FROM

JACKENDOFF

Semantics & Cognition

1983

Chapter 9
Semantics of Spatial Expressions

These last three chapters move away from fundamental theoretical issues toward more detailed linguistic description. They are intended as illustration of the benefits to be gained from adopting the theoretical stance developed in the preceding chapters.[1]

9.1 The Semantics of Spatial Prepositional Phrases

Chapter 3 argued that prepositional phrases such as "here," "thataway," "on the table," and "in the park" can function referentially, being used to pick out #places# and #paths# in the projected world. This section will develop these notions at somewhat greater length, in order to arrive at a rough taxonomy of #places# and #paths# and their relationship to the prepositional phrases (PPs) of English. (For the rest of this and the next chapter, I will drop ## when speaking of reference, for the sake of typographical sightliness.)

First consider the internal structure of simple PLACE concepts. As observed in chapter 4, a PP in English may consist of an intransitive preposition alone, such as "here," "thataway," "forward," or "downstairs." Alternatively, it may explicitly mention a *reference object* as the object of the preposition, as in "on the table," "under the counter," or "in the can." It may even mention two reference objects, as in "between the square and the circle" and "across the road from the firehouse." (Both of these examples function as unitary PPs—see Jackendoff (1977a).) The place referred to is distinct from the reference object, since one can refer to a variety of places, such as "under the table," "near the table," "on the table," and "inside the table," holding the reference object constant.

We can express this conceptual possibility formally in terms of a phrase-structure-like rule for the functional composition of a conceptual structure. (We ignore multiple reference objects for the moment.)

(9.1) $$[\text{PLACE}] \rightarrow \begin{bmatrix}\text{PLACE} \\ \text{PLACE-FUNCTION } ([\text{THING}])\end{bmatrix}$$

For convenience, we will introduce an alternative notation, which treats the ontological category feature as a subscript on the bracketing, or omits it when clear from context. Thus we use (9.2) interchangeably with (9.1).

(9.2) $[_{\text{Place}}\ x] \rightarrow [_{\text{Place}}\ \text{PLACE-FUNCTION } ([_{\text{Thing}}\ y])$

Different PPs correspond to place-concepts in different ways. The intransitive preposition "here" expresses a [PLACE] all by itself, so the expansion (9.2) does not apply. The transitive preposition "on," by contrast, expresses a place-function, and its strictly subcategorized object NP has the role of expressing the reference object, the argument y of the place-function.

Each place-function imposes conceptual constraints on the nature of the reference object. These appear in the language as selectional restrictions on the corresponding preposition. For instance, the place-function IN requires its reference object to be regarded as a bounded area or volume; this is why "The dog is in the dot" is odd. The most salient place-function expressed by "on" requires its reference object to have an upper surface. Another sense of "on" occurs in "the fly on the ceiling," in which the place-function involves the *outer* (i.e., visible) surface of the reference object. These two senses seem to be typicality conditions in a preference rule system in the lexical entry for "on." (See Miller and Johnson-Laird (1976, section 6.1) for interesting discussion of various spatial prepositions.)

The most important distinction within the class of senses of spatial PPs is the distinction between [PLACES] and [PATHS]. [PLACES] are the simpler of the two: a [PLACE] projects into a point or region, as illustrated in the examples above. Within the structure of an event or state, a [PLACE] is normally occupied by a [THING], as seen in sentences like those in (9.3).

(9.3) ([THING] occupies [PLACE])
- a. John is in the room.
- b. The lamp is standing on the floor.
- c. The mouse stayed under the table.

Alternatively, a PP of location can express the location of the event or state described by the sentence. This PP may come at either the beginning or the end of the sentence, and is attached higher on the tree than strictly subcategorized arguments (see the trees in section 4.2).

(9.4)
- a. In Cincinnati, Max met a cockroach.
- b. Jean ate breakfast in her bedroom.

[PATHS] have more varied structure than [PLACES] and play a wider variety of roles in [EVENTS] and [STATES]. The internal structure of a [PATH] often consists of a path-function and a reference object, as expressed by phrases like "toward the mountain," "around the tree," and "to the floor." Alternatively, the argument of a path-function may be a reference *place*. This possibility is most transparent in a phrase like "from under the table," where "from" expresses the path-function and "under the table" expresses the reference place. Prepositions such as "into" and "onto" express both a path-function and the place-function of the reference place, meaning roughly "to in" and "to on," respectively. Thus we have such conceptual structures as these:

(9.5)
- a. The mouse ran from under the table.
  $[_{\text{Path}}\ \text{FROM } ([_{\text{Place}}\ \text{UNDER } ([_{\text{Thing}}\ \text{TABLE}])])]$
- b. The mouse ran into the room.
  $[_{\text{Path}}\ \text{TO } ([_{\text{Place}}\ \text{IN } ([_{\text{Thing}}\ \text{ROOM}])])]$

Many prepositions in English—for example, "over," "under," "on," "in," "above," and "between"—are ambiguous between a pure place-function and TO + place-function, as illustrated in (9.6).

(9.6)
- a. The mouse is under the table.
  $[_{\text{Place}}\ \text{UNDER } ([_{\text{Thing}}\ \text{TABLE}])]$
- b. The mouse ran under the table.
  $[_{\text{Path}}\ \text{TO } ([_{\text{Place}}\ \text{UNDER } ([_{\text{Thing}}\ \text{TABLE}])])]$

To avoid ambiguity in the notation for conceptual structure, we will henceforth use such prepositions in capitals exclusively to denote the

place-function reading; the path-function reading will be notated as in (9.6b).

One might consider claiming that there is no ambiguity in these prepositions and that it is a mistake to distinguish [PATHS] from [PLACES]. As this section continues, we will provide further evidence for the distinction. As a preliminary bit of evidence, though, we observe that there are other languages in which the distinction between the path and place readings receives systematic grammatical treatment. For example, certain German prepositions take dative case when used as place-functions and accusative when used as path-functions. In Hungarian, postpositions (prepositions that occur after their object) take an extra suffix *-n* when used as place-functions that is not present when they express path-functions. For these grammatical distinctions to be properly based in semantic distinctions, both conceptual structures in (9.6) are essential, and we must treat prepositions like "under" as ambiguous. Thus we find three-way patterns in English like (9.7).

(9.7) a. [$_{\text{Place}}$ PLACE-FUNCTION ([THING])]

in the room, on the table, between the trees, under the house

b. [$_{\text{Path}}$ PATH-FUNCTION ([$_{\text{Place}}$ PLACE-FUNCTION ([THING])])]

(*functions lexicalized separately*)

from in the room, from on the table, from between the trees, from under the house

c. [$_{\text{Path}}$ PATH-FUNCTION ([$_{\text{Place}}$ PLACE-FUNCTION ([THING])])]

(*functions lexicalized together*)

in(to) the room, on(to) the table, between the trees, under the house

In addition, a number of intransitive place-prepositions fall into a similar (though slightly less regular) pattern, except that the reference object is not expressed separately as an NP. (9.8a,b,c) correspond to (9.7a,b,c), respectively.

