Abstract

This paper confronts the 'Bootstrapping' proposals of how children acquire the meaning of verbs based on their formal properties ('Syntactic Bootstrapping'; Landau & Gleitman 1985), or the morphosyntactic properties of verbs based on their semantic argument structure ('Semantic Bootstrapping'; Pinker 1989), with some facts about the syntax and semantics of motion event expressions in Yucatec Maya. I argue that Maya children cannot possibly identify motion verbs in Yucatec solely on grounds of formal evidence. At the same time, there are considerable semantic differences in the expression of motion events across Indo-European languages and Yucatec. These differences suggest that in acquiring the meaning of motion event expressions, learners must consider morphosyntactic evidence from the adult language, contrary to what is presupposed by the Semantic Bootstrapping hypothesis.

CHAPTER 3

The Pitfalls of Getting from Here to There: Bootstrapping the Syntax and Semantics of Motion Event Coding in Yukatek Maya

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1. INTRODUCTION

According to Landau and Gleitman's (1985) syntactic bootstrapping hypothesis, children are guided in the acquisition of motion and state-change expressions by certain morphosyntactic clues which distinguish their meanings. In particular, source- and goal-denoting expressions such as *into* and *out of* identify (literal and metaphoric) motion event expressions. From the presence of these clues, children are able to predict that the expression encodes motion rather than state change. It is shown in this article that children acquiring Yukatek Maya cannot rely on such morphosyntactic clues to differentiate between motion and state-change meanings. Yukatek is a Native American language spoken by approximately 800,000 people living on the Yucatan peninsula in Mexico and Belize. In this language, the referential ground in a motion event, that is, the object or place with respect to which motion is described, is expressed by obliques which distinguish neither dynamicity ('move to/from' vs. 'be at') nor directionality (source vs. goal), and the verbs deployed in such constructions to assert change of location are morphologically members of a class of dedicated change-of-state verbs. So there is no morphosyntactic difference in Yukatek between the translations of 'enter the house' and 'die in the house'.

The semantic bootstrapping hypothesis of Pinker (1984, 1989), in contrast, predicts that children start from universal cognitive representations and learn to package these into language-particular semantic representations. These are then encoded according to universal linking rules. However, the semantics of motion event constructions in Yukatek does not seem to fall inside what Pinker assumes to be

crosslinguistically invariant. The crosslinguistic variation in semantic construal that Pinker's account allows is circumscribed by the scope of Talmy's (1985, 2000) conflation typology. With Talmy, Pinker assumes that semantic representations of motion events invariably involve a "figure" moving along a "path" relationally defined with respect to a series of grounds (such as the "source" and "goal" of the motion event). But in Yukatek, motion is construed as location change of the figure with respect to single grounds. Motion from source to goal is not encoded as a single event in Yukatek (e.g., 'She went from A to B'), but is represented as a sequence of a departure event and an arrival event, where the path traversed in between is left to implicature (e.g., 'She left A, and then she arrived at B'). So Yukatek children have to learn to construe motion events for encoding in a way that is more different from how English children learn to construe motion events for encoding than Pinker assumes possible. Given that English and Yukatek children learn these different ways of construing events from listening to adult speakers talking about real world events that will be in many cases broadly similar across the two environments, it seems inevitable to conclude that children must pay more attention to language-particular structures than the semantic bootstrapping hypothesis assumes necessary.

While neither semantic bootstrapping nor syntactic bootstrapping is considered a one-way road by its proponents, the two hypotheses do hold that children need, as a first approximation, only semantic input plus innate knowledge of linking rules and syntax to come up with reasonably good predictions of argument structures (semantic bootstrapping), and that they only need argument structure input and innate knowledge of syntax and linking rules to come up with reasonably good predictions of the "ball park meanings" (e.g., motion vs. physical state change) of verbs (syntactic bootstrapping). In contrast, the picture that emerges from the discussion of motion event encoding in Yukatek suggests that semantic learning and syntactic learning are more closely intertwined than the proponents of both bootstrapping hypotheses assume. Taking the evidence from Yukatek and English in a comparative perspective, it seems likely that children acquire verb meanings and argument structures in tandem.

2. THE SYNTACTIC BOOTSTRAPPING HYPOTHESIS

In Landau and Gleitman's (1985) proposal, the distinction between motion and nonmotion meanings plays a central role. Landau and Gleitman (1985: 130–136) argue extensively and forcefully that all languages differentiate these meanings with morphosyntactic clues that may guide learners in the acquisition of motion and nonmotion verbs. Landau and Gleitman are aware of important differences in the encoding of motion events across languages. However, they hold that, no matter how, all languages do distinguish motion from state change in one way or other:

> In English, both a verb 'satellite' and a preposition are generally required to express the path: *John ran out* (satellite) *of* (preposition) *the house*. But in Atsugewi there is a set of satellites (appearing as verb suffixes), used without a preposition,

> which play these roles: for example, suffixes expressing 'into a liquid', 'down into the ground', or 'horizontally onto an object above the ground.' Summarizing, languages vary in which meaning components are characteristically conflated within the verb, and in the surface syntactic or morphological resources for expressing these various meaning components....Though languages differ from one another, each language apparently is restricted in the choices taken. If so, the learner can depend on the notional conflations a language characteristically exhibits to guide inductions about the meanings of new verbs; and he can depend on the surface reflexes (satellites, prepositions, etc.) of the verbs to determine just how these notions will likely be mapped into individual lexical entries. (Landau & Gleitman, 1985: 148–149)

From Landau and Gleitman's proposal, the following hypothesis can be derived (to be falsified by the Yukatek facts): motion event constructions have formal properties that distinguish them from other constructions. These differences guide learners to map the motion meaning onto the motion construction, and, more specifically, onto the motion verb that contains the central lexical information in the construction. Specifically: motion event expressions are formally sensitive to the "path" component of the motion event, i.e., the distinction between motion to, from, into, out of, and past a ground, etc. Languages vary in *how* they signal and distinguish path relations, but learners can always rely on the fact that they *do* signal and distinguish path relations.

