing processes. The latter are indeed necessary if the former occur--they must gather and integrate into a single image the relevant references scattered through an utterance. But image-construction could play a role even with a fixed-format form of expression, for it would be needed to combine even such minimal indications with contextual and general information in a way that yielded a fuller picture.

Nesting: A special form of elaboration. We can take special note of one form of elaboration, "nesting," in which the output of one descriptive construction is cycled back as the input to another. We have a clear example of nesting in "There are clusters of dots all over the board." Here the phrase "clusters of dots," which is roughly equivalent to the full assertion "The dots are in clusters," constitutes a description of a first-level, more local spatial pattern in which certain dots configure. The elements of this pattern, the "clusters," can in turn be treated as new units to which a further spatial characterization is applied: that they are "all over" the board.

A subtler case of nesting also serves as a solution to the earlier "prairie" example's difficulty of expression. That example's special configuration can now be exactly captured by the locution "He walked along on the prairie." In this sentence there is an inner characterization "He walked along," whose element along is not a preposition relating a Figure to a Ground (as it would be in "He walked along the pier"), but is a verb particle that simply indicates a point Figure's line-defining forward progression. This self-subsistent motion event is then characterized as taking place "on" a prairie, the configuration that nests it. Since on makes no requirements as to boundaries for a planar Ground (as across does), the new nested locution is perfectly suited for the unbounded prairie case.

Note that because of nesting and the various concatenative forms of elaboration--employing both closed-class and lexical elements--it is possible to characterize extremely intricate

spatial configurations, for example: "There are some clusters of dots near the lower left of the board and streaks of dots all over the rest of the board, with an occasional spiral of dots located here and there."

9. The Way Language Represents Meaning--As Generalized from the Way it Structures Space

The presentation thus far--a survey of the basic spatial distinctions marked by closed-class elements and the properties that characterize them generally--has achieved, albeit with varying degrees of resolution, a form of descriptive comprehensiveness over one whole semantic domain, that of the structure of space and its contents. Through this purchase on one domain, we can now consider the system of semantic representation that is generally characteristic of language. It is by this system that language breeches an everpresent disparity--that between its finite and relatively small set of fine-structural elements representing an equally small set of disjunct schemas, and the indefinitely large perceptual and conceptual continuum potentially to be referred to. While Section 8.4 just treated several means built into language for getting "in between" such disjunct specifications, we further need to begin a description of the general character of this representational system.

It has traditionally been conceived that any closed-class system in a language--e.g., the set of space-characterizing prepositions in English or the set of object-indicating "numeral classifiers" of Chinese--constitutes for some semantic domain a classificatory system whose categories to a large extent are contiguous (start up nearby the boundaries at which others leave off), are exhaustive (leave few gaps), are mutually exclusive (exhibit little overlap) and, generally perhaps, are of roughly equal size. An image readily associable with such a conception is a two-dimensional array of adjacent "pigeonholes"--contiguous and exhaustive of their frame, well-partitioned, same-sized--where any particular item clearly fits into one pigeonhole or another. But this concept's actual applicability requires examination. At this point, I must introduce a particular semantic differential, with respect to which the examination is best carried out. The elements of a closed set tend to range along a specificity gradient from very general to very specific--examples among English prepositions might be near and across, respectively--where the more specific a term is, the narrower a band it

indicates on a greater number of semantic parameters simultaneously. It is the specific elements of a set that challenge the traditional classificatory concept and require attention in this regard.

Actually, the specific terms in some morpheme sets--e.g., in most sets of personal pronouns, kinship terms, and color terms--do largely behave in accordance with the traditional concept, over sometimes extensive portions of the whole domain. Thus, in a manner that is typical for the color domain in English, a term like pink--which denotes a rather specific range of colors that are red in hue, moderately high in lightness, and pale in saturation--neighbors the equally specific term lavender, from which it differs primarily in the parameter of hue and, along another dimension, neighbors a further specific term, rose, from which it differs mainly in lightness.[9] But what distinguishes morpheme sets like these is that their semantic domains--like the array of pigeonholes--are characterized by only a small number of dimensions or parameters, e.g., the domain of color terms by only hue, lightness, and saturation (plus, in most languages perhaps, a few parameters pertaining to the surface or object bearing the color). For such restricted domains, it is feasible for the number of even fairly specific terms to be quite low and still provide comprehensive coverage of the domain.