(9.8) a. here, there, (at) home
b. from here, from there, from home
c. here, (to) there, home

Paths can be divided into three broad types, according to the path's relationship to the reference object or place. The first class, ***bounded paths,*** includes source-paths, for which the usual preposition is "from," and goal-paths, for which the preposition is "to." In bounded paths, the reference object or place is an endpoint of the path—the beginning in a source-path and the end in a goal-path. As already observed, "from" can be followed by many place-prepositions to express conceptually complex sources, whereas the path-function TO tends to combine with place-functions into a single lexical item.

In the second class of paths, *directions,* the reference object or place does not fall on the path, but would if the path were extended some unspecified distance. "Away from" and "toward" are the most common transitive prepositions expressing directions. To see the distinction between bounded paths and directions, notice that in (9.9a) John is claimed to have reached the house, while in (9.9b) he quite possibly has not. Similarly, in (9.9c) he began running at a point adjacent to or inside the house, while in (9.9d) his initial distance from the house is inexplicit.

(9.9) a. John ran to the house. (bounded path)
b. John ran toward the house. (direction)
c. John ran from the house. (bounded path)
d. John ran away from the house. (direction)

In addition to the transitive prepositions "toward" and "away from," there are several intransitive prepositions of direction, such as "up(ward)," "down(ward)," "forward," "backward," "homeward," and "north(ward)." We will use the expressions TOWARD and AWAY-FROM for the basic path-functions of direction. Like TO and FROM, these differ in polarity.

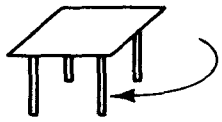
In the third class of paths, *routes,* the reference object or place is related to some point in the interior of the path. (9.10) gives some examples; the verb used there, "pass," occurs only with a PP that expresses a route.

(9.10) The car passed { by the house. / along the river. / through the tunnel. / *to the garage. (PP is goal) / *toward the truck. (PP is direction) }

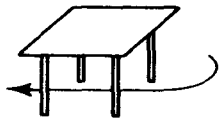
In the traversal of a route, nothing is specified about the endpoints of the motion. All that we know is that at some point in time along the trip, the car in (9.10) was located by the house, along the river, or inside the tunnel.

We will use VIA as the basic path-function for routes, to be further differentiated by features that we will not explore here. Many route expressions of English use place-prepositions such as "by," "along," and "over" to express VIA + place-function. "Through" expresses roughly VIA INSIDE. "Under" has, in addition to the place and goal readings illustrated in (9.6), a route reading that appears in "The mouse passed under the table." Thus "The mouse went under the table" is actually ambiguous between the goal and route readings.

(9.11) a. The mouse went under the table.
[$_{\text{Path}}$ TO ([$_{\text{Place}}$ UNDER ([$_{\text{Thing}}$ TABLE])])]



b. The mouse went under the table.
[$_{\text{Path}}$ VIA ([$_{\text{Place}}$ UNDER ([$_{\text{Thing}}$ TABLE])])]



The need for this distinction provides further evidence for the ambiguity in (9.6), between "under" of place and of path.

A wide range of paths, then, can be expressed by the well-formedness rule (9.12), which is analogous to rule (9.2) for places.

(9.12)
$$[\text{PATH}] \rightarrow \left[\begin{array}{l} \\ \\ \\ \\ \text{Path} \end{array} \left\{ \begin{array}{l} \text{TO} \\ \text{FROM} \\ \text{TOWARD} \\ \text{AWAY-FROM} \\ \text{VIA} \end{array} \right\} \left(\left\{ \begin{array}{l} [\text{Thing } y] \\ [\text{Place } y] \end{array} \right\} \right) \right]$$

To complete this rough taxonomy of place- and path-concepts, we must introduce a class of place-concepts that appear to be based on reference *paths*. For example, "The house is up the hill" seems to imply "on a (distal) point of a path up the hill." "Ahead" and "through" used as place-expressions have a similar effect, as in

"There's a train ahead" and "The train is through the tunnel." This suggests an additional well-formedness rule (9.13a) for [PLACE], giving the place-expression "up the hill" the conceptual structure (9.13b), in which UP is a variety of direction-function ("toward the top of" or the like).[2]

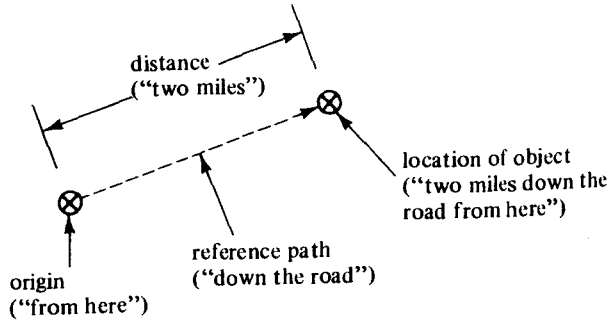
(9.13) a. [PLACE] → [$_{\text{Place}}$ ON ([$_{\text{Path}}$ x])]
b. [$_{\text{Place}}$ ON ([$_{\text{Path}}$ UP ([$_{\text{Thing}}$ HILL])])]

The construction of a place-concept from a reference path permits two more options, which can be added to (9.13a). Consider the examples in (9.14).

(9.14) The firehouse is
a. across the street from the library.
b. two miles down the road (from here).
c. far/way north of/from here.
d. two miles from my house.

In (9.14a) the location of the firehouse is given in terms of a reference path, "across the street," whose origin is specified in the "from"-phrase. If the reference path is unbounded (for instance, "down the road" or "north"), then a distance along the reference path can be added, as in (9.14b,c). Finally, one can specify just the origin and the distance, leaving direction inexplicit, as in (9.14d). (9.15) makes this construction more graphic.

(9.15)



An amplification of (9.13a) that permits these possibilities is (9.16a). (9.16b) and (9.16c) are then approximate representations of the [PLACES] in (9.14a) and (9.14b), respectively. (The connection of the components in (9.16a) is looser than it should be, but it will suffice for present purposes.)

