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 & 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* only occur with 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, i.e. the object or place with respect to which motion is described, is expressed by adjuncts 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), by 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 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). On this account, motion scenes are construed as incremental location changes of objects that move along paths as the event progresses through time. But in Yukatek, motion is construed as discrete location change of the figure with respect to a single ground. That is to say, motion from source to goal cannot be encoded as a single event in Yukatek (e.g. ‘She went from A to B’), but has to be 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 are considered one-way roads by their proponents, they do hold that children need in 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 in 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 & Gleitman's (1985) proposal, the distinction between motion and non-motion meanings plays a central role. Landau & Gleitman (1985: 130-136) argue extensively and forcefully that all languages provide morphosyntactic clues differentiating these meanings that may guide learners in the acquisition of motion and non-motion verbs. Landau & 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 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. (...) 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 & 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 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 adjuncts 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 & Gleitman (1985).

(a)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 (1998, in press) for extensive discussion).[1] The system of morphosyntactic predicate classes distinguished by these processes is summarized in Figure 1:

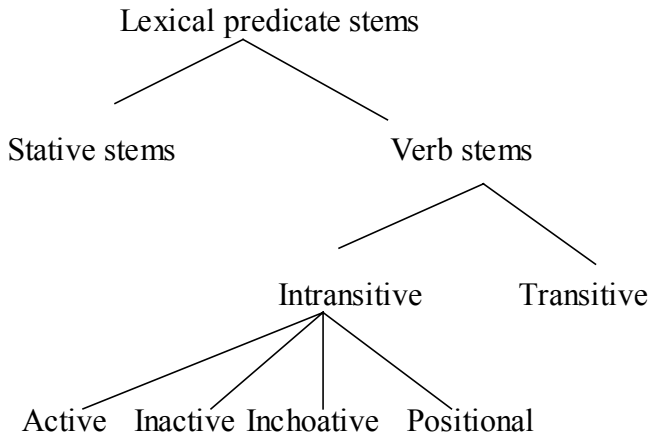


Figure 1. ***Yukatek formal predicate classes***

There are one class of transitive verb stems and four classes of intransitives. The labels assigned to the intransitive classes stand for the semantic traits that motivate the classes. In Bohnemeyer (in press), it is shown that 'inactive',

'positional', and 'inchoative' verbs encode state changes, while active verbs express 'activities' in the sense of Vendler (1967) and Dowty (1979). The active verb class features typical activities like 'dance' and 'play', manner-of-motion verbs like 'roll' and 'run', and 'emission' verbs (Levin & Rappaport Hovav 1995 [LRH]) 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 like English *be born*, 'phase verbs' equivalent to English *begin* and *end*, and verbs of 'inherently directed motion' (LRH) 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 non-permanent 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 in prep.). 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 (in press) 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 also 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 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 article, they will be neglected. Transitive verb stems express caused motion, i.e. motion events portrayed as caused by a participant different from the moving entity (e.g. putting, inserting, throwing, tossing, etc.). 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 1 lists some active and inactive verbs that frequently figure in the expression of motion events:

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'

Table 1. ***The distribution of 'motion verbs' in the active and inactive classes***

The English glosses in Table 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 left 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' (LRH).

This presumed semantic difference across 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 adjuncts. Consider the examples in (1):[3]

(1)a. Le=ch'íich'-o' túun **xíiknal** y-óok'ol le=che'-o'.

DEF=bird-D2 PROG:A.3 fly A.3-top DEF=tree-D2

'The bird is **flying** [i.e. circling!] above the tree.'

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

When active motion verbs are combined with ground-denoting adjuncts (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 the (1b-c), translating 'it ascended/descended flying').[4]

Since only the inactive motion verbs assign source, goal, or via roles to the

ground-denoting adjunct, it seems fair to conclude that only they express 'inherently directed motion'. The inactive motion verbs are focal from here. They shall be termed **change-of-location** verbs. The semantics of these verbs are examined in detail in section 5.