By contrast, the majority of semantic domains in language are "n"-dimensional, with "n" a very large number. For example, no fewer than the following twenty parameters are relevant to the domain of spatial configuration as expressed by closed-class elements such as English prepositions and deictics:

(53) a. division of a spatial configuration into Figure and Ground

[9] Over micro-portions of the spatial domain, even some small subsets among the English prepositions behave in the traditional contiguous-classificatory manner. Thus, across and along together form a two-member subset that schematizes most versions of a path extending over a bounded plane, with the venue of one preposition giving way to that of the other as the plane's ratio of axis-lengths changes in magnitude.

b. basic geometry of the Figure object
c. basic geometry of the Ground object
d. each geometry: symmetric or biased
e. biased geometry: based on an object's parts or its directedness
f. each geometry's number of relevant dimensions
g. each geometry's boundary conditions
h. each geometry: continuous or composite
i. orientation of the Figure with respect to the Ground
j. relative distance/magnitude of the Figure compared to the Ground
k. presence/absence of contact
l. Figure's distribution of substance relative to that of the Ground
m. presence of self-referentiality for a Figure-Ground configuration
n. presence of further Reference Objects
o. external projection of a secondary Reference Object's geometry
p. imputation of biasing onto a primary Reference Object
q. orientation of the Figure or Ground to the earth/speaker/other secondary Reference Object
r. further embeddings of one Figure-Ground configuration within another or concatenations of one upon another
s. perspective-point adopted from which to regard the configuration
t. change of the Figure's or perspective-point's location with respect to time (hence, paths of motion and perspectival scans)

With so many parameters, full domain coverage by fairly specific references would require thousands of distinct vocabulary items, and coverage by very specific references would require millions. Such an arrangement is not in principle impossible for a symbol system, but natural languages appear to be under a constraint that limits the number of distinct symbolic elements it can utilize, and in fact never exhibit systems of same-category elements in such numbers. Rather than a contiguous array of specific references, languages instead exhibit a smaller number of such references in a scattered distribution over a semantic domain. That is, a fairly specific reference generally does not have any immediate neighbors of equal specificity. This arrangement can be illustrated with Section 4.1's example of a board lying across a railway bed. The English preposition across here designates a rather specific spatial configuration with the nine or so properties

listed in (8), including the requirements that the board be horizontal, be perpendicular to the railway bed's axis, reach from one side of it to the other, and be adjacent to, but not in, the plane of the railway bed. Now what if a board bears all but one of these same spatial relations to the railway bed? It could, for example, extend horizontally and perpendicularly from one track to the other, but a little distance beneath them (hence buried in the bed) or above them, but not directly atop them. Across now no longer serves; but there are no equally specific prepositions, such as "acrinss" and "acrupss," to handle the new spatial configurations. All that English provides to refer to these configurations are such severely under-specific general terms as in and over, which can be used even if the board is not horizontal, not perpendicular to the tracks, and too short to span them. There is a large referential distance between across and the other specific prepositions of English such as around, through, alongside, underneath, past, beside. Thus, with English prepositions as the exemplar of semantic representation in general, we can say that, for the organization of relatively specific references in language, there appears to be at work a principle different from that of classification in the traditional sense of a continguous "pigeonhole"--like partitioning of semantic domains. The principle seems, rather, to be one of representativeness. The references are not exhaustive of these domains, but representative of them. In particular:

(54) With its stock of relatively specific morphemic references, a language must provide a sufficiently distributed and dense (but not too dense) dotting of semantic "n"-dimensional space--over individual semantic domains as well as over the whole.

The more general terms of a closed set--e.g., the spatial terms in and over, as used in the preceding railway example--appear to have a special form of functioning, one not much shared by more specific terms, in the way they represent elements of a scene. A key to understanding their functioning is found in the nature of the schematization process. A morpheme never specifies a referent as to the full detail in which it exists in fact, in perception, or in conception, but rather specifies a particular complex of aspects abstracted from the total referent. Nevertheless, a communicator generally wants to convey a complete picture of a

referent situation--i.e., to engender the emergence of a full image in the mind of an addressee. Such transmission is accomplished in language by a complementary pair of processes: the sender designates a whole with only a portion thereof, and the receiver "fleshes out" or "reconstitutes" the whole from this portion by the operation of his image-constructing processes (Section 8.4.3). The sender's process, which can be termed "part-for-whole designation," is a natural concomitant of schematization, and could have been treated in Section 7 along with the other concomitants, idealization, abstraction, and topology. As a particular feature of its operation, a speaker, in order to convey some referent at all, must at times resort to fastening upon any aspect of that referent for which there is some ready-to-hand term available in the language, whether or not that aspect is especially relevant to his larger discourse. Thus, in the railway example, if a board is horizontal, is perpendicular to and spans the railway bed, and happens to be buried therein, a speaker has no recourse but to utilize this last aspect, as in the expression the board in the railway bed, even if this aspect is wholly irrelevant, in order to designate the presence of the board's complex of spatial relations at all. This, then, would seem to be a major function of the more general terms in a language. Because their specifications are minimal, they refer to aspects present in a broad range of full conceptual complexes, and so can be seized upon so as to convey those complexes as a whole, in conjunction with the reconstitution process on the receiving side.