3. THE MORPHOSYNTAX OF YUKATEK MOTION EVENT EXPRESSIONS

This section investigates the formal properties of motion verbs and ground-denoting obliques in Yukatek and discusses the implications of the findings for the syntactic bootstrapping hypothesis. The upshot is that there is no formal reflex of path distinctions in Yukatek, contrary to the prediction derived in the previous section from Landau and Gleitman (1985).

3.1. Morphological and Syntactic Properties of Motion Verbs in Yukatek

In order to understand how Yukatek grammar treats motion verbs, the basic facts of verb form classes in the language need to be considered. Yukatek verbs are divided into a number of distinct form classes. These distinctions have to do with the realization of aspect-mood marking on the verb. For present purposes, the mechanisms involved may be likened to distinctions among conjugation classes in Latin and Romance languages, or to processes of auxiliary selection in languages like Dutch (Zaenen, 1993), German (Shannon, 1992), and Italian (Van Valin, 1990). The details are of no particular concern here (but see Bohnemeyer, 2002, 2004, for extensive discussion).[1] The system of morphosyntactic predicate classes distinguished by these processes is summarized in Figure 3.1.

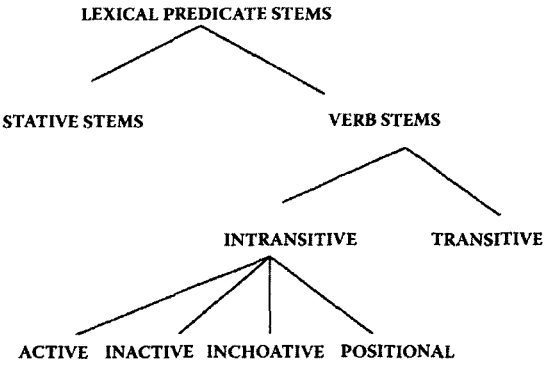

FIGURE 3.1. Yukatek formal predicate classes.

There is one class of transitive verb stems and there are four classes of intransitives. The labels assigned to the intransitive classes stand for the semantic traits that motivate the classes. "Inactive," "positional," and "inchoative" verbs encode state changes, while active verbs express "activities" in the sense of Vendler (1967) and Dowty (1979) (see Bohnemeyer, 2004). The active verb class features typical activity verbs like 'dance' and 'play', manner-of-motion verbs like 'roll' and 'run', and 'emission' verbs (Levin & Rappaport Hovav, 1995) such as 'shine' (light emission), 'buzz' (sound emission), and 'urinate' (bodily emission). Active verbs constitute a large class in Yukatek. Moreover, the class is open in the sense that it freely accommodates Spanish loan verbs. Only the active, transitive, and (to a lesser extent) inchoative classes have this property.

The inactive class includes verbs of physical state change comparable to English *be born*, "phase verbs" equivalent to English *begin* and *end*, and verbs of "inherently directed motion" (Levin & Rappaport Hovav, 1995) resembling English *come*, *go*, *enter*, and *exit*. There is a closed class of no more than perhaps 100 roots that produce inactive stems without derivation. Positional verbs express nonpermanent spatial properties of objects, animals, and people, including shape (e.g., 'bulge'), disposition (e.g., 'be coiled around something'), distribution (e.g., 'be scattered'), configuration (e.g., 'be between two things'), posture (e.g., 'sit', 'stand', 'lie'), and orientation (e.g., 'lie face-down'). This class includes 100–150 roots in Yukatek (see Bohnemeyer & Brown, 2007). The members of the last set, inchoative verbs, are all derived from stative predicates (corresponding to English adjectives) and nouns, and express the process of entering the state denoted by the base (e.g., 'be big' > 'grow'). This class is open in the sense that most nouns and stative predicates—both themselves open classes—produce inchoatives, and also in the sense that the inchoative derivation also operates to some extent on stative predicates borrowed from Spanish.

The evidence presented in Bohnemeyer (2004) in support of the analysis that the inactive, inchoative, and positional verbs express state changes comes from their aspectual behavior. Semantic tests show that these verbs entail a transition between two states, a source state and a result state (e.g., 'be alive' and 'be dead' in the case of *kim* 'die'), such that the event encoded by the verb is completed once the theme or patient enters the result state.[2]

Active intransitives differ from the three classes of state-change verbs in their argument structure properties. To produce transitive stems, active roots take an "applicative" suffix *-t*. The semantic effect of this alternation is the addition of an "applied object." In contrast, state-change roots causativize to produce transitive stems. This alternation is marked by different suffixes in the three subclasses. The semantic effect of this alternation is the addition of a causer argument.

Of the five morphological verb classes introduced in Figure 3.1, only the inchoative class does not host verbs that regularly occur in the expression of motion events. The dynamic verb forms of positional roots refer to the process of entering the spatial configuration expressed by the base (e.g., the process of assuming a posture) and only in this sense denote "motion"; in the remainder of this chapter, they are ignored. Transitive verb stems express caused motion, that is, motion events portrayed as caused by a participant different from the moving entity (e.g., putting, inserting, throwing, tossing). What from the point of view of English appears to be the most basic case of a motion scenario, motion of an object or animate being without an external cause, is expressed in Yukatek using intransitive verbs of the active and inactive classes. Table 3.1 lists some active and inactive verbs that frequently figure in the expression of motion events.