*(b)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', i.e. particles such as *up*, *down*, *in*, *out*. (Note that Yukatek does *not* show any such satellites, unlike many other Mayan languages!).[5] If so, then learners of English have direct morphological evidence at hand to the effect that a given verb has a location change 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 in English, children are not led by any morphological facts to assumptions about the meanings of 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. equivalent 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' etc. and the manner-of-motion verbs translating 'run', 'swim', 'fly' and so forth.[6]

(c) The expression of the referential ground in Yukatek motion event coding

The referential ground is always referred to by an adjunct in a Yukatek motion event description. This holds with three exceptions: *tàal* 'come' and *u'l* 'return' both assigns 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 adjuncts 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 2.

From class	Items	meaning in ground-denoting adjuncts
Prepositions	*ti'* *ich(il)*	'LOC' (generic preposition) in
Relational nouns that may directly head ground-denoting adjuncts	*óok'ol* *àanal* *iknal* *chúumuk*	top, upper side, on, above bottom, below, beneath at at the center of
Relational nouns that require the generic preposition *ti'* or the relational suffix *–il* to form ground-denoting adjuncts	*háal* *nak'* *(ba')pàach* *(ak)táan* *tséel* *ts'u'* *xno'h* *xts'i'k* *xùul* *tòoh*	on the edge of at mid-height back, outside, around in front of, before; opposite at the side of at the (solid) inside of to the right of to the left of at the end of in the direction of

Table 2. ***Spatial relators in Yukatek ground-denoting adjuncts***

Like other Mayan languages, Yukatek lacks an elaborate set of genuine prepositions (cf. Kaufman 1990: 78). Aside from *ti'* and *ich(il)* 'in', all relators listed in Table 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 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 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 neither sensitive 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'.
DEF=cart-D2 PRV-enter(B.3.SG) in/LOC DEF=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'.
DEF=cart-D2 PRV-exit(B.3.SG) in/LOC DEF=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'.
DEF=cart-D2 LOC=EXIST(B.3.SG) in/LOC DEF=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 adjuncts 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 e.g. 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.

(d)Implication of the expression of the referential ground for the bootstrapping hypothesis

Since the adjunct 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) below, and no syntactic difference that could be read off constituent order. This means contrary to what is predicted by the Syntactic Bootstrapping hypothesis, Yukatek children have to 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 DEF=house-D2

'He has entered the house.'

(4) Ts'o'k u=kim-il ich le=nah-o'.

TERM A.3=die-INC in DEF=house-D2

'He has died in the house.'

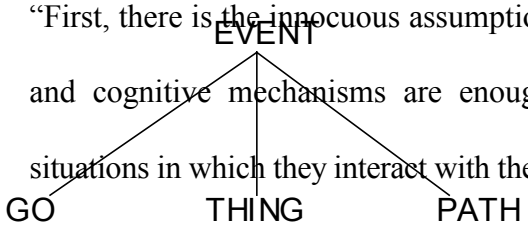
Notice that (3) cannot be understood as locating the entire entering event inside the house, just like (4) locates the dying event inside the house. Under this analysis, (3) would not distinguish between entering *into* the house (where the source state of the entering event is outside the house) and 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 adjunct 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 adjunct 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 with respect to Landau & Gleitman's Syntactic Bootstrapping approach was 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 against the Semantic Bootstrapping hypothesis to be presented now is of a different nature. There is no evidence suggesting that children could not learn the *morphosyntactic* properties of motion event expressions in Yukatek the way 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 are able to construct semantic representations of the events they are learning to encode independently of input from the morphosyntactic treatment of the corresponding event expressions in the adult language. 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 it should be obvious, given beneficial input, for 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 Pinker assume 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" (p. 177), which Pinker represents as in Figure 2. The predicate GO here stands for the event type of "a thing moving along a path" (p. 176) and THING 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

Figure 2. ***Conceptual representation of motion events according to Pinker (1989: 177)***

children acquire semantic representations like the one for 'roll' depicted in Figure 3 as the only way to frame manner of motion, whereas English-learning children in addition acquire representations like the one in Figure 4 which Pinker considers "created" from the those in Figure 3 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 is intended to license *The ball rolled*, which is fine in both English and Spanish, whereas the one in Figure 4 is intended

to license *The ball rolled down the hill*, which is not permitted in Spanish.