(9.16)

a. [PLACE] → [Place ON([Path FROM ([THING / PLACE]) / TO ([THING / PLACE]) / DIRECTION / [DISTANCE]])]

b. [Place ON([Path FROM ([Thing LIBRARY]) TO ([Place OTHER SIDE OF ([Thing ROAD])])])]

c. [Place ON([Path FROM ([Place HERE]) DOWN ([Thing ROAD]) [Distance TWO MILES])])]

Now let us turn to the roles that paths may play in an event or state. First, a [PATH] may be *traversed* by a [THING], as in (9.17a). Second, a [THING] may *extend* over a [PATH], as in (9.17b); here the subject of the sentence is not understood as being in motion. Third, a [THING] may be *oriented* along a [PATH], as in (9.17c); here the subject, if in motion, is understood to be adopting an orientation, not traversing the path.

(9.17) a. ([THING] traverses [PATH])
John ran into the house.
The mouse skittered toward the clock.
The train rambled along the river.

b. ([THING] extends over [PATH])
The highway extends from Denver to Indianapolis.
The flagpole reaches (up) toward the sky.
The sidewalk goes around the tree.

c. ([THING] is oriented along [PATH])
The sign points to Philadelphia.
The house faces away from the mountains.
The cannons aim through the tunnel.

The next section will discuss how [PATHS] come to play these roles as a consequence of the choice of other elements in the sentence.

To sum up the taxonomy of [PATHS], there are nine possible combinations of path type with path role. (9.17) illustrates each path role with one example of each path type (bounded paths, directions, routes), thus exhibiting the full range of paths.

Many accounts of the structure of spatial concepts have not recognized the generality of path-concepts. Schank (1973), for example, encodes the source and the goal of a physical motion as two arguments of the "primitive act" PTRANS, which means roughly "object is in one place (source) at the beginning of the event and in another (goal) at the end." Such an account allows for only one of the nine possible combinations of path type with path role, the one in the first sentence of (9.17a).[3] Similarly, Jackendoff (1976) treats source and goal as the second and third arguments of the function GO(x,y,z); there is no way to represent directions, routes, or even complex goals like those in (9.6b). The formulation is a slight improvement on Schank's, in that the function GO can express extension as well as transition, but the orientation role of paths still cannot be represented. Miller and Johnson-Laird (1976) have a notion of path as a distinct conceptual category and are thus able to treat the three path types uniformly. However, they describe paths in terms of a temporal succession of points, for example (p. 406):

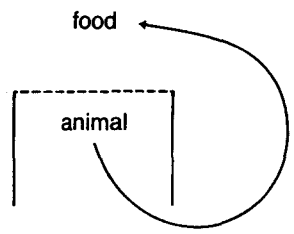
TO(x,y): A referent x is "to" a relatum y if, for an interval ending at time $t - 1$, notAT(x,y) and: (i) AT(x,y) at time t.

Though such a definition suffices for the traversal role of paths, it cannot be adapted to the extensional role (9.17b) or the orientation role (9.17c).

By contrast, the present account provides a uniform set of conceptual structures for PPs that express paths. These conceptual structures are organized spatially and nontemporally. They are therefore equally available for any of the three roles that paths may play in larger conceptual structures.

An interesting bit of nonverbal evidence for the psychological reality of paths comes from the observations of Köhler (1927, chapter 1). He points out that a sufficiently intelligent animal (e.g., a dog but not a chicken), confronted with food behind a transparent barrier, will "run in a smooth curve, without any interruption, out of the blind alley, round the fence to the new food," as in (9.18).

(9.18)



The execution of such a smooth curve requires its being planned in advance—not as a finite sequence of points joined by straight lines, but as an entire path. For this plan to be present all at once, it must be stored nontemporally; the animal then plays out the plan over time. Thus, if an animal can perform such an action as Köhler describes, it must be able to formulate concepts of spatial organization that fall under what we have called here the major ontological category of paths. In other words, not only language but the theory of action as well requires a notion of path, and it is pointless to try to eliminate it from language on grounds of parsimony.

9.2 Verbs of Spatial Location and Motion

We next turn to sentences that describe spatial location and motion. For the moment let us restrict ourselves to sentences of the form NP V PP; we will extend the analysis to the more general case shortly. Within this restricted class, the correspondence of syntax and semantics is transparent: the PP refers to a place or path, the subject NP refers to a thing, and the sentence as a whole refers to a situation or event in which the thing is located or moving in some way with respect to the place or path. The verb specifies exactly what the thing is doing with respect to the place or path. For example, in "Bill flew around the pole," the sentence refers to an event in which Bill traverses a path specified as being around the pole. The verb "fly" specifies both that Bill traverses the path (rather than occupying it, for instance) and that Bill traverses it in a particular manner.

In general, the thing whose motion or location is asserted is not always in subject position; hence we need a technical term for the NP that fulfills this semantic function. Following Gruber's (1965) analysis, we will call the NP whose motion or location is asserted the *theme*. Thus "Bill" is the theme of the example above.[4]

A major division in the class of spatial sentences, already alluded to in chapter 4, is between those that express [EVENTS] and those that express [STATES]. A clear linguistic test for the distinction is the possibility of occurring after "What happened/occurred/took place was (that) . . ."; events happen, while states do not. Thus we find contrasts like these:

(9.19) a. (Events)

What happened was that { Bill flew around the pole. / the rock fell off the table. / the mouse ran up the clock. / a bee buzzed in the window. }

b. (States)

?What happened was that { Max was in Africa. / the rug lay on the floor. / the statue stood in the park. / a vine clung to the wall. }

Another relevant grammatical distinction, idiosyncratic to English, concerns the use of the simple present tense. With states, simple present can be used to express present time (9.20a). With events, however, present time must be expressed by present progressive aspect (9.20b); simple present may only be used to express generic events, future time, and various less common sorts of speech acts such as stage directions and newspaper headlines.

(9.20) a. (States)
Max is in Africa.
The rug lies/is lying on the floor.
The statue stands/is standing in the park.
The picture hangs/is hanging on the wall.

b. (Events)
Bill is flying/*flies around the pole.
The rock is falling/*falls off the table.
The mouse is running/*runs up the clock.
A bee is buzzing/*buzzes in the window.

c. Bill flies around the pole tomorrow. (future)
Bill flies around the pole every day. (generic)
Bill flies around the pole, and then says, ". . ." (stage direction)
BILL FLIES AROUND THE POLE! (headline)

All the sentences in (9.19a) describe motion of the theme along a path. We will express this commonality with conceptual structure (9.21a), a necessary condition for the verbs of motion in (9.19a) as well as for several hundred others of the same character (see Miller and Johnson-Laird 1976) for a larger sample). The sentences in

(9.19b), by contrast, express the location of the theme in a place; we will express this with conceptual structure (9.21b). (The relation of this BE to the BE of chapters 5 and 6 will be discussed in section 10.2.)

