Imagine a language learner. She confronts an unfamiliar intransitive verb such as *glorp* in (1).

(1) Cookie Monster saw that [Ernie glorped].

Now she has a problem. She knows that *glorp* is intransitive, but is it unergative or unaccusative? How does she decide? The problem is stated in (2).

(2) *The learning problem for unaccusativity*
    How does the learner decide to which class a given intransitive verb belongs?

For their helpful discussion and input, we thank Melissa Bowerman, Ursula Brinkmann, Jill Carrier, Marlene Jonas, Zvi Penner, and Susan Powers, as well as the many colleagues who have commented on presentations of this material. We are also grateful to our wonderful assistants: Berdine Bodegom, Bianca Hettlich, Bart Hollebrandse, Christina Lamertz, Tina Lieb, Ellis van Lieshout, Suzanne Requardt, and Colinda Verlinde, for their help through all stages of this research. The research was supported by grant WE-1236-2-2 from the Deutsche Forschungsgemeinschaft to Jürgen Weissenborn, by a Research Grant
In a context such as (1), the surface syntax does not help her. In English, although unaccusatives take an underlying object, at the surface they look just like unergatives with an NP subject.

(3)

<table>
<thead>
<tr>
<th>Unergative</th>
<th>Unaccusative</th>
</tr>
</thead>
<tbody>
<tr>
<td>She laughed.</td>
<td>She disappeared [t].</td>
</tr>
</tbody>
</table>

Now, if unaccusativity is determined on the basis of semantics (Perlmutter 1978), the learner will expect a correlation between the semantics of a given verb and its syntax, and assign it to one class or the other based on that. What this means is that there is a difference between the meanings of the two classes of verbs at the level of Conceptual Structure (CS). This is indicated in (4) with P and R.

(4)

<table>
<thead>
<tr>
<th>Unergative</th>
<th>Unaccusative</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Structure: [NP she] [VP laughed]</td>
<td>[NP she] [NP disappeared [t]].</td>
</tr>
<tr>
<td>D-Structure: [NP she] [VP laughed]</td>
<td>[NP disappeared [NP she]].</td>
</tr>
<tr>
<td>Argument Structure: a ( )</td>
<td>( a )</td>
</tr>
<tr>
<td>Conceptual Structure: [ P (x) ]</td>
<td>[ R (x) ]</td>
</tr>
</tbody>
</table>

Based on this meaning difference, the two x arguments at the Conceptual Structure level link to Argument Structure (AS) in different ways. In the unergative CS (laugh) on the left, the x argument links to an external position in the AS, and projects to the subject position in D-Structure, where it stays at S-Structure. In the unaccusative CS (disappear) on the right, the x argument links to an internal position in the AS, and projects to the D-Structure object slot. It then moves to the subject position at S-Structure, to satisfy the need in English for a surface subject.

Now, if the linking difference between the two verb classes is based on semantics, we need to say specifically which semantic factors matter. What is it about the meanings of laugh versus disappear that makes the linking from CS to AS different? Going back to our learner trying to classify the new verb glorp, the question is:

(5) What semantic factors is she looking for?
Secondly, should we expect learners across languages to look for the same ones? That is,

(6) Are the linking rules universal?

### 12.2. Linking Rules Across Languages

To approach the second question first, when we look across languages, there are linking rules that exist in one language but are missing from another, as Carter (1988) pointed out. A linking difference between English and French is illustrated in (7):

(7) a. The bottle floated under the bridge. (location/movement reading)
    b. La bouteille a flotté sous le pont. (location/*movement reading)

In English, (7a) is ambiguous; it can mean either that the bottle was located under the bridge while it was floating, or that it moved to a position under the bridge in a floating manner. In French (and other Romance languages) this second reading is impossible. French does not allow \([NP \text{ la bouteille}]\) ('the bottle') to appear in the subject position of a sentence containing a manner verb that takes a directional PP.\(^2\) This meaning has to be expressed in another way. Now, given that we find differences in the linking rules that languages contain, we might also find differences in how a particular linking rule looks in two different languages. Two languages could share a common linking rule, but in different versions. This, in fact, seems to be the case in Dutch and German, for the linking rules that determine whether a given intransitive verb is unaccusative or unergative, as we will see below.

Before we can understand what the linking rules for intransitive verbs look like, we need an independent way to tell apart unaccusatives and unergatives. One diagnostic that has been proposed for these two languages is auxiliary-verb selection. As shown in (8), unergatives take \(\text{have}\) and unaccusatives take \(\text{be}\).

(8) \begin{tabular}{ll}
            & \textbf{Unergatives} & \textbf{Unaccusatives} \\
\textbf{German} & haben & sein \\
\textbf{Dutch} & hebben & zijn
\end{tabular}

\textsc{HAVE} \hspace{2cm} \textsc{BE}

Most of the time Dutch and German agree on the auxiliary for a verb in a given context. In both languages, as shown in (9) and (10), for instance, \textit{dance on the table} takes \textsc{have} and \textit{dance into the room} takes \textsc{be}.