TABLE 3.1

The Distribution of Motion Verbs in the Active and Inactive Classes

Active		*Inactive*	
péek	'move'	*bin*	'go'
sùut	'turn'	*tàal*	'come'
xíimbal	'walk'	*máan*	'pass'
áalkab	'run'	*u'l*	'return'
síit'	'jump'	*lúuk'*	'leave'
balak'	'roll'	*k'uch*	'arrive'
xíiknal	'flutter, fly'	*na'k*	'ascend'
bàab	'swim'	*em*	'descend'
òokot	'dance'	*òok*	'enter'
...	...	*hóok'*	'exit'
		lúub	'fall'
		líik'	'rise'

The English glosses in Table 3.1 invite an informed guess to the effect that active verbs occurring in motion event descriptions express "manner of motion" in the sense of Talmy (1985, 2000). In contrast, the inactive verbs in the right column express an aspect of the "path" in Talmy's parlance: a feature of location change with respect to a ground. Thus, the inactive motion verbs denote "inherently directed motion" (Levin & Rappaport Hovav, 1995).

This presumed semantic difference between active and inactive motion verbs is confirmed by a striking semantic asymmetry in the behavior of verbs of the two classes vis-à-vis ground-denoting obliques. Consider the examples in (1):[3]

1. a. Le=ch'íich'=o' túun xíiknal y=óok'ol le=che'=o'
   DET=bird=D2 PROG:A.3 fly A.3=TOP DET=tree=D2
   'The bird is flying [i.e., circling!] above the tree.'

   b. Le=ch'íich'=o' h-em u=xíiknal te=che'=o'.
   DET=bird=D2 PRV-descend(B.3.SG) A.3=fly LOC:DET=tree=D2
   'The bird flew down from the tree [lit.: it descended from the tree flying].'

   c. Le=ch'íich'=o' h-na'k u=xíiknal te=che'=o'
   DET=bird=D2 PRV-ascend(B.3.SG) A.3=fly LOC:DET=tree=D2
   'The bird flew up to the tree [lit.:it ascended to the tree flying].'

When active motion verbs are combined with ground-denoting obliques (1a), the resulting interpretation is not change of location with respect to the ground, but only location of the motion event as a whole. Only inactive motion verbs can express change of location with respect to the ground, assigning to the latter a semantic role such as "source" (as with *em* 'descend' in (1b)), "goal" (as with *na'k* 'ascend' in (1c)), or "via" (cf. Jackendoff, 1983), in the case of *máan* 'pass'.

There are various ways to combine reference to change of location with reference to manner of motion. In the simplest case, the two verbs appear in independent sentences which are simply coordinated or juxtaposed ('The bird flew, and it ascended/descended to/from the tree'). The two verbs can also be combined into one sentence. In this case, the active motion verb may appear as a "gerundial" subordinate to the main verb (as in (1b–c), translated 'it ascended/descended flying').[4]

Because only the inactive motion verbs assign source, goal, or via roles to the ground-denoting oblique, it seems fair to conclude that only they express "inherently directed motion". These inactive motion verbs are the focus of the rest of this chapter. They are termed *change-of-location* verbs. The semantics of these verbs is examined in detail in section 5.

3.2. Implications of the Distribution of Yukatek Motion Verbs across Form Classes

In English, verbs may be assumed to form complex lexical entries together with what Talmy (1985, 2000) calls "satellites," that is, particles such as *up*, *down*, *in*, *out*. (Note that Yukatek does not have any such satellites, unlike many other Mayan languages.)[5] If so, then learners of English have direct morphological evidence to the effect that a given verb has a change-of-location meaning. If, on the other hand, satellites are assumed not to form lexicalized collocations with verb stems (as argued, e.g., in Ruhl, 1989: 163–172), then English does not show a morphological distinction of motion verb classes. This means that, in English, children are not led by any morphological facts to assumptions about the meanings of these verbs. By contrast, Yukatek learners should be biased by the morphological pattern of the change-of-location verbs to assume that the semantics of these verbs is in some respect similar to the semantics of verbs that lexicalize uncaused state changes in the physical domain, such as 'be born', 'die', or 'explode', and that the semantics of the change-of-location verbs is in the same respect dissimilar to the semantics of activity verbs (e.g., equivalents of *sing* and *dance*) and transitive verbs denoting caused state changes (e.g., equivalents of *make*, *break*, *drink*, etc.). By the same token, unlike their English-learning peers, Yukatek learners should be biased by the morphological facts of their language to assume a semantic difference between the change-of-location verbs translating 'come', 'go', 'enter', 'exit', and so on and the manner-of-motion verbs translating 'run', 'swim', 'fly', and so forth.[6]

3.3. The Expression of the Referential Ground in Yukatek Motion Event Coding

The referential ground is always referred to by an oblique in a Yukatek motion event description. This holds with three exceptions: *tàal* 'come' and *u'l* 'return' both assign a goal role to the deictic center; this may be expressed by a deictic adverb like *here*, but usually remains unexpressed. In addition, *bin* 'go' assigns a source role either to the deictic center (in which case it again remains unexpressed) or to a location that cannot be specified in the same clause, but has to be retrieved anaphorically from context.[7]

Ground-denoting obliques are usually headed by a preposition or relational noun. The most important of the prepositions and relational nouns that appear in this context are listed in Table 3.2.