The difference between the framing in Figure 3 and the one in Figure 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

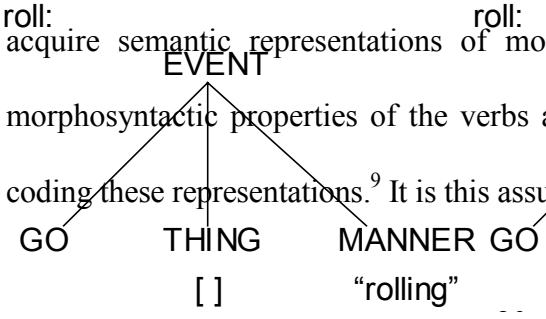


Figure 4. ***Semantic representations of manner of motion in Spanish according Pinker (1989: 182)***

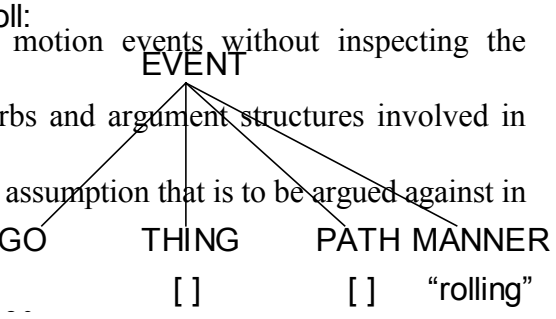


Figure 3. ***Semantic representations of manner of motion in English according to Pinker (1989: 182)***

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, the way Pinker assumes Figure 4 to be derived from Figure 3. In Yukatek, motion is not framed at all as "a moving object (…) traversing some trajectory", the cognitive representation of motion that Pinker assumes universally mapped onto semantic representations by 'event-category labeling'. Instead, motion is represented as discrete location change with respect to single grounds. It is argued below that Yukatek children could not possibly tune into this Yukatek way of framing motion without examining the morphosyntactic properties of motion event expressions (in particular, the properties of ground-denoting adjuncts), contrary to the Semantic Bootstrapping Hypothesis.

5. The semantics of Yukatek motion event expressions

It has been shown in section 3 that ground-denoting adjuncts in Yukatek motion clauses do not formally distinguish among distinct path functions such as 'source', 'goal', and 'via'. Instead, any ground-denoting adjunct 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 adjunct.[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 in place to determine which role is assigned to which ground-denoting adjunct, since the form of the adjunct does not reflect the role assigned to it. And since 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 scenario depicted in Figure 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',
DEF=where PRV-leave(B.3.SG) DEF=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 xane',
IMPF-A.3=pass A.3-at one-CL.IN DIM thing red(B.3.SG)also
k-u=ts'o'k-ol-e', k-u=k'uch-ul
IMPF-A.3=end-INC-TOP IMPF-A.3=arrive-INC

y-iknal le=triàangulo áasul-o'.

A.3-at DEF=triangle blue(B.3.SG)-D2

'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 blue [i.e. green] triangle.'

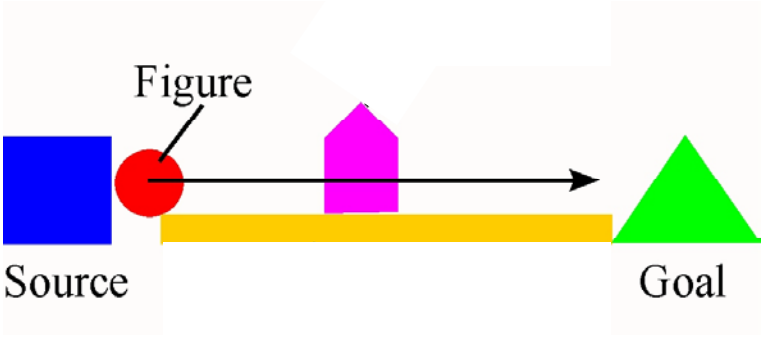


Figure 5. ***The stimulus described in (10)***

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 to describe Figure 5 in English. More pertinently, this construal is generally considered merely a special case of a kind of a construal available in all Indo-European languages whereby the figure undergoes incremental location change along the path as the event progresses through time, the path being encoded with its beginning and end points assigned to source- and goal-denoting adjuncts that may be copresent in the clause (Jackendoff 1983; Krifka 1998; Talmy 1985, 2000). But this construal cannot be encoded at all in Yukatek. Yukatek represents motion as discrete (non-incremental) location change[11] with

respect to single grounds, leaving to implicature traversal of a path in between events of departure, passing, and arrival (and even the occurrence of motion during the corresponding intermittent time intervals).