(9) Dutch: \hspace{1cm} John \textbf{heeft} urenlang op de tafel gedanst.
    German: \hspace{1cm} John \textbf{hat} stundenlang auf dem Tisch getanzt.
    ‘John \textsc{aux} been dancing on the table for hours.’

\(^2\) The prohibition actually applies before the NP moves to subject position.
(10) Dutch:  John is in twee seconden de kamer in gedanst.
    German: John ist in zwei Sekunden ins Zimmer getanzt.
    ‘John AUX danced into the room in two seconds.’

But, interestingly, Dutch and German disagree on the auxiliary in (11) for *dance around the room*. Dutch takes HAVE, but German takes BE.

(11) Dutch:  John heeft urenlang door de zaal rondgedanst.
    German: John ist stundenlang durch den Saal herumgetanzt.
    ‘John AUX been dancing around the room for hours.’

The situation looks as in (12). The two languages draw the line between unaccusatives and unergatives in different places. Unaccusative verbs such as *dance into the room* are to the left of the lines for both languages, unergatives such as *dance in the room* are to the right of the lines for both. But *dance around the room* falls between the two lines.

It falls on the unergative side in Dutch but on the unaccusative side in German. This means that, if we use auxiliary selection as our indicator of verb class, then Dutch and German must have slightly different linking rules for distinguishing between the two classes of intransitive verbs.

(12)

12.3. The Semantics of Unaccusatives

How can we characterize the difference between the two intransitive verb classes in each language? Can we find a semantic explanation underlying the split? And can we explain, also in semantic terms, the difference we just found between Dutch and German?

Notice that what differs in the three sentences in (9)–(11) is the prepositional phrases. In (10), *John has danced into the room*, where both Dutch and German select BE, the preposition is *into*. In this sentence, John moves from outside the room to inside and he must end up at a different point from where he started. In (9), *John danced on the table*, where both languages select HAVE, John need not change his position; he can dance in place. In (11), *John has been dancing around the room*, just as in (9), his position need not have a different endpoint from where he started. He can travel around and finish where he started. In Dutch this verb phrase is categorized with (9) and assigned HAVE. Only (10) is considered unaccusative and assigned BE.
Looking at the semantics of these three cases, what seems to matter for unaccusativity in Dutch is ‘telicity’, that is, whether or not an event comes to an endpoint. Although there have been slightly different uses of the term ‘telic’ in the literature, for clarity, we will use it in its classical sense, in which a telic situation is one that has an endpoint (Comrie 1976; Smith 1997):

[. . .] telic events have a natural final endpoint, or intrinsic bound. In contrast, atelic events are simply processes. They can stop at any time: there is no outcome. In other words, atelic events have arbitrary final endpoints. (Smith 1997: 19)

Verbs whose CSs contain an endpoint will link as unaccusatives, using what we will call the Telic Linking Rule, in (13). (This rule is stated in the formalism of Jackendoff (1990). INC BE stands for inchoative BE, or ‘comes to be’.)

(13) Telicity Linking Rule: disappear, arrive, dance into the room (unaccusative / BE)

\[
\begin{align*}
\text{AS:} & \quad (a) \\
\text{CS:} & \quad \text{INC BE} (x, \text{at} \ldots)
\end{align*}
\]

We can read the rule as follows: an x argument that comes to be at a new place (or state) links to an internal argument position in AS.

The rule in (13) applies to all verb phrases that contain INC BE: to verbs such as disappear and arrive and to more complex predicates such as dance into the room. But it does not apply to dance around the room or dance in the room, which do not contain INC BE, only BE. We can differentiate verbs that have INC BE in their CS from those that do not with the feature [±telic]. However, it is important to remember that the [±telic] feature is really only a shorthand for a type of CS.4

What about German? German classifies (11), dance around the room, with (10) dance into the room. As such, it cannot be using the Telicity Linking Rule in (13) to make its unergative–unaccusative distinction. As we saw, (13) applies to (10), but not to (11), where there is no endpoint. In order to classify this predicate as unaccusative, German must be using something else.

One possibility is a linking rule based on what we will call ‘locomotion’. Locomotion is not any kind of motion—it refers only to ‘travelling’ motion. Wiggling, for instance, is not locomotion, and neither is dancing in place. But dancing around the room in (11) and dancing into the room in (10) are both instances of locomotion. If we classified predicates in terms of a [±locomotion] feature, and if German had a linking rule based on this feature, then both (11) and (10) would be unaccusative in German.5

---

1 For example, van Hout (1998: 92) uses telic not to refer only to events that reach endpoints, or ‘terminative’ events; but more broadly, to refer to all event types with a moment of temporal transition, including resultative but also inchoative and causative events.