Like other Mayan languages, Yukatek lacks an elaborate set of genuine prepositions (cf. Kaufman, 1990: 78). Aside from *ti' 'LOC'* and *ich(il)* 'in', all relators listed in Table 3.2 are relational nouns (see Lehmann, 1996, for details). The generic preposition *ti'*, somewhat elusively glossed 'LOC' in the examples, is a semantically almost empty adverbializer which does not distinguish between a

TABLE 3.2

Spatial Relators in Yukatek Ground-Denoting Obliques

Form Class	*Relators*	*Meaning in Ground-Denoting Obliques*
Prepositions	*ti'*	'LOC' (generic preposition)
	ich(il)	'in(side)'
Relational nouns that may directly head ground-denoting obliques	*óok'ol*	'upper side', 'on (top of)', 'above'
	àanal	'(at the) bottom (of)', 'under'
	iknal	'at', 'vicinity'
Relational nouns that require the generic preposition *ti'* or the relational suffix *-il* to form ground-denoting obliques	*chúumuk*	'(at the) center (of)'
	nak'	'belly', '(at) mid-height'
	ts'u'	'(at the) core (of)'
	(ba')pàac h	'(at the) back (of)', 'behind', 'outside', 'around'
	(ak)táan	'(in) front (of)', 'before', 'opposite'
	tséel	'(at the) side (of)'
	xno'h	'(to the) right (of)'
	xts'i'k	'(to the) left (of)'
	háal	'(at/on the) edge (of)'
	xùul	'(at the) end (of)'
	yáam	'interstice', 'between'
	tòoh	'(in the) direction (of)'

spatial point of reference, a recipient, beneficiary, or experiencer, a purpose, and a number of other readings. The function of *ti'* simply consists in relating any kind of peripheral participant (with the exception of a comitative or instrumental participant) to the event core expressed by the verbal complex. *Ti'* may generally be translated as 'with respect to'.

It is easily demonstrated that the operators listed in Table 3.2 do not express path relations. Consider the examples in (2). Both *òok* 'enter' and *hóok'* 'exit' are equally possible with both *ich* 'in' and *ti'* 'LOC'. The same holds for the existential predicate *yàan* employed in (2c) to express stative location. Hence, the preposition is sensitive neither to the source–goal distinction nor even to the dynamicity of the event core (cf. also Goldap, 1992, and Lehmann, 1992).

2. a. Le=kàaro=o' h-òok ich/ti' le=kàaha=o'.
DET=cart=D2 PRV-enter(B.3.SG) in/LOC DET=box=D2
'The cart, it entered [lit.: in] the box.' (or rather: it entered with respect to the box's inside)

b. Le=kàaro=o' h-hóok ich/ti' le=kàaha=o'.
DET=cart=D2 PRV-exit(B.3.SG) in/LOC DET=box=D2
'The cart, it exited [lit.: in] the box.' (or rather: it exited with respect to the box's inside)

c. Le=kàaro=o' ti=yàan ich/ti' le=kàaha=o'.
DET=cart=D2 LOC=EXIST(B.3.SG) in/LOC DET=box=D2
'The cart, it is in the box.' (or rather: it is located with respect to the box's inside)

Prepositions or relational nouns heading ground-denoting obliques merely serve to specify a spatial region of the ground, such as the inside of the cardboard box in the examples in (2) if *ich(il)* is chosen. If for whatever reason no particular region is selected, *ti'* takes over, leaving the spatial properties of the ground to inference.

If the ground is not referred to by a phrase headed by a preposition or relational noun, but for example by a deictic adverb equivalent to *here* or *there*, there is likewise no formal reflex of either the distinction between motion and location or the distinction between different path roles such as source and goal.

3.4. Implications of the Expression of the Referential Ground for the Syntactic Bootstrapping Hypothesis

Because the oblique specifying the referential ground in a motion event does not distinguish between stationary location and change of location, and the verb used to express change of location has the same formal properties as an inactive verb expressing change of state in the physical domain,[8] there is no morphological difference between (3) and (4) as shown next, and no syntactic difference that could be read off of constituent order. This means that, contrary to what is predicted by the syntactic bootstrapping hypothesis, Yukatek children have no formal clue that would allow them to determine that (3), but not (4), expresses motion.

3. Ts'o'k uy=òok-ol ich le=nah=o'.
TERM A.3=enter-INC in DET=house=D2
'He has entered the house.'

4. Ts'o'k u=kim-il ich le=nah=o'.
TERM A.3=die-INC in DET=house=D2
'He has died in the house.'

Notice that (3) cannot be understood as locating the entire entering event inside the house, as (4) locates the dying event inside the house. Under this analysis, (3) would not distinguish between entering *into* the house (where the source state of the entering event is outside the house) and entering a room or compartment *inside* the house (where the theme is located inside the house at both the source and the target state of the entering event). But native speakers systematically reject the latter type of interpretation. The interpretation of the prepositional phrase *ich le naho'* in (3) is by necessity different from the interpretation of the same prepositional phrase in (4). When combined with a verb that lexicalizes change of location, the ground denoted by the oblique is assigned a path role of source, goal, or via. With a verb that does not lexicalize change of location, no such interpretation arises. The interpretation of the ground-denoting oblique strictly depends on the semantics of the verb. Only once Yukatek-learning children have established the change-of-location verbs as a lexical category, based on semantic evidence, can they assign the correct interpretations to utterances of the structure of (3) and (4) and use these in an adult-like manner.