(9.21) a. [Event GO ([Thing x], [Path y])]

b. [State BE ([Thing x], [Place y])]

The variables x and y in (9.21) represent the information to be filled in from the subject and PP of the sentence, respectively.

GO is not the only event-function. A much smaller class of verbs such as "stay" and "remain" express the maintenance of position over time. The tests of (9.19) and (9.20) reveal these as expressions of events.

(9.22) a. What happened was that {the bird stayed in its nest. / Bill remained on the floor.}

b. The bird is staying/*stays in its nest.

c. Bill is remaining/*remains on the floor.

We will assign these verbs the partial conceptual structure (9.23).[5]

(9.23) [Event STAY ([Thing x], [Place y])]

Nor is BE the only state-function. In the previous section we discussed the use of paths as arguments of functions of extent (9.17b) and orientation (9.17c), repeated here.

(9.17) b. The highway extends from Denver to Indianapolis.
The flagpole reaches (up) toward the sky.
The sidewalk goes around the tree.

c. The sign points to Philadelphia.
The house faces away from the mountains.
The cannons aim through the tunnel.

These sentences pass the tests for state rather than event expressions: they are in the simple present tense, and in past tense they cannot be preceded by "What happened was" (as in *"What happened was that the highway extended from Denver to Indianapolis").

Let us examine the orientation sentences first. These describe not the location of the subject but the direction it is pointing (as a result, the subject is restricted to orientable things—featureless spheres cannot point). The prepositional phrase is a path-function, usually a direction or route, that specifies the orientation of the subject. Thus

we need a new function *ORIENT*, with the functional structure (9.24).

(9.24) [State ORIENT ([Thing x], [Path y])]

There are also orientation *events*, such as that described in "John spun around," but we will not go into further details here.

Now turn to the extent sentences (9.17b). Notice how they differ from motion sentences such as "Amy went from Denver to Indianapolis." In a motion sentence, the subject is asserted to have traversed the path, covering each point of the path in order over time. By contrast, in "Highway 36 goes from Denver to Indianapolis," the subject is asserted to occupy the entire path at a single point in time. I will call the function expressed by extent sentences GO_{Ext}, as in (9.25).

(9.25) [State GO_{Ext} ([Thing x], [Path y])]

It is significant that most verbs of extent, like those in (9.17b), can also be used as verbs of motion. With such verbs, the possibility of a motion or extent interpretation is determined by the motility of the subject (people travel, roads don't) and sometimes by the tense (simple present for extent, a state, and progressive for traversal, an event). With the proper choice of subject and tense, one can produce an ambiguous sentence such as "The giant reached to the ceiling," which may describe either a movement by the giant or the giant's extreme height.

This lexical generalization between verbs of motion and verbs of extent is of the sort that the Grammatical Constraint encourages us to incorporate into semantic theory. One plausible way is to claim that GO and GO_{Ext} are not distinct functions, but that the difference between a traversal and an extent interpretation depends only on whether the GO function is a feature of an [EVENT] or a [STATE]. Alternatively, one could claim that the functions are distinct but share a great deal of internal structure. At the moment I do not know how to distinguish these two positions; for clarity I will retain the term GO_{Ext}, using GO for traversal only.

Stepping back from the formal issues, we see from this lexical generalization that there is a close relation between the means for mentally representing temporal sequence (motion along a path) and spatial sequence (objects extending along a path). Thus semantic theory provides a surprisingly direct corroboration of Lashley's (1951)

argument that temporal ordering must be mentally represented in spatial terms.

As mentioned in the previous section, the function GO has often been treated as expressing a change of state from one position to another, in effect reducing the event GO to a succession of two states and apparently eliminating one primitive spatial function. Here are three arguments against such a treatment. First, GO can occur not only with bounded paths (sources and goals) but also with directions and routes, where the endpoints are left inexplicit. This shows that the stipulation of beginning- and end-states is not essential to the use of a GO function. Rather, whatever the particulars of the path, GO expresses the traversal of every point of it. Second, the reduction of GO to a change of state is incompatible with the generalization of GO to expressions of extent. "The road goes from A to B" does not merely inform us about the endpoints; it tells us about the continuity of the road between A and B. For GO_{Ext} to be related in any sensible way to motional GO, the latter must encode continuous transition. Third, it is clear that perception must include representations of motion: we are aware not just of things being in one place and then being somewhere else—they might as well be jumping discontinuously—but also of their moving. Why should natural language semantics not permit us to encode this? Thus the Expressiveness Constraint, the Grammatical Constraint, and the Cognitive Constraint all converge on the position that there must be an event-function GO that is not reducible to a succession of BEs.

To sum up, the well-formedness rules (9.26a,b) express the functional decomposition of [EVENTS] and [STATES].

(9.26) a. $[\text{EVENT}] \rightarrow \left\{ \begin{array}{l} [_{\text{Event}}\ \text{GO}\ ([_{\text{Thing}}\ x], [_{\text{Path}}\ y])] \\ [_{\text{Event}}\ \text{STAY}\ ([_{\text{Thing}}\ x], [_{\text{Place}}\ y])] \end{array} \right\}$

b. $[\text{STATE}] \rightarrow \left\{ \begin{array}{l} [_{\text{State}}\ \text{BE}\ ([_{\text{Thing}}\ x], [_{\text{Place}}\ y])] \\ [_{\text{State}}\ \text{ORIENT}\ ([_{\text{Thing}}\ x], [_{\text{Path}}\ y])] \\ [_{\text{State}}\ \text{GO}_{\text{Ext}}\ ([_{\text{Thing}}\ x], [_{\text{Path}}\ y])] \end{array} \right\}$

9.3 Causative Functions

A further element in our survey of spatial functions is the notion of causation, involved in the relation between the sentences in (9.27a) and those in (9.27b).

(9.27) a. Sim came into the room.
The ball flew out the window.
The books stayed on the shelf.

b. The wind pushed Sim into the room.
Beth threw the ball out the window.
Suzanne kept the books on the shelf.

Roughly, the (b) sentences describe an agent bringing about the events described in the (a) sentences. We will represent the role of the agent by means of a binary function CAUSE, with structure (9.28a). Thus the sentences in (9.27b) have the representations shown in (9.28b); the embedded [EVENT] in each of these is the representation of the corresponding noncausative in (9.27a).