4 We are using features strictly as a shorthand device, to make the differences between the verb classes easy to see. Technically speaking, though, in a framework like ours that uses full-blown CS representations, the features can be read off of the CSs, and are not additional tags assigned to them.

5 Of course, (10) would also be classified as unaccusative by the Telicity Linking Rule so it is tempting to suggest that we should just replace the Telicity Linking Rule in German by a more inclusive Locomo-
Once we add the locomotion feature, only (9), *dance on the table*, will be classified as both [−locomotion] and [−telic], and will be assigned an unergative syntax by both rules. We do not want to characterize the Locomotion Linking Rule here, but we want to stress that according to the data we have seen so far, Dutch and German split the intransitives using two different semantic factors. As shown in (14), Dutch uses telicity; German uses locomotion.

(14) Dutch: Telicity Linking Rule  
     German: Locomotion Linking Rule

We can add these factors into our picture of where the two languages divide the unergatives and unaccusatives:

(15) Unaccusative        Unergative
     dance into          dance around  dance in
     [−telic]            [−locomotion]  [−telic]
     Dutch               German

Before we return to our learner, in (16) is a diagram of how the features ‘telic’ and ‘locomotion’ map onto other semantic features that have been proposed in the literature for unaccusatives, for example, directed change (Levin and Rappaport Hovav 1992b), and what Lieber and Baayen (1997) have called Inferrable Eventual Position or State (IEPS).

(16) +telic             −telic
     +directed change    −directed change
     +IEPS              −IEPS

<table>
<thead>
<tr>
<th>dance into the room</th>
<th>dance towards the room</th>
<th>dance around in the room</th>
<th>dance in the room</th>
</tr>
</thead>
<tbody>
<tr>
<td>German: be</td>
<td>German: be</td>
<td>German: be</td>
<td>German: have</td>
</tr>
<tr>
<td>Dutch: be</td>
<td>Dutch: HAVE</td>
<td>Dutch: have</td>
<td></td>
</tr>
</tbody>
</table>

Let us now turn to one more semantic factor that has been suggested to be relevant to unaccusativity, which we can also state as a feature: [±actor]. Like [±telic], [±actor] has been characterized in slightly different ways, some of which are listed in (17).
Although [actor] may, in fact, be reducible to other semantic properties, we will use it here to make the very rough semantic distinction between an animate participant actively doing something and a completely non-volitional inanimate participant. An independent diagnostic for [±actor] is Jackendoff’s (1990) ‘actor test’ in (18).

(18) The actor test:
What John did was . . . (laugh, sing, sleep, dance, *disappear, *arrive)

Verbs that pass this test contain [ACT] in their CS, so the actor test distinguishes the subjects of laugh and sing from the subjects of disappear and arrive. A linking rule based on [actor] is shown in (19). The x argument of a CS that contains ACT links to the external position in AS. When this linking rule applies, the x argument qualifies as an actor and the verb is classified as unergative.

(19) Actor Linking Rule: laugh, sing, sleep, dance (unergative/HAVE)

How does the actor Linking Rule operate alongside the Telicity Linking Rule in Dutch? For the two Dutch [+telic] cases, dance on the table and dance around the room, the Telicity Linking Rule does not apply. The actor Linking Rule is the only relevant rule, and it links these verbs as unergative with HAVE as the predicted auxiliary. This was shown in (9) and (11):

(9) Dutch: John heeft urenlang op de tafel gedanst.
    German: John hat stundenlang auf dem Tisch getanzt.
    ‘John have been dancing on the table for hours.’

(10) Dutch: John is in twee seconden de kamer in gedanst.
    German: John ist in zwei Sekunden ins Zimmer getanzt.
    ‘John aux danced into the room in two seconds.’

In our [+telic] case, repeated from (10), John danced into the room, the Telicity Linking Rule does apply, linking the verb as an unaccusative.

However, notice that this sentence also contains an actor, John. So the Actor Linking Rule should apply too, which would make the verb unergative. What happens in this case, where the two rules conflict? We propose that the answer lies in the geometry of
the CS for the verb phrase, which contains both the CS of *dance* in (20) and the CS of *into* in (21). The verb *dance* is a manner-of-motion verb that takes an actor but does not specify an endpoint. But the preposition that it combines with, *into*, does encode an endpoint. In Carrier and Randall (1993), we propose that a preposition like *into* is a two-place predicate, containing INC BE. This is where the endpoint comes from.

(20)  
\[
\begin{array}{l}
dance: \\
\text{DO}_{\{+\text{motion}\}} (z) \\
\text{ACT}
\end{array}
\]

(21)  
\[
\begin{array}{l}
\text{into:} \\
\text{INC BE} (x, \text{AT} (y))
\end{array}
\]

In (22) we can see how these two CSs combine. If we conceptualize *dance into the room* as meaning 'go into the room by dancing', then the CS for *dance* is subordinated under the CS for *into*.