4. THE SEMANTIC BOOTSTRAPPING HYPOTHESIS

The point advanced above with respect to Landau and Gleitman's syntactic bootstrapping approach is that it is not capable of accounting for the acquisition of motion expressions in Yukatek, because the formal clues distinguishing motion from state change that the syntactic bootstrapping proposal relies on do not exist in Yukatek. The evidence to be presented now against the semantic bootstrapping hypothesis is of a different nature. There is no evidence suggesting that children could not learn the *morphosyntactic* properties of motion event expressions in Yukatek in the way that Pinker (1989) suggests children learning any language would (essentially, by application of universal linking rules to semantic event representations). However, Pinker's proposal entails that learners do not require evidence of the morphosyntactic treatment of event expressions in the adult language to construct semantic representations of the events they are learning to encode. Pinker (1989) does *not* claim that semantic representations are language-independent, and he actually stresses the differences between semantic and cognitive representations (in contrast to Pinker, 1984). However, he assumes that semantic differences across languages reduce to variation in idiosyncratic properties among otherwise corresponding lexemes, and to differences in lexicalization patterns as studied by Talmy (1985, 2000). With the aid of "child-friendly" parental input, children should still be able to map their prelinguistic cognitive event representations onto verbs by application of a process of "event-category labeling," without having to take in extensive evidence from the morphosyntactic properties of the verbs in the adult language:

> First, there is the innocuous assumption that children's perceptual and cognitive mechanisms are enough like adults' (at least in situations in which they interact with their parents) that they construe the world in pretty much the same way that the adults speaking to them do. Second, there is a somewhat stronger assumption:

> that in parent-to-child speech, the parent uses words whose semantic representations correspond closely to the child's conceptual representation for that situation, so that event-category labeling and analogous processes for other grammatical entities will generally be accurate. (Pinker, 1989: 362)

In the motion domain, this means that, given beneficial input, it should be obvious to both English- and Yukatek-learning children how to form the appropriate semantic representation of a motion scene, so that they can then proceed to structurally encode this representation following linking rules. The cognitive representation of motion that Pinker assumes to feed into the "event-category labeling" process is "a certain schematization of motion whereby a moving object is idealized as a point traversing some trajectory" (1989: 177), which Pinker repre-

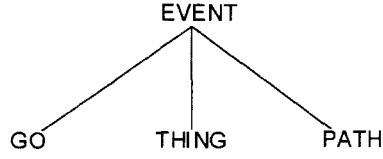

FIGURE 3.2. Conceptual representation of motion events according to Pinker (1989:177). Reprinted by permission.

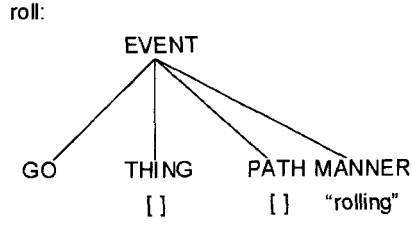

FIGURE 3.3. Semantic representation of manner of motion in English according to Pinker (1989: 182). Reprinted by permission.

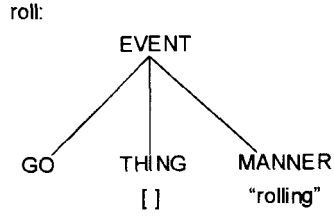

FIGURE 3.4. Semantic representation of manner of motion in Spanish according to Pinker (1989: 182). Reprinted by permission.

sents as in Figure 3.2. The predicate GO here stands for the event type of "a thing moving along a path" (1989: 176) and THING stands for the moving entity.

"Event-category labeling" then maps this conceptual representation onto language-particular semantic representations. The main crosslinguistic difference among such representations has to do with the integration of manner of motion along the lines of Talmy's (1985, 2000) lexicalization typology. Spanish-learning children acquire semantic representations like the one for 'roll' depicted in Figure 3.4 as the only way to frame manner of motion, whereas English-learning children in addition acquire representations like the one in Figure 3.3, which Pinker considers "created" from the one in Figure 3.4 according to a "lexical rule". Here, the open brackets represent argument positions to be filled according to the linking rules. The representation in Figure 3.4 is intended to license *The ball rolled*, which is fine in both English and Spanish, whereas the one in Figure 3.3 is intended to license *The ball rolled down the hill*, which is not permitted in Spanish.

The difference between the framing in Figure 3.3 and the one in Figure 3.4 covers the amount of crosslinguistic variation in motion semantics that Pinker acknowledges, and he contends that children can cope with this variation and still acquire semantic representations of motion events without inspecting the morphosyntactic properties of the verbs and argument structures involved in coding these representations.[9] It is this assumption that is to be argued against in the following section. The difference in the semantic construal of motion scenes across English and Yukatek cannot be accounted for by a mere lexical-semantic rule that derives the Yukatek-type representation from the English-type one or vice versa, in the way Pinker assumes Figure 3.3 to be derived from Figure 3.4. In Yukatek, motion is not framed at all as "a moving object (...) traversing some trajectory", the cognitive representation of motion that Pinker assumes is universally mapped onto semantic representations by "event-category labeling." Instead, motion is represented as location change with respect to single grounds. It is argued later in this chapter that Yukatek children could not possibly tune in to this Yukatek way of framing motion without examining the morphosyntactic properties of motion event expressions (in particular, the properties of ground-denoting obliques), contrary to the semantic bootstrapping hypothesis.