(9.28) a. $[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ x], [_{\text{Event}}\ y])]$

b. $[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \text{WIND}], [_{\text{Event}}\ \text{GO}\ ([_{\text{Thing}}\ \text{SIM}], [_{\text{Path}}\ \text{INTO ROOM}])])]$

$[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \text{BETH}], [_{\text{Event}}\ \text{GO}\ ([_{\text{Thing}}\ \text{BALL}], [_{\text{Path}}\ \text{OUT WINDOW}])])]$

$[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \text{SUZANNE}], [_{\text{Event}}\ \text{STAY}\ ([_{\text{Thing}}\ \text{BOOKS}], [_{\text{Place}}\ \text{ON SHELF}])])]$

A number of points about this representation merit discussion. First, consider the syntactic relation between the (9.27a) sentences and the (9.27b) sentences. The noncausative sentences, like all the sentences of the previous subsection, have the form NP_1 V PP, with the theme in the subject. The causative sentences have the form NP_2 V NP_1 PP, with the agent in the subject and the theme in the direct object. In an earlier period of generative grammar, various attempts were made to treat this relationship by means of syntactic transformations. This was the hallmark of case grammar (Fillmore (1968)) and generative semantics (McCawley (1968), Lakoff (1970, 1971)), for example. Such an account was especially appealing in light of verbs that have both causative and noncausative forms, such as "fly" and "grow."

(9.29) a. Amelia flew the plane.
The plane flew.

b. Luther grew the peas.
The peas grew.

But since the introduction of lexical rules as a means of expressing morphological and semantic relations among similar lexical items (Chomsky 1970)), it has come to be widely accepted that the causative-noncausative relation in English is not a syntactic relationship but a lexical one. That is how it will be treated here; I will assume that there is no "deeper" word order underlying either set of sentences in (9.27). (See Jackendoff (1975a) and Bresnan (1978) for details.)

Let us consider now some aspects of semantic structure (9.28a) itself. Notice that the agent is not necessarily acting willfully; for example, "the wind" is agent in the first sentence of (9.27b). The possibility of willfulness arises from the fact that an event of causation can be reanalyzed as an actor performing an action, as will be discussed in the next section. We will see there that willfulness or intentionality is an optional property of an *actor,* and need not be represented in addition as part of the function CAUSE.

Some analysts (for example, Schank (1973), Davidson (1967b), and Miller and Johnson-Laird (1976)) have treated CAUSE as a function over two events. Instead of (9.28a), they propose something like (9.30). (I have translated their notations into my formalism.)

(9.30) $[_{\text{Event}}$ CAUSE $([_{\text{Event}}$ DO$([_{\text{Thing}}\ x], [_{\text{Action}}\ z])], [_{\text{Event}}\ y])]$

(9.30) can be expressed in English roughly as "*x* did something *z* that caused *y*." This analysis has been justified on the basis of sentences like "John's blowing bubbles made us laugh," in which an event, expressed by an NP, appears in subject position and therefore appears to be fulfilling the role of agent. The claim is that greater generality is achieved by requiring the first argument of CAUSE always to be an event; the representation in (9.30) then automatically expresses the fact that *x* is performing some action in bringing *y* about. Furthermore, this analysis easily accommodates an expression such as the "by"-phrase in "John made us laugh by blowing bubbles": such an expression of means simply fills in the action *z* in (9.30).

However, according to the Grammatical Constraint, we should be wary of positing a semantic structure such as the DO...$[_{\text{Action}}\ z]$ in (9.30) and of assigning the same semantic structure to such radically different syntactic structures as subjects and means expressions. Indeed, this wariness is justified by the existence of means expressions in sentences whose subject is an [EVENT], such as "John's blowing bubbles made us laugh by making us realize how drunk we all were." This example shows that the means expression cannot be

taken to fill the variable *z* in (9.30): in this example *z* has already putatively been filled by "blowing bubbles." Thus the alleged syntactic generality of (9.30) is illusory. (A related argument appears in Fodor, Garrett, Walker, and Parkes (1980).)

In the present theory, we will claim instead that the function CAUSE permits either a [THING] or an [EVENT] as its first argument and that this argument appears invariably in subject position. Then "John made us laugh" is represented roughly as (9.31a); "John's blowing bubbles made us laugh" as in (9.31b).

(9.31) a. $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}$ JOHN$], [_{\text{Event}}$ WE LAUGH$])]$

b. $[_{\text{Event}}$ CAUSE $([_{\text{Event}}$ JOHN BLOW BUBBLES$],$
$[_{\text{Event}}$ WE LAUGH$])]$

The fact that John did something will be expressed by the reanalysis of (9.31a) and the first argument of (9.31b) as actor-action pairs (see next section). The fact that John may have been willful but John's blowing bubbles (taken as a whole) could not be follows from the fact that only animate actors can be willful. Finally, a means expression, like all such syntactic modifiers, corresponds to a restrictive modifier of the conceptual constituent that dominates it—in this case the CAUSE function. In other words, the means expression expresses *how* John, or John's blowing bubbles, caused the event in the second argument. Thus the present analysis, by simply extending the first argument of CAUSE to include [EVENTS], incorporates all the evidence for (9.30) at no cost to the generality of the syntax-semantics correspondence.

Finally, consider the second argument of CAUSE. This is explicitly an [EVENT], not a [STATE], for agents make things *happen.* For example, (9.32) presents two alternative analyses of "Amy put the flowers in the vase."

(9.32) a. $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}$ AMY$], [_{\text{Event}}$ GO $([_{\text{Thing}}$ FLOWERS$],$
$[_{\text{Path}}$ INTO VASE$])])]$

b. $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}$ AMY$], [_{\text{State}}$ BE $([_{\text{Thing}}$ FLOWERS$],$
$[_{\text{Place}}$ IN VASE$])])]$

(9.32a) may be read "Amy made it happen that the flowers went into the vase"; (9.32b), "Amy made it be the case that the flowers were in the vase." Either is superficially plausible. However, notice that the latter is somewhat odd-sounding: what Amy really did was bring about an event whose end-state is the situation in question. This is

invariably the case in causative sentences that appear to have a [STATE] as a second argument. Thus I will maintain that the second argument of CAUSE is an [EVENT]. (For further discussion, see Jackendoff (1976).)

Gruber (1965) motivates a second kind of agency, called *permissive* agency, using contrasts like those in (9.33).

(9.33) a. The rock went down the cliff.
The bird flew out of the cage.
Sam ran around the tree.

b. Bill pushed the rock down the cliff.
Bill removed the bird from the cage.
Bill made Sam run around the tree.

c. Bill dropped the rock down the cliff.
Bill released the bird from the cage.
Bill let Sam run around the tree.

The sentences in (9.33b) express the familiar causative versions of those in (9.33a). The sentences in (9.33c), however, involve a different relation between the agent and the event, which we will call the function *LET*. The fundamental structure is (9.34).