The fact that Yukatek does not express incremental location change along a trajectory 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 is 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 cancelled. 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, while 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* enter*ed* the box' once the beaming event is completed.[12]

It was claimed in section 4 that the difference in semantic representations of motion scenes across Yukatek and English cannot be accounted for by a mere lexical rule that derives one type of representation from the other, the way Pinker assumes the English-type representation in Figure 4 above to be derived from the Spanish-type representation in Figure 3. 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 2-4 above is not instantiated in semantic representations of motion in Yukatek.

Let us assume now, with Pinker, that Yukatek and English children bring the same prelinguistic cognitive representations of motion to the task of language acquisition, "whereby a moving object is idealized as a point traversing some trajectory" (p. 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 adjunct, expressing discrete 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 5 and then hears the description in (5) above. Would that input be sufficient to prevent Yukatek children from deriving English-style lexical-semantic representations for Yukatek verbs? Certainly not. Nothing in (5) preempts Yukatek children from assuming that change-of-location verbs *could* occur with multiple ground-denoting adjuncts

the way English motion verbs do, even if the change-of-location verbs in (5) happen to occur only with single ground-denoting adjuncts. 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 adjuncts within the clause denoting the event.

Of course, children's predictions become much more accurate once their database includes information about the *frequency* at which motion verbs occur with multiple ground-denoting phrases (high in English, zero in Yukatek) – but this information is already 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 above in which the figure does not actually move, Yukatek children clearly have to perform an even more detailed analysis of the ground-denoting adjuncts with which change-of-location verbs occur.[13] In particular, they have to take on board the fact that Yukatek ground-denoting adjuncts 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. Conclusion

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 adjunct, like a change-of-location verb, or whether it assigns a stationary locative role to that ground-denoting adjunct, like any other verb (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 that 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 discrete location change with respect to single grounds, from this input – *especially* if they start from the same cognitive representations of continuous locomotion along a path as their English peers do, as Pinker assumes – unless they take in evidence from

the fact that change-of-location verbs only ever occur with single ground-denoting adjuncts, and that these adjuncts 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. How can they cope with this circularity? But there is no real circularity here! Structural evidence is required to determine that *any* change-of-location verb denotes discrete location change with respect to individual grounds. Semantic evidence is needed to determine whether an *individual* verb assigns a path role to a ground-denoting adjunct, and if so, what type of path role.

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 proposal are in fact *right*. If the proponents of the two hypotheses are falsified in any respect by the Yukatek data, then in the assumption that not both hypotheses can be correct.

@@@WHO ELSE HAS SAID THIS? FISHER? PINKER HIMSELF?@@@

The amount of crosslinguistic variation in both semantic framing of events and predicate argument structures suggests that semantic learning and morphosyntactic learning proceed in tandem.

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

[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 paper is morphemic rather than morpho-phonemic. 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- 2nd person; 3 – 3rd 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; DEF – 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 AM; TOP – topic marker.

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

[5] Many Mayan languages have so-called 'directional' morphemes grammaticalized out of motion verbs; cf. Kaufman (1990: 82-83), 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 submitted), I counted a total of 158 inactive change-of-location verbs. Of these, only one third (52) were accompanied by ground-denoting adjuncts. 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 were specified. The only member

of the set of inactive change-of-location verbs that virtually never occurs without a ground-denoting adjunct 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 determining 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 5 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 adjuncts headed by *tu tòohil* 'in the direction of' (see Table 3), i.e. 'towards' or 'away from', can be combined with adjuncts encoding source, goal, or via roles. But since 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] The verbs *na'k* 'ascend', *em* 'descend', and *lùub* 'fall' actually encode 'degree achievements' (Dowty 1979; LRH) when appearing without a ground-denoting adjunct. In this case (and only then), they do express gradual location

change, but do not entail a definite end state and so cannot be said to encode 'bounded path' in the sense of Jackendoff (1983: 165).

[12] Lucy (1994: 641) points to the framing of motion as discrete 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.

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