The properties observed so far in this section--a specificity gradient among closed-class terms; a representative "dotting," not a comprehensive classification, exhibited by specific terms; part-for-whole designation as a major function of general terms--can be understood as resulting from several constraints that language is under at once. The character of human communication imposes several requirements: language must be able to represent all of an enormous referential field, express conceptual material of certain kinds with great enough specificity, and convey this information at a fast enough rate. Language might in theory be able to accomplish all this with a store of millions of specific terms, except that it appears to be under an additional constraint limiting the total number of distinct symbolic elements it can employ, presumably due to the difficulties of processing the great degree of phonetic discrimination and memory access-

sing that would be entailed. Moreover, if such terms were uniformly very specific, any utterance would require stringing together too many of them to accord with the timing requirement of communication. So language must at least reduce its store of specific terms; but it may not do so without also including a number of general terms, because otherwise the requirement of whole-field coverage would not be satisfied. General terms are necessary for referring to interstitial conceptual material, between the references of specific terms, which they accomplish largely by indicating one aspect of a more complex concept, in accordance with a process of part-for-whole designation and its complement, reconstitution. On the other hand, language could not abandon specific terms entirely in favor of all general ones because it would then fail the specificity requirement of communication. After all, full-field coverage could be achieved by just a few very general terms--thus, the five English words someone, something, do, happen, and be, plus a few grammatical morphemes for tense, modality and the like, can in construction encompass virtually all conceptual phenomena with sentences like Someone did something., Something happened., Something is.--but these would lack all necessary specificity. Hence, language needs both specific and general terms. Further, the same reasoning that has led to this conclusion also requires that the specific terms be well-distributed over semantic space. For if they were not, there would be large regions covered by general terms, again insufficient to the requirement of specificity. One further feature can be pointed out about this distribution of specific references. While there are undoubtedly factors that encourage the positioning of these at certain locations within semantic space--such as a high frequency of occurrence or cultural significance attaching to some specific notions--their locations must nevertheless be to a great extent arbitrary, constrained primarily by the requirement of being "representative" of the lay of the semantic landscape, as evidenced by the enormous extent of non-correspondence between specific morphemes of different languages, even where these are spoken by the peoples of similar cultures. In conclusion, our examination of how language structures space has not only uncovered basic characteristics of a significant cognitive domain as reflected in a major cognitive system, language, but has also shed light on the general nature of conceptual representation in that same system.

IV. REFERENCES

Bennett, D. Spatial and temporal uses of English prepositions: An essay in stratificational semantics. New York: Longman Press, 1975.

Fillmore, C. The case for case. In E. Bach & R. Harms (Eds.), Universals in linguistic theory. New York: Holt, Rinehart & Winston, 1968.

Gruber, J. Studies in lexical relations. Unpublished doctoral dissertation, Massachusetts Institute of Technology, 1965.

Hill, C. Variation in the use of 'front' and 'back' in bilingual speakers. Proceedings of the First Annual Meeting of the Berkeley Linguistics Society. Berkeley, CA: University of California. 1975.

Langacker, R. Grammar as image. In: Linguistic notes from La Jolla 6. San Diego, CA: University of California, 1979.

Leech, G. Towards a semantic description of English. New York: Longman Press, 1969.

Talmy, L. Semantic structures in English and Atsugewi. Unpublished doctoral dissertation, University of California at Berkeley, 1972.

Talmy, L. Semantics and syntax of motion. In J. Kimball (Ed.), Syntax and Semantics, Vol. 4. New York: Academic Press, 1975.

Talmy, L. Semantic causative types. In M. Shibatani (Ed.), Syntax and Semantics, Vol. 6. New York: Academic Press, 1976.

Talmy, L. Figure and Ground in complex sentences. In J. Greenberg, C. Ferguson, & E. Moravcsik (Eds.), Universals of human language. Stanford, CA: Stanford Unifersity Press, 1978. a

Talmy, L. Relation of grammar to cognition. In D. Waltz (Ed.), Proceedings of TINLAP-2 (Theoretical Issues in Natural Language Processing). Champaign, IL: Coordinated Science Laboratory, University of Illinois, 1978. b

Talmy, L. Lexicalization patterns: Semantic structure in lexical form. In T. Shopen (Editor-in-Chief), Language typology and syntactic descriptions. New York: Cambridge University Press, in press.