(22)  
\[
\begin{array}{l}
dance \text{ into:} \\
\text{INC BE} (x, \text{AT} (y))
\end{array}
\]

\[
\text{VIA} \begin{array}{l}
\text{DO}_{\{+\text{motion}\}} (z_i) \\
\text{ACT}
\end{array}
\]

Linking always begins at the top with the highest clause. Since this clause contains INC BE, the Telicity Linking Rule (repeated below), applies first. The x in (22) is linked to an internal AS position, making the entire phrase unaccusative, and the predicted auxiliary is BE. Since linking begins at the top, the Actor Linking Rule does not have a chance to apply, because ACT is lower in the representation than the INC BE clause.

(13)  
\[
\begin{array}{l}
\text{Telicity Linking Rule:} \text{ disappear, arrive, dance into the room} \text{ (unaccusative / BE)} \\
\text{AS:} \quad ( \text{ a } ) \\
\text{CS:} \quad \text{INC BE} (x, \text{AT} . . . )
\end{array}
\]

We have one more case to look at—namely, when the Telicity Linking Rule applies but the Actor Linking Rule does not. Such a case is (23).

(23)  
\[
\begin{array}{l}
\text{Dutch:} \quad \text{De tennisbal is in twee seconden de baan op gerold.} \\
\text{German:} \quad \text{Der Tennisball ist in zwei Sekunden auf den Tennisplatz gerollt.} \\
\quad \text{‘The tennis ball aux rolled onto the court in two seconds.’}
\end{array}
\]

Here there is no conflict between the two rules, and the sentence is unaccusative.

To summarize, the three cases we have seen so far are shown in (24). In the lower left cell, only the Telicity Linking Rule applies, and BE is selected. In the upper right cell, only the Actor Linking Rule applies, and HAVE is chosen. However, in the upper left cell, where both the Telicity and Actor Linking Rules apply and lead to different outcomes (both HAVE and BE), the conflict is resolved by the geometry of the CS. Although BE is finally chosen, HAVE appears in parentheses to reflect its potential competition with the other linking rule.
We have not discussed what happens where neither linking rule applies, cases that would fall into the bottom right cell. At this point we have no prediction to make, but if there were a ‘default’ linking rule (as proposed by Levin and Rappaport Hovav 1995), this is where it would apply.

### 12.4. The Learner and the Linking Rules

Let us summarize so far. We have proposed two linking rules that appear to be operating for Dutch intransitive verbs. One of these, the Telicity Linking Rule, is clearly insufficient for German. The other rule, the Actor Linking Rule, applies in both languages. Now let us go back to the learner. Our question was what factors she would be looking for in trying to determine whether a given intransitive verb, such as glorp in (1) (repeated here), is unaccusative or unergative. To see whether she pays attention to the two factors [±actor] and [±telic] we can construct new verbs in which we systematically vary these factors and see how she behaves.

(1) Cookie Monster saw that [NP glorped].

Moreover, we can look not only at Dutch, where both of these factors operate in the adult system but also at German, where a third factor, [±locomotion], plays a role. This is just what we did in a set of experiments. Before we turn to them, we want to address one other issue that could affect what our learners will do.

Consider again how verb phrases link as unaccusatives. They can satisfy our Telicity Linking Rule in two different ways. One way is when the verb itself is telic, because it contains END in its CS. Telicity is an inherent property of the verb’s CS, as in disappear in (25). We will call such cases ‘inherently telic’. Their [±telic] feature is [±inherent] in the verb’s CS.

(25) (a)

\[
\text{disappear: } \text{INC BE (x, AT (END))}
\]

The second way that a verb phrase can link unaccusatively is when [−telic] verb combines with a [+telic] PP. This is a common property of manner-of-motion verbs such as dance. Though the verb is not inherently telic (it has no END in its CS), combining it with into the room produces a [+telic] VP, [dance into the room] The combination, in terms of features, is [+telic] [−inherent]. (Of course, it is also possible for a [+inherent] [+telic] verb such as disappear to combine with a [+telic] PP but that case is not relevant here.)
Now consider the effect of the $\pm$inherent feature by looking at our new verb, $\text{glorp}$. Imagine that $\text{glorp}$ is a $\pm$telic verb like $\text{disappear}$. And imagine that you observe someone ‘glorping’ while you hear a sentence such as (26a). In order to interpret glorping as a $\pm$telic event and assign the verb phrase to the unaccusative class, you need to observe that the glorping activity involves a clear endpoint.