5. THE SEMANTICS OF YUKATEK MOTION EVENT EXPRESSIONS

It has been shown in section 3 that ground-denoting obliques in Yukatek motion clauses do not formally distinguish among distinct path functions such as "source", "goal", and "via". Instead, any ground-denoting obliques can be assigned any of these roles by the change-of-location verbs (whereas other verbs cannot assign path roles at all). This has the consequence that no verb can combine with more than one ground-denoting oblique in a single clause.[10] This follows from the fact that every change-of-location verb assigns exactly one path role. Moreover, even if the change-of-location verbs could assign multiple path roles, no mechanism would be

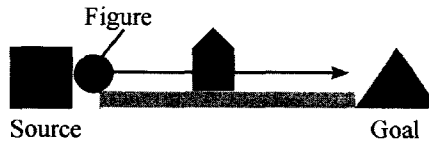

FIGURE 3.5. First frame of the motion event video stimulus described in (5).

in place to determine which role is assigned to which ground-denoting oblique, because the form of the oblique does not reflect the role assigned to it. And because there are no serial verb constructions in Yukatek that license combinations of multiple change-of-location verbs in single clauses, Yukatek motion clauses only encode location changes with respect to single grounds. Consequently, scenarios of a figure traveling from source to goal have to be distributed across at least two clauses, one encoding departure from the source, the other arrival at the goal. Consider, for example, (5), a description of the motion scenario depicted in Figure 3.5:

5. Ba'l=e', be'òora=a' t-inw=il-ah=e', hun-p'éel
thing=TOP now=D1 PRV-A.1=see-CMP(B.3.SG)=TOP one-CL.IN

chan áasul ba'l k-u=p'áat-al t-u=xùul
DIM blue thing IMPF-A.3=await\ACAUS-INC LOC-A.3=end

le=tu'x h-luk' le=chan ba'l chak=o',
DET=where PRV-leave(B.3.SG) DET=DIM thing red(B.3.SG)=D2

k-u=bin u=balak'=e', k-u=ts'o'k-ol=e',
IMPF-A.3=go A.3=roll=TOP IMPF-A.3=end-INC=TOP

k-u=máan y-iknal hun-p'éel chan ba'l chak xan=e',
IMPF-A.3=pass A.3–at one-CL.IN DIM thing red(B.3.SG) also=D3

k-u=ts'o'k-ol=e', k-u=k'uch-ul y-iknal le=triàangulo...
IMPF-A.3=end-INC=TOP IMPF-A.3=arrive-INC A.3-at DET=triangle

'But, this time, I saw a blue thing, it remains at the end where the red thing left, [the red thing] goes rolling, then it passes by a thing which is also red, then it arrives at the triangle...'

Indo-European languages provide the option of a Yukatek-like framing as well, as the English translation of (5) illustrates. However, this hardly seems the most natural way in English to describe the motion event represented in Figure 3.5. More pertinently, in Indo-European languages this construal is merely a borderline case of a kind of construal whereby the figure undergoes incremental location change along the path as the event progresses through time. The path is encoded with its be-

ginning and end points assigned to source- and goal-denoting obliques that may be copresent in the clause ('The red ball rolled from the square (via the house) to the triangle'). Motion event descriptions of this type entail a "homomorphic" (i.e., many-to-one) mapping from subevents into the "subpaths" traversed by the figure during the subevents (cf. Jackendoff, 1996; Krifka, 1998).

This construal is not encoded at all in Yukatek. In Yukatek, motion is represented, not as a homomorphic mapping from the course of the event into the path, but as location change with respect to single grounds. Traversal of the path that connects events of departure, passing, and arrival, and even the occurrence of motion during the corresponding time intervals, is left to implicature. This has some striking consequences for the conditions under which Yukatek "motion" descriptions can be used. Elicitation with a variety of different stimuli (some of which are presented in Bohnemeyer, 1997) has shown that the change-of-location verbs *òok* 'enter', *hóok'* 'exit', *na'k* 'ascend', *em* 'descend', and *máan* 'pass' do not entail but only implicate motion of the theme argument. In scenarios in which the ground moves instead of the figure, these verbs are still applicable to the event, provided the implicature that the figure moves is explicitly canceled. For example, if a cardboard box is placed upside down over a toy car so that the car ends up inside, it is perfectly acceptable in Yukatek to say 'The box was moved, and the car entered it'. Here, reference to the motion of the box serves to block the implicature that the car moved. Even when there is no motion involved at all, for example in animations in which a figure "beams" into or out of a spatial configuration, any of a variety of different resultative or perfect forms of the change-of-location verbs can still be used in reference to the configuration. For instance, although an event of the toy car materializing inside the box cannot be referred to as the car 'entering' the box, it is perfectly acceptable to say 'The car *has* entere*d* the box' once the beaming event is completed.

It has been claimed in section 4 that the difference in semantic representations of motion scenes between Yukatek and English cannot be accounted for by a mere lexical rule that derives one type of representation from the other, in the way that Pinker assumes the English-type representation in Figure 3.3 to be derived from the Spanish-type representation in Figure 3.4. The justification for this claim is that the basic event type of movement along a path captured by the GO predicate in the representations depicted in Figures 3.2–3.4 is not instantiated in semantic representations of motion in Yukatek.[11]

Let us assume now, with Pinker, that Yukatek and English children bring to the task of language acquisition the same prelinguistic cognitive representations of motion "whereby a moving object is idealized as a point traversing some trajectory" (Pinker, 1989: 177). Can Yukatek children derive semantic representations from these conceptual representations that license the relevant argument structure properties of change-of-location verbs (in particular, the fact that they take no more than one ground-denoting oblique, expressing location change with respect to that single ground), merely by "event-category labeling" relying on beneficial input? Suppose a child sees the scenario in Figure 3.5 and then hears the description in (5).