(9.34) $[_{\text{Event}}$ LET $([_{\text{Thing}}\ x], [_{\text{Event}}\ y])]$

It has been suggested from time to time that LET means something like "cease to prevent" and therefore may be reducible to NOT CAUSE...NOT. For instance, the first example in (9.33c) might be taken to mean "Bill ceased preventing the rock from going down the cliff." However, the differences between CAUSE and LET, when examined in detail, do not support such a reduction, at least with particular ease. (See Gruber (1965), Jackendoff (1976), Miller and Johnson-Laird (1976, section 6.3).) I will therefore assume that LET represents a distinct type of causative function.

We therefore add the following two event types to the taxonomy of (9.26), establishing the basic syntax of causal concepts.

(9.35) $$[\text{EVENT}] \rightarrow \left\{ \begin{array}{l} [_{\text{Event}}\ \text{CAUSE}\ ([_{\left[\begin{smallmatrix}\text{Thing}\\ \text{Event}\end{smallmatrix}\right]}\ x], [_{\text{Event}}\ y])] \\ [_{\text{Event}}\ \text{LET}\ ([_{\left[\begin{smallmatrix}\text{Thing}\\ \text{Event}\end{smallmatrix}\right]}\ x], [_{\text{Event}}\ y])] \end{array} \right\}$$

Further refinement of the semantics of causation is possible. I will mention only one example from Talmy's (1976) interesting study.

Talmy observes that some verbs, such as "throw" and "send," express events in which the agent acts only as initiator; after the inception of the event, the theme takes its course without the agent's further intervention. By contrast, the agents of verbs such as "drag" and "bring" participate throughout the theme's motion. Among verbs of permissive agency, "drop" and "lower" contrast along the same dimension. I leave the formalization of this distinction and of others like it for future research.

9.4 VPs and ACTIONS

The formal treatment developed in chapter 4 and elaborated here has so far ignored one of the major ontological categories discussed in chapter 3: [ACTIONS]. As pointed out in section 4.4, [ACTIONS] correspond to the double-primed syntactic category VP and are thus an exception to the generalization that major ontological categories are expressed by major (triple-primed) syntactic categories. This leads to a descriptive inadequacy in a representation like (9.36) for "The man put the book on the table," for this representation contains no constituent identified as an [ACTION].

(9.36) $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}$ MAN], $[_{\text{Event}}$ GO $([_{\text{Thing}}$ BOOK], $[_{\text{Path}}$ TO ON TABLE])])]

As a first step in solving this problem, notice that sentences that express [ACTIONS] are a subset of those that express [EVENTS]. (9.37) illustrates this; "what happened was" is a diagnostic for [EVENTS] and "what x did" is a diagnostic for [ACTIONS].

(9.37) a. What happened was that

$$\left\{ \begin{array}{ll} \left.\begin{array}{l}\text{the pig ran away.}\\ \text{she put the book on the table.}\\ \text{Fred heard about the accident.}\\ \text{Louise received a letter.}\end{array}\right\} & \text{EVENTS} \\ \left.\begin{array}{l}\text{*the fire truck was red.}\\ \text{*Fred loved Louise.}\end{array}\right\} & \text{STATES} \end{array} \right.$$

b. What Fred did was

$$\left\{\begin{array}{l}\left.\begin{array}{l}\text{run away.}\\ \text{put the book on the table.}\end{array}\right\}\ \text{ACTIONS}\\ \left.\begin{array}{l}\text{*hear about the accident.}\\ \text{*receive a letter.}\\ \text{*be red.}\\ \text{*love Louise.}\end{array}\right\}\ \text{non-ACTIONS}\end{array}\right.$$

An [EVENT] that is also an [ACTION] involves a character with a special role—the one who is performing the [ACTION]. We will call this character the [ACTOR]. The linguistic evidence of chapter 3 shows that an [ACTION] can be identified independently of who is carrying it out (for instance, "Joe did the same thing Harry did"). Thus an [ACTION] is an [EVENT] from which one argument is missing, the one corresponding to the [ACTOR].

These considerations suggest a representation for "The man put the book on the table" something like (9.38).

(9.38) $[_{\text{Event}}\begin{bmatrix}\text{ACTOR}\\ _{\text{Thing}}\text{MAN}\end{bmatrix}_i, [_{\text{Action}}\ \text{CAUSE}\ (i,$
$[_{\text{Event}}\ \text{GO}\ ([_{\text{Thing}}\ \text{BOOK}], [_{\text{Path}}\ \text{TO ON TABLE}])])]]$

In this expression, the first argument of CAUSE is occupied by i, the index of the [ACTOR] constituent. Formally, one can think of this argument place as bound by the [ACTOR]; conceptually, this role is what the [ACTOR] does in performing this [ACTION].

(9.38) deviates from the usual function-argument structure we have employed so far. It is therefore necessary to sanction the possibility of this expression by means of a special well-formedness rule (or rule of conceptual reanalysis):

(9.39) $[_{\text{Event}}\ \text{F}(X_i, Y_j, Z_k,\ldots)] \leftrightarrow$
$[_{\text{Event}}\begin{bmatrix}\text{ACTOR}\\ \text{X}\end{bmatrix}_i, [_{\text{Action}}\ \text{F}(i, Y_j, Z_k,\ldots)]]$

The double arrow in (9.39) means that the forms are interconvertible, so that (9.38) can be derived from (9.36) and vice versa.

Rule (9.39) must be amplified with conceptual conditions on what can count as an [ACTOR] and what as an [ACTION]. The conditions on [ACTOR] can be illustrated by a contrast like the one shown in (9.40).

(9.40) What $\left\{\begin{array}{l}\text{Fred}\\ \text{?the mail}\end{array}\right\}$ did was go to Philadelphia.

Apparently an [ACTOR] must display a certain capacity for autonomy. Animacy is too strong a requirement, since (9.41a) and even (9.41b) are acceptable.

(9.41) a. What the rock did was roll down the hill.
b. What the clouds did was go over Philadelphia.

The mail seems even flabbier than the clouds, incapable of action; but I won't try to push the distinction further here.

The conditions on [ACTION] can be specified fairly precisely. First, when the variable of an [ACTION] is bound, the result must be an [EVENT]; this condition is incorporated into rule (9.39). This condition excludes "being tall" or "loving Louise" from expressing [ACTIONS], since binding the variable results in a [STATE] rather than an [EVENT]. Second, the semantic role of the variable position in an [ACTION] is limited to agents, as in (9.36), and themes, as in (9.41a). "Receive a letter" and "hear about Bill" do not express [ACTIONS] because the subject is a goal rather than an agent or theme.

Among the correspondence rules, there must be a rule relating the constituent VP to the [ACTION] constituent in conceptual structure:

(9.42) A VP may be construed as an [ACTION]; the argument position of the verb corresponding to the subject is occupied by the bound variable of the [ACTION].