(26)  
\begin{align*}
\text{a. Ernie saw that [Bert glorped in the forest].} \\
\text{b. Ernie saw that [Bert glorped into the forest].}
\end{align*}

This is not the case with (26b). In this $\pm$telic case, it is not only the scene that can tell us that the verb phrase is unaccusative, the syntax does, too. English uses $\text{into}$ as opposed to $\text{in}$. German and Dutch also both mark the PPs clearly. German uses casemarking; Dutch uses postpositions. (Cases without an endpoint are marked with a preposition in Dutch.)

(27)  
\begin{align*}
\text{a. Dutch: Ernie liep in het bos.} \\
\text{German: Ernie lief in dem Wald. (dem = dative)} \\
&\text{Ernie ran in the woods.}
\end{align*}
\begin{align*}
\text{b. Dutch: Ernie liep het bos in.} \\
\text{German: Ernie lief in den Wald. (den = accusative)} \\
&\text{Ernie ran into the woods.}
\end{align*}

So for cases such as (27b) there are two sources of information about which class $\text{glorp}$ belongs to; the visual information from the scene and the auditory information from the syntactic marking—either case or a postposition.

Now consider the learner. We hypothesize that she will find it easier to recognize an endpoint when it is overtly marked, belonging to our $\neg$inherent class, than when it is part of the lexical meaning of the verb, or $\pm$inherent. That is, sentences that mark the endpoint with either case or a preposition or postposition will be more readily understood as having endpoints than sentences in which the endpoint is not overtly marked in the syntax, but is detectable only from the scene. We can add this prediction to the chart in (24). Notice that it changes the chart only on the $\pm$telic side. It predicts that the $\pm$inherent $\pm$telic verbs (verbs like $\text{disappear}$, where the endpoint is inherent in the meaning, not marked with a PP or case) will be harder to classify as unaccusative (and will get fewer $\text{be}$ auxiliaries) than the verbs whose endpoints are $\neg$inherent, overtly marked with case or an unambiguous preposition or postposition. $\neg$be indicates fewer $\text{be}$ responses than $\text{be}$. And remember that the (H) in the top two

(28)  
\begin{align*}
\begin{array}{|c|c|c|c|c|}
\hline
& \text{+telic} & \text{−telic} & \text{+inherent} & \text{−inherent} \\
\hline
\text{+actor} & \text{‘stretch’} & \text{‘dance into the room’} & \text{‘laugh’} & \text{‘dance in the room’} \\
\text{?be (have)} & \text{be (have)} & \text{have} & \text{have} \\
\hline
\text{−actor} & \text{‘disappear’} & \text{‘roll into the room’} & \text{‘sparkle’} & \text{‘roll into the room’} \\
\text{?be} & \text{be} & \text{??} & \text{??} \\
\hline
\end{array}
\end{align*}
<table>
<thead>
<tr>
<th>+telic</th>
<th>-telic</th>
</tr>
</thead>
<tbody>
<tr>
<td>+inherent</td>
<td>-inherent</td>
</tr>
<tr>
<td>1. 'stretch' (a) [\text{INC BE (x}_{i}[\text{AT (END)})]]</td>
<td>2. 'dance into the room' (a,a) [\text{INC BE (z}_{i}[\text{AT (y)})]]</td>
</tr>
<tr>
<td>VIA $\text{DO}^{[\text{+motion}]}(x)_{i}$ [\text{ACT}]</td>
<td>VIA $\text{DO}^{[\text{+motion}]}(x)_{i}$ [\text{ACT}]</td>
</tr>
<tr>
<td>5. 'disappear' (a) [\text{INC BE (x}_{i}[\text{AT (END)})]]</td>
<td>6. 'roll into the room' (a,a) [\text{INC BE (z}_{i}[\text{AT (y)})]]</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
left cells comes from the fact that the actor is present along with the endpoint in these verbs’ CSs, which might lead to some uncertainty in assigning them to the unaccusative class.

At the top of each cell is an English verb that fits the category. In the expanded chart in (29) these verbs are shown with their ASs and CSs. 6

Let us sum up so far. We have focused on two semantic factors that are encoded in Linking Rules for classifying intransitive verbs, [±telic] and [±actor]. These seem to capture the facts of Dutch adult grammar. A third factor, [±inherent], indicates whether or not a verb is inherently specified for [+telic]. Our [−inherent] verbs such as dance do not inherently encode an endpoint. They can switch from [+telic] to [−telic] depending on the PP they appear with. Our [+inherent] verbs do not switch. They are either like disappear with an endpoint inherent inside their CS, [+inherent, +telic], or like laugh with no endpoint, [+inherent, −telic]. We have proposed that when a verb is [+telic], it will be easier for a learner to classify it as unaccusative if it is overtly marked with a syntactic clue (i.e., if it is [−inherent]), as in dance into the room, than if it is not overtly marked but has a [+inherent] endpoint, as in disappear. In all, we are looking at three variables: [telicity], [inherency], and [actor], which give us eight types of verb. 7