Would that input be sufficient to prevent Yukatek children from deriving English-style lexical-semantic representations for Yukatek verbs? Certainly not. Nothing in (5) prevents Yukatek children from assuming that change-of-location verbs *could* occur with multiple ground-denoting obliques the way that English motion verbs do, even if the change-of-location verbs in (5) happen to occur only with single ground-denoting obliques. And if Pinker is correct in assuming that Yukatek children derive their semantic representations from conceptual representations of "a moving object (...) traversing some trajectory", then Yukatek children should *expect* that the path of a motion event can be mapped onto a series of ground-denoting obliques within the clause denoting the event.

Of course, children's predictions become much more accurate once their database includes information about the *frequency* with which motion verbs occur with multiple ground-denoting phrases (high in English, zero in Yukatek)—but this information is assumed unnecessary for learning semantic representations that license the argument structure properties of verbs according to the semantic bootstrapping hypothesis. But in order to predict *adult-like* semantic representations that would not clash with the uses discussed earlier, in which the figure does not actually move, Yukatek children clearly have to perform an even more detailed analysis of the ground-denoting obliques with which change-of-location verbs occur.[12] In particular, they have to take on board the fact that Yukatek ground-denoting obliques show no formal reflex of path or locative roles. Given this information, they can conclude that path relations are exclusively expressed in verbs in Yukatek, and on this basis they can infer the correct semantic analysis of change-of-location verbs.

6. THE DIALECTIC OF SEMANTIC AND SYNTACTIC LEARNING

Contrary to what is predicted by the syntactic bootstrapping hypothesis, Yukatek children cannot learn the basic semantic difference between motion expressions and descriptions of physical state changes relying on formal clues, because such formal clues—morphosyntactic reflexes of motion path roles outside the verb—are lacking in Yukatek. On the contrary, to determine whether a verb assigns a path role to a ground-denoting oblique, as a change-of-location verb does, or a stationary locative role, or whether it is merely compatible with a locative oblique, as any other verb is (including, of course, manner-of-motion verbs, which are also used in reference to motion events!), Yukatek learners have to have access to the semantics of the verb first.

However, in contradiction to what is assumed by the semantic bootstrapping hypothesis, Yukatek children cannot derive semantic representations of change-of-location verbs that license the correct argument structure properties of these verbs solely by event-category labeling of preverbal cognitive representations with the aid of "child-friendly" parental input. Yukatek-learning children could not derive

the appropriate semantic representations, namely location change with respect to single grounds, from this input—*especially* if, as Pinker assumes, they start from the same cognitive representations of continuous locomotion along a path as their English peers do—unless they take in evidence from the fact that change-of-location verbs only ever occur with single ground-denoting obliques, and that these obliques do not formally reflect the path roles assigned to them.

It would appear, then, that Yukatek children need information about the argument structure properties of change-of-location verbs to determine their semantics, and information about the semantics of these verbs to determine their argument structures. This suggests a learning mechanism that offers a synthesis of syntactic and semantic bootstrapping, by exploiting both the constraining power of semantic representations on syntactic ones and that of syntactic representations on semantic ones. However, in order to avoid circularity, syntactic learning and semantic learning have to have distinct roles in the mechanism. One such mechanism is "lexical reconciliation," proposed by Grimshaw (1994). The reconciliation process is summed up in a nutshell in (6):

6. Lexical reconciliation (based on Grimshaw, 1994: 423)
   a. The learner hears a sentence, observes an event she assumes the sentence to refer to, isolates the verb in the sentence, and forms candidate semantic representations of the verb that fit both the observed event and whatever she knows about the sentence's lexical content.
   b. On the basis of the candidate semantic representations and the universal and/or language-specific linking rules she assumes, the learner predicts the verb's argument structure. The predicted argument structures are then checked against the observed syntactic properties of the sentence, and candidate semantic representations that predict argument structures not fitting the observed facts are rejected.

Reconciliation preserves the full predictive power of semantic bootstrapping, but it does not rely on mere "concept labeling" for the formation of the semantic input. The input representations for the phase of reconciliation that corresponds to semantic bootstrapping are derived from potentially fairly intricate mappings between perceived utterances and perceived events. The predictive power of syntactic bootstrapping is exploited by a checking mechanism whose function it is to filter out candidate input representations that are inconsistent with the perceived syntactic properties of the target verb, given the learner's assumptions about linking. Learning semantic representations that are not discriminated by syntactic properties that linking is sensitive to—such as the distinction between motion and state change in Yukatek—is no longer a problem, because the semantic input to verb learning comes from an independent source.

Grimshaw's lexical reconciliation mechanism avoids the pitfalls syntactic bootstrapping runs into when applied to the Yukatek data. But to the pitfalls of semantic bootstrapping it offers only partial remedy. Under reconciliation, Yukatek

children are no longer burdened with initial interpretations of change-of-location verbs *exclusively* as labels for conceptual representations of translational motion, such as those in Figures 3.3 and 3.4, which children learning English and Spanish presumably start out with. But there is no reason to assume that such representations are not among the candidate input representations the learner attempts to map to the verb's argument structure, and it is not clear that the observed syntactic facts of the verb and the learner's knowledge of linking rules are sufficient to reject them. The problem is that even though the child observes change-of-location verbs only with single ground-denoting obliques (say, expressions of the source), no single instance of this observation rules out the interpretation that another ground (e.g., the goal) is merely left unexpressed even though present in the semantic representation.