This rule is necessary particularly for the interpretation of sentences like (9.37b), in which a bare VP expressing an [ACTION] appears to the right of "be." It may also prove useful elsewhere.[6]

This account requires no special lexical markings of verbs as action verbs (as does, for example, Ross's (1972) theory). Rather, this information is encoded in the general conditions on the nature of [ACTIONS], in the relation of [ACTIONS] to [EVENTS], and in the correspondence rule (9.42) that relates VPs to [ACTIONS]. A particular VP will be construed as an [ACTION] only if all these conditions are met.

An important subclass of actions is the class of *willful* or *intentional* actions. Consider the following pairs of sentences:

(9.43) a. The rock rolled down the hill.
b. John rolled down the hill.

(9.44) a. The rock broke the window.
b. John broke the window.

The VPs of all these sentences express [ACTIONS] ("What John/the rock did was roll down the hill/break the window"). The subjects in (9.43a,b) are both themes, and those in (9.44a,b) are both agents. However, the (b) sentences are ambiguous: one can ask whether John acted on purpose or not. In the intentional sense, John performs the action as a result of his own will. In the unintentional sense, he is acting more or less as an inanimate object: he stumbles and falls down the hill or is pushed into the window. This ambiguity can be expressed by the presence or absence of a marker WILLFUL in the semantic structure of the sentence. This marker will be applicable to an animate actor such as "John," but anomalous if applied to an inanimate actor such as "the rock."

How should this marker be attached to the semantic structure? One possibility would be to make it a modifier of CAUSE. But this would not explain the possibility of willfulness when the subject is theme, as in (9.43b).[7] The alternative is to associate the marker WILLFUL with [ACTOR]-[ACTION] pairs, regardless of the thematic relation of the [ACTOR]. This analysis applies uniformly to (9.43) and (9.44) without further ado.

There is then the question of whether WILLFUL should be associated with the [ACTOR] or with the [ACTION]. One's first impulse is to attach it as a modifier of the [ACTOR], since this is the character exerting will. In fact, however, syntactic expressions of willfulness such as "deliberately" and "on purpose," as well as the denial of willfulness in "accidentally," are normally attached to the VP, not to the subject:

(9.45)
a. What John did was roll down the hill { deliberately. / on purpose. / accidentally. }
b. Breaking windows { deliberately / accidentally / on purpose } is punishable by death.

Thus the Grammatical Constraint suggests that WILLFUL is a feature of an [ACTION], not of an [ACTOR].

This analysis leads to a simple treatment of imperative sentences like "Wash the dishes!" as bare VPs that express [WILLFUL ACTIONS]. Thus, for example, "Receive a letter!" and "Know the answer!" are not possible commands because they do not express [ACTIONS], and "Keep sleeping!" is odd because it expresses an [ACTION] over which it is hard to imagine exerting will.[8]

With this analysis, then, we can treat [ACTIONS] as independent conceptual constituents, in accordance with the linguistic evidence presented in chapter 3. A VP expressing an [ACTION] is a conceptual constituent that may be used referentially, filled in with information derived from pragmatic anaphora, questioned, or quantified over. Moreover, action sentences have a conceptual analysis containing both an [EVENT] and an [ACTION] constituent, as required for explicitness in conceptual representation. This dual analysis, created by rule (9.39), leads to formal and substantive advantages in the description of a number of linguistic constructions.

9.5 A Principle of Lexicalization

The verbs in the examples so far express only one event- or state-function, with the exception of causative verbs, which express two. All of the sentences have also expressed place- or path-functions explicitly as a preposition. However, this is only because I have selected examples in which the correspondence of semantics and syntax is maximally transparent.

In order to deal with the more general case, we must ask how a conceptual structure can be carved up into lexical items. The verb "enter" serves as a good preliminary example. "The dog entered the room" can be paraphrased by "The dog went into the room." Both sentences have the semantic structure (9.46a), in which "the dog" is theme and "the room" is the reference object of the path.[9] However, this structure is lexicalized differently in the two cases. (9.46b) shows how it is composed in "The dog went into the room"; (9.46c) shows how it is composed in "The dog entered the room."

(9.46) a. [Event GO ([Thing DOG], [Path TO ([Place IN ([Thing ROOM])])])]
b. "go": [Event GO ([Thing x], [Path y])]
"into": [Path TO ([Place IN ([Thing z])])]
c. "enter": [Event GO ([Thing x], [Path TO ([Place IN ([Thing z])])])]

In other words, the verb "enter" itself lexicalizes the path- and place-functions instead of leaving them to be overtly expressed by a prepo-

sition. Since the open argument z is a thing rather than a place or a path, "enter" acts syntactically as a simple transitive verb.

A similar case is "approach," which also lexicalizes a path-function. This time the appropriate function is TOWARD:

(9.47) "approach": $[_{\text{Event}}$ GO $([_{\text{Thing}}\ x], [_{\text{Path}}$ TOWARD $([_{\text{Thing}}\ y])])]$

Slightly more complex is the verb "rise," which can occur either intransitively ("The balloon rose") or with a PP ("The balloon rose along the cliff"). The intransitive use lexicalizes the path UPWARD; the PP adds an additional component to the path, as in (9.48).

(9.48) $[_{\text{Event}}$ GO $([_{\text{Thing}}$ BALLOON], $\begin{bmatrix} \text{UPWARD} \\ {}_{\text{Path}}\ \text{ALONG}\ ([_{\text{Thing}}\ \text{CLIFF}]) \end{bmatrix})]$

The structure of "rise" is therefore (9.49).

(9.49) "rise": $[_{\text{Event}}$ GO $([_{\text{Thing}}\ x], \begin{bmatrix} \text{UPWARD} \\ {}_{\text{Path}}\ \langle y \rangle \end{bmatrix})]$

The angle brackets around the variable y indicate that this argument is optional. When it is not present, we get the intransitive "rise," which takes only a single argument, the theme: the path is totally lexicalized by the verb. When y is present, we get the use of "rise" with a PP: the path given by the verb and that given by the PP combine as features of a more complex path.

The verb "raise" is the causative of "rise." Its structure, which is representative of causatives, is (9.50).

(9.50) "raise": $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}\ x], [_{\text{Event}}$ GO $([_{\text{Thing}}\ y],$ $\begin{bmatrix} \text{UPWARD} \\ {}_{\text{Path}}\ \langle z \rangle \end{bmatrix})])]$

The bracketed variable z abbreviates two uses of "raise," with and without a PP after the direct object, as in "Max raised his hand to the ceiling" and "Max raised his hand," respectively.