12.5. An experiment to test the semantic factors in linking rules

The question is: how do learners use the three semantic factors to categorize intransitive verbs that they have never seen before? Our study focused on Dutch and German, two languages in which auxiliary selection has been proposed as a marker of intransitive verb class. Although we have seen that these two languages divide up the intransitives in slightly different ways, in this study we expected similar results, because we used only those verbs on which the two languages overlap. In other words, we did not use any cases such as dance around the room, which are unaccusative in German but

6 Because our two linking rules make no predictions about how the CS arguments in cells 7 and 8 link to AS, we do not show linking lines for these cells. As we noted in section 12.3, though, in some theories a Default Linking Rule stipulates the linking of arguments that do not fall under the scope of any other linking rule. Levin and Rappaport Hovav (1995), for example, stipulate that such arguments link internally. Because our two linking rules make no predictions about how the CS arguments in cells 7 and 8 link to AS, we do not show linking lines for these cells. As we noted in section 12.3, though, in some theories a Default Linking Rule stipulates the linking of arguments that do not fall under the scope of any other linking rule. Levin and Rappaport Hovav (1995), for example, stipulate that such arguments link internally.

7 It should be kept in mind that many verbs can qualify for membership in more than one cell, depending on the context. For instance, a verb like drop can be used either with a volitional [actor] (When they heard shots, the soldiers dropped to the ground) or with an inanimate, non-volitional participant (The glass dropped out of Sarah’s hand). We are not claiming that all verbs belong to one cell uniquely.
unergative in Dutch.

The subjects who participated in our study are shown in (30).

(30) Number of subjects in each age group

<table>
<thead>
<tr>
<th></th>
<th>4–5 years</th>
<th>7–8 years</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch</td>
<td>14</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>German</td>
<td>19</td>
<td>18</td>
<td>15</td>
</tr>
</tbody>
</table>

Our methodology was a cloze task. Our subjects watch a series of movies, each one showing a new type of event that is describable by a new verb. Cookie Monster (manipulated by the experimenter) watches the movie alongside the subject, and his job is to learn the new verb from our experimenter. The subject is asked to help Cookie Monster learn the verbs, ‘because he’s not very good at it’. Each scene depicting a verb had a script similar to (31), which is for a scene containing a [+telic, +inherent, +actor] verb. In this scene, Ernie continually wiggles his mouth in a back-and-forth wavy motion, as he sits on a pile of books.

(31) A sample Dutch script

Experimenter: Hier is Ernie. En een stapel boeken. En nu komt plurgen.

*Hier’s Ernie. And a pile of books. And now comes plurging.*

Can you say that?

Subject: plurgen (repeats the verb)

plurging

Experimenter: Dat was plurgen. Ernie plurgt op de boeken.

*That was plurging. Ernie plurgs on the books.*

Can you say that?

Subject: Ernie plurgt op de boeken. (repeats the sentence)

Ernie plurgs on the books.

Experimenter (to CM): *Now, Cookie Monster, tell us what you saw:*

Cookie Monster: Ik zag dat Ernie op de boeken ge- uh, . . . , ge-, uh . . .

*I saw that Ernite on the books ge- uh, . . . , ge-, uh . . .*

Experimenter (to subject): *Can you help Cookie Monster?*

Subject: geplurga is/heeft

participle auxiliary

Cookie Monster (played by the experimenter) always falters on the participle, pretending not to remember the verb, but at the same time he fails to supply the word that follows the participle. That word is the crucial auxiliary verb, which tells us whether the subject classifies the new verb as unergative (HAVE) or unaccusative (BE). Subjects who
said *geplurgd heeft* (‘has plurged’) chose the unergative auxiliary, those who said *geplurgd is* (‘is plurged’) chose the unaccusative auxiliary. We tested the three factors, [±telic], [±actor], and [±inherent], using the eight-cell design in the table in (28). There are sixteen scenes, two in each of the eight conditions. They are listed in the Appendix.

### 12.6. Results and Discussion

The results are set out in Tables 12.1–6, in two different ways. We begin with tables showing the percentages of *have* and *be* chosen in the eight cells in which we made our predictions. In each cell, the percentage of subjects that chose the predicted auxiliary is in bold. The *have* responses are to the left in each cell, the *be* responses, to the right. Recall that in each cell we encode our predictions as follows. In cells (3), (4), and (6), either *have* or *be* is clearly predicted, so the cell contains simply H or B. In cells (1) and (2), subjects should use the Telicity Linking Rule to choose *be*, but may be influenced by the presence of an actor in the scene (even though the Telicity Linking Rule should ‘win’ over the Actor Linking Rule). So in these cells, both auxiliaries appear, with H in parentheses. In cells (1) and (5), *be* is predicted by the telicity facts but telicity is inherent and therefore potentially not detectable to our subjects. So, here, *be* is marked with a ?. In cells 7 and 8, neither the Telicity Linking Rule nor the Actor Linking Rule applies, so there is no predicted preference for *have* or *be*. This is indicated with a ‘?’.