To realize that this is not the case, the learner might need to determine that the form of the ground-denoting oblique does not discriminate a path function like source or goal, unlike in English or Spanish. But this realization can apparently only come from a generalization across uses of the same ground-denoting oblique in different path roles. From this the learner might conclude that Yukatek clauses cannot include more than one ground-denoting oblique *as a matter of principle.* This might eventually lead her to discard translational-motion representations for the meanings of the change-of-location verbs. So it appears that in order to arrive at the correct language-particular semantic representations, semantic and syntactic learning have to proceed in tandem to an extent that exceeds even what Grimshaw assumes to be part of lexical reconciliation.

7. CONCLUSIONS

It could be argued on the basis of the facts of motion event expressions in Yukatek that both bootstrapping hypotheses are wrong. But a more appropriate conclusion seems to be that both proposals are in fact *right.* If there is a sense in which the two hypotheses are falsified by the Yukatek data, it is in the assumption that they are mutually exclusive. This is a conclusion that has been arrived at before, on the basis of other sets of data, for example, by Grimshaw (1994). However, the amount of crosslinguistic variation in both semantic framing of events and predicate argument structures uncovered in the present study suggests that semantic learning and morphosyntactic learning proceed in tandem to an extent that goes even beyond what Grimshaw envisioned.

NOTES

[1]The Yukatek verb classes have also been studied intensively by Lehmann (1993), Lucy (1994), and Krämer and Wunderlich (1999). As far as the issues dealt with here are concerned, these authors have reached the same conclusions as Bohnemeyer (2004).

[2]An exception are "degree achievement" verbs (Dowty, 1979) such as the inchoative *nohochtal* 'grow'. Such verbs do not entail a definite end state, unless the extent to which the theme or patient undergoes the change is specified (e.g., 'grow five inches').

[3]The orthographic representation in this chapter is morphemic rather than morphophonemic. The orthography applied is based on Lehmann (1996). In the interlinear morpheme glosses, '-' is used for for affixes and '=' for clitics. Abbreviations in the glosses include the following: 2, second person; 3, third person; A, set-A ('ergative'/possessor) clitics; ACAUS, anticausative derivation; B, set-B ('absolutive') suffixes; CL, (numeral/possessive) classifier; CMP, completive aspect; D1, proximal deixis; D2, distal/anaphoric deixis; DET, definite determiner; DIM, diminutive (particle); EXIST, existential/locative/possessive predicate; IMPF, imperfective aspect; IN, inanimate (classifier); INC, incompletive aspect; LOC, generic preposition; PROG, progressive aspect; PRV, perfective aspect; REL, relational derivation (nouns); SG, singular; TERM, terminative aspect-mood marker; TOP, topic marker.

[4]Alternatively, the manner verb may be fronted in a special manner-focus construction; cf. Bohnemeyer & Stolz (2006) for details.

[5]Many Mayan languages have so-called "directional" morphemes grammaticalized out of motion verbs; cf. Kaufman (1990: 82–83), and Zavala (1993).

[6]These points have been stressed by Lucy (1994).

[7]With most change-of-location verbs, the ground is frequently not specified at all in the clause that contains the verb, but either retrieved from context by inference or simply left unspecified. In five "Frog Story" narratives collected by Christel Stolz (cf. Bohnemeyer & Stolz, 2006), I counted a total of 158 inactive change-of-location verbs. Of these, only one-third (52) were accompanied by ground-denoting obliques. In 25 cases (16%), the verb appeared in a "motion-cum-purpose" construction, in which instead of a ground, a "goal event" is specified (as in *to go shopping*). And in 51% of all instances, neither a ground nor a goal event was specified. The only member of the set of inactive change-of-location verbs that rarely occurs without a ground-denoting oblique is *na'k* 'ascend'.

[8]There is in fact one difference: the three most frequent inactive motion verbs, *bin* 'go', *tàal* 'come', and *máan* 'pass', are all irregularly zero-marked in one aspect-mood category which on all other state-change verbs is overtly marked. But I do not see how this could help a child determine that these verbs express change of location.

[9]As far as I can see, Pinker does not explain *how* English-learning children acquire the representation in Figure 3.3 while Spanish-learning children do not. But for the sake of the argument, I will assume that Pinker is correct in his supposition that these lexical-semantic representations can be acquired without evidence from argument structure properties.

[10]There is one exception: direction obliques headed by *tu tòohil* 'in the direction of' (see Table 3.2), that is, 'toward' or 'away from', can be combined with obliques encoding source, goal, or via roles. But because direction specifications do not entail change of location (cf. Jackendoff, 1983: 165), their presence in a clause does not affect the location change information entailed by the clause.

[11]Lucy (1994: 641) points to the framing of motion as state change in Yukatek, but holds that continuous-locomotion readings can still be obtained with the progressive aspect. But this misses the point that the path from source to goal cannot be encoded. Progressives of motion clauses refer to pre-states of departure, arrival, or passing events, but even progressives cannot portray a moving entity as being en route from source to goal in Yukatek.

[12]It may be argued that Yukatek children can predict the semantics of change-of-location verbs on the basis of observations of nonmotion uses. However, such uses are highly infrequent. A Yukatek child may never observe a single instance of such usage until age 4 or even much later, and initial evidence suggests that children's use of change-of-location verbs is already adult-like at age 4.

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