Verbs may lexicalize more than just a path- or place-function. For example, "Nicky buttered the toast" has a component that may be paraphrased as "Nicky put butter on the toast"; "Sam dusted the furniture" means "Sam took (the) dust off the furniture." Thus the verbs "butter" and "dust" lexicalize not only the path-function but the theme as well, leaving the agent and the reference object as the two syntactically expressed arguments.

(9.51) a. "butter": $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}\ x], [_{\text{Event}}$ GO $([_{\text{Thing}}$ BUTTER], $[_{\text{Path}}$ TO $([_{\text{Place}}$ ON $([_{\text{Thing}}\ y])])])])])]$

b. "dust": $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}\ x], [_{\text{Event}}$ GO $([_{\text{Thing}}$ DUST], $[_{\text{Path}}$ FROM $([_{\text{Place}}$ ON $([_{\text{Thing}}\ y])])])])])]$

Notice that the two verbs have opposite path-functions. Each is representative of a class of English denominal verbs. Like "butter" are many verbs such as "paper (the walls)," "paint," and "water." Like "dust" are less numerous verbs such as "scale (a fish)," "milk" (with path FROM IN), and "skin."

The most extreme case arises when a verb lexicalizes both the theme and the path, leaving no arguments to be expressed syntactically. The verb "rain" is such a case: it strictly subcategorizes only a semantically empty "it" in the subject. In languages such as Spanish that do not require a syntactic subject, the parallel verb can form a sentence all by itself.

(9.52) "rain": $[_{\text{Event}}$ GO $([_{\text{Thing}}$ RAIN], $[_{\text{Path}}$ DOWNWARD])]

From these examples emerges an important general principle of lexicalization, for which I have found no exceptions.

Lexical Variable Principle
A variable in the structure of a lexical item must be capable of being filled by a conceptual constituent.

This principle is true of every example given here (including the variable y in "rise" (9.49), which is a [PATH]). To understand its significance, let us see what it predicts must *not* happen.

(An initial caveat: I am generally put off by arguments purporting to demonstrate the nonexistence of a conceivable class of lexical items, since they rely essentially on the author's lack of imagination. Thus I present such an argument with a certain amount of diffidence. To keep myself honest, I will try to formulate as plausible an example as possible.)

Suppose that we take a conceptual structure like (9.53), which is lexicalized most transparently as "Joe put butter on the bread."

(9.53) $[_{\text{Event}}$ CAUSE $([_{\text{Thing}}$ JOE], $[_{\text{Event}}$ GO $([_{\text{Thing}}$ BUTTER], $[_{\text{Path}}$ TO $([_{\text{Place}}$ ON $([_{\text{Thing}}$ BREAD])])])])])]$

(9.53) can also be lexicalized as "Joe buttered the bread," in which the verb includes the theme as well as the path- and place-functions, as

shown in (9.51). However, one might imagine another lexicalization in which the verb includes the reference object instead. Suppose that, following approximately the pattern of the denominal verbs in (9.51), this verb were pronounced "bread." It would have the structure (9.54).

(9.54) "bread": [$_{\text{Event}}$ CAUSE ([$_{\text{Thing}}$ x], [$_{\text{Event}}$ GO ([$_{\text{Thing}}$ y], [$_{\text{Path}}$ z ([$_{\text{Thing}}$ BREAD])])])]

We would expect this verb to occur in patterns like (9.55).

(9.55) a. Joe breaded the butter on. (= "Joe put butter on the bread.")
b. Joe breaded the jelly under. (= "Joe put jelly under the bread.")
c. Joe breaded some salami on top of. (= "Joe put some salami on top of the bread.")

Such a verb is plausible on pragmatic grounds: it means something that one can imagine actually wanting to say. Nevertheless, it is intuitively bizarre. This is clearer if we compare it to a hypothetical verb "mayonnaise" ("put mayonnaise on") that follows the formal pattern of "butter" in (9.51a). A sentence like "Joe mayonnaised the bread," though it uses a nonexistent verb, is altogether understandable, while "Joe breaded the butter on," in the sense intended in (9.55a), is nonsense.

There are two ways in which the hypothetical verb "bread" differs from the other verbs we have discussed. First, it violates the Lexical Variable Principle: the variable z is not a conceptual constituent, but a path-function whose argument position has been lexicalized. The second difference is a direct syntactic reflection of the first: in order to express the argument z, such a verb would have to subcategorize a transitive preposition occurring without its object. The reason one can feel fairly confident of the nonexistence of a verb like "bread" is that there are no verbs with such a subcategorization. One can produce the superficial syntactic pattern of (9.55) in two ways, illustrated in (9.56).

(9.56) a. John put the books down.
Sally sent some sandwiches over.
b. Bill turned the light off.
Alice looked the answer up.

In (9.56a), the verb subcategorizes a full PP, which happens in these instances to be filled by an (optionally) intransitive preposition. In these examples, the preposition specifies the path all by itself. In (9.56b), the verb occurs idiomatically with an intransitive preposition (or "particle"), and the meaning of the verb-particle combination is specified in the lexicon. In neither case does the preposition have the syntactic or semantic role called for by a verb like "bread," a bare preposition expressing a bare path-function. Thus the Lexical Variable Principle appears to be valid, at least for this case, which—given the wide range of combinations of functions and arguments seen in (9.46)–(9.52) that *can* lexicalize—is not a trivial one.

This argument has involved lexicalization of an event-function and parts of a path. Ross (1972) gives a similar argument with respect to embedded event-functions (interestingly, in a quite different theoretical framework). He observes that the semantic structure of "try to find" in (9.57a) can also be lexicalized as "look for," as in (9.57b); but there could not be a verb "trentertain" that lexicalizes the semantic structure of "try" and "entertainment" alone, as in (9.57c).

(9.57) (Ross's (88))
a. Fritz tried to find entertainment.
b. Fritz looked for entertainment.
c. *Fritz trentertained to find.

Though the pragmatics of Ross's hypothetical example may leave something to be desired, the verb "trentertain" is particularly implausible because the corresponding syntactic pattern—a verb that must be followed by an objectless transitive verb—is unknown. Ross argues from this example that if a verb lexicalizes multiple predicates (event- or state-functions), they must be adjacently embedded in semantic structure. Formally, his claim amounts to a special case of the Lexical Variable Principle, since lexicalization of nonadjacent functions would lead to a variable that is a bare event- or state-function rather than a full conceptual constituent. Again, this is a case of nontrivial interest.[10]

This is by no means all there is to say about lexicalization patterns. I have not mentioned, for instance, any of the fascinating material in Talmy's (1980) broad crosslinguistic survey. However, this much will serve for present purposes; it begins to provide some idea of how lexical and syntactic variety can be achieved within the expressive constraints imposed by a fairly rigid functional form in semantic structure.