Tables 12.1–3 show the Dutch results for adults, 7–8-year olds, and 4–5-year olds, respectively.8 (To remind the reader which verb classes our nonsense verbs belong to, we have inserted some English verbs at the top of each cell. But of course, our subjects heard no real verbs at all, only nonsense verbs belonging to the same classes.)

<table>
<thead>
<tr>
<th>Table 12.1. Dutch adults: per cent choosing <em>have</em> or <em>be</em> auxiliary (n=16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ‘stretch’</td>
</tr>
<tr>
<td>(H)</td>
</tr>
<tr>
<td>97</td>
</tr>
<tr>
<td>5. ‘disappear’</td>
</tr>
<tr>
<td>?B</td>
</tr>
<tr>
<td>41</td>
</tr>
<tr>
<td>?</td>
</tr>
</tbody>
</table>

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8 For a more complete discussion of the results, together with statistical analyses, see van Hout (1998: ch. 6) and Randall et al. (in progress).
What we see, for all three groups of subjects, is that on the [−telic] side of the tables, in cells 3, 4, 7, and 8, the predominant response is have. The be responses cluster on the [+telic] side. This suggests that we have evidence for an effect of our [telicity] feature. Notice that within the four [+telic] cells, the be's are strongest in cells 2 and 6, the cells in which the endpoint is detectable from the postpositional phrases. Although the endpoints were visually marked in the scenes in all four [+telic] scenes, hearing the syntactically marked directional PP increased the likelihood that the subject would classify the verb phrase as unaccusative. The endpoints that were [+inherent], contained in the verbs but not mentioned in a PP, in the scenes for cells 1 and 5, may not have been detected. So our [inherency] factor is playing a role here.

What about [±actor]? This factor is exactly what we need in order to explain the difference in the adult responses between cells 1 and 5. Here, we just said that some of our subjects might not have detected the endpoints. But this is equally likely for cell 1 as for cell 5. The only difference between these scenes was in [±actor]. For the [+actor] scene (as in cell 1), the adult subjects virtually always assigned the verb to the HAVE

Table 12.2. Dutch 7–8-year olds: per cent choosing have or be auxiliary (n=18)

<table>
<thead>
<tr>
<th></th>
<th>+telic</th>
<th>−telic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+inherent</td>
<td>−inherent</td>
</tr>
<tr>
<td>1 'stretch'</td>
<td>(H) 67</td>
<td>(H) 33</td>
</tr>
<tr>
<td>6 'dance into the room'</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>3 'laugh'</td>
<td>H</td>
<td>?</td>
</tr>
<tr>
<td>4 'dance in the room'</td>
<td>64</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 12.3. Dutch 4–5-year olds: per cent choosing have or be auxiliary (n=14)

<table>
<thead>
<tr>
<th></th>
<th>+telic</th>
<th>−telic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+inherent</td>
<td>−inherent</td>
</tr>
<tr>
<td>1 'stretch'</td>
<td>(H) 79</td>
<td>(H) 21</td>
</tr>
<tr>
<td>6 'dance into the room'</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>3 'laugh'</td>
<td>H</td>
<td>?</td>
</tr>
<tr>
<td>4 'dance in the room'</td>
<td>68</td>
<td>52</td>
</tr>
<tr>
<td>5 'disappear'</td>
<td>B</td>
<td>?</td>
</tr>
<tr>
<td>6 'roll into the room'</td>
<td>32</td>
<td>68</td>
</tr>
</tbody>
</table>
class. For the [−actor] scene (as in cell 5), this happened much less often. Thus, [±actor] seems to be playing a role for Dutch adults, but not in those cases in which subjects are clearly using the Telicity Linking Rule. Now, we might have expected [±actor] also to distinguish cells 3 and 4 from cells 7 and 8. However, since we made no prediction about 7 and 8, it is not clear what is happening. This non-difference is not evidence against the Actor Linking Rule, though, since this is exactly what we would expect if there were an unergative default linking rule when neither the Telicity Linking Rule nor the Actor Linking Rule applied. To sum up, from the adult Dutch results we have evidence for all of our factors. And we also have evidence that when both the Telicity Linking Rule and the Actor Linking Rule apply, the Telicity Linking Rule wins.

Now let us look more carefully at the youngest Dutch subjects, the 4–5-year olds. Here, again, though the results in every cell are less clear-cut than the adult results, the cells with the highest numbers of + are cells 2 and 6. Again, cell 6 is the strongest, as we would expect if there is some competition in cell 2 from the presence of [+actor]. Basically, the only scenes that are categorized as unaccusative are those with a syntactically detectable endpoint, namely, cells 2 and 6—in fact, these children did no better in detecting the endpoints in cells 1 and 5 than they did where there were no endpoints, in cells 3, 4, 7, and 8. So, a syntactic PP is used even by 4-year olds, in helping learners to decide what the semantics of a verb are. The 7–8-year olds basically fell between the youngest children and the adults. The differences just get stronger as we move from the youngest subjects to the adults. Overall, then, we see that differences in lexical semantics, unless they are accompanied by a detectable syntactic (or phonological) difference, do not help subjects to sort out verb type. With new verbs, it is harder to pick up on lexical telicity (inherent in the verb) than on compositional telicity, where the endpoint is clearly marked.

While the charts show a clear pattern of results, in order to see which differences are significant, we can view the data using what are called ‘classification trees’ (Breiman, Friedman, Olshen, and Stone 1984). Each factor that plays a significant role adds structure to a tree. The more significant factors, the more structure. Note that

(32) Classification tree for Dutch adults

![Tree Diagram]

In this chapter we use simplified versions of the classification trees that emerged from our full analysis. In the more elaborate versions of the trees, the length of the tree branches indicates the relative proportions of the reduction in deviance that a split at any particular node brings about (see van Hout 1998; Randall et. al, in progress).
we have entered the percentages of \textsc{have} and \textsc{be} based on the majority of responses. Branches in which \textsc{have} was chosen more often are represented with per cent H, and branches in which \textsc{be} was preferred show per cent B, so that it is clear which auxiliary was preferred for each category.\footnote{Alternatively, we could have used only \textsc{be} responses and converted all the \textsc{have} responses to percentage of \textsc{be} responses by subtracting from 100.}

What we see in the trees for each subject group confirms our earlier conclusions. Beginning with the adults, we see that they assign \textsc{have} to the [−telic] cases, with no other factor having a significant effect. \textsc{be} is assigned to the [+telic] cases, and within these, was chosen significantly more often in all of the [−inherent] cases, which correspond to cells 2 and 6. However, the 88 per cent \textsc{be} for the [+actor] cases, as opposed to 100 per cent when no actor is present, is significant—it is evidence for the [±actor] factor. We were also correct that [±actor] played a role in distinguishing the responses in cells 1 and 5, where the endpoint may not have always been detectable, since we see a split, 59 per cent \textsc{be} for the [−actor] branch (cell 5) versus 97 per cent \textsc{have} for the [+actor] branch (cell 1).

Interestingly, (34), the tree for the Dutch 4–5-year olds, tells us that their important distinction is between the [+telic] [−inherent] cases, the detectable endpoint cases, cells 2 and 6, versus all the others. And the difference between cells 2 and 6, which shows a trend towards an effect of [±actor] is not significant. So these children appear to be using the Telicity Linking Rule, wherever they detect an endpoint.

The German results follow, beginning with the tables. Again, in each cell the percentage of the predicted auxiliary is in bold. If we look at the adults, in Table 12.4 again the highest numbers of \textsc{be} cluster in cells 2 and 6, where the endpoints were detectable
from the syntax as well as the scenes, as we predicted. But there is something going on in cells 4 and 8, where we find higher numbers of be than we found in the Dutch adults. Notice that these four cells (2, 6, 4, and 8) are our four [-inherent] cells, which correspond to our flexible verbs like dance. That is, these four cells all contain verbs that can switch classes. And the verbs in this ‘switchable’ class correspond to [+locomotion] verbs.

What we see is that the [+locomotion] verbs are being treated differently by German adults than the other verbs. This is not such a surprise when we remember that German, unlike Dutch, employs the Locomotion Linking Rule, using be not only for [+telic] verbs, but for all [+locomotion] verbs. Now, the scenes that we showed with the verbs in cells 4 and 8 did not include endpoints, but the actions were clearly [+locomotion]. So a German speaker who is paying attention not to telicity but to locomotion could treat these scenes differently from the others, even though all of the

<table>
<thead>
<tr>
<th>Table 12.4. German adults: per cent choosing have or be auxiliary (n=15)</th>
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<tr>
<td></td>
</tr>
<tr>
<td>+actor</td>
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<td></td>
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<td></td>
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<td>-actor</td>
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<tr>
<th>Table 12.5. German 7–8-year olds: per cent choosing have or be auxiliary (n=18)</th>
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<tr>
<td></td>
</tr>
<tr>
<td>+actor</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>-actor</td>
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</tbody>
</table>

|                  |                  |                  |      |                  |                  |
prepositions in these scenes were *in* or *on*. The subject could have assigned these scenes to the unaccusative class on the strength of locomotion alone.\textsuperscript{11}

One might now ask why, if the German adults are using [+locomotion], the \textit{be} responses are stronger in cell 8 than in cell 4, and similarly, in cell 7 than in cell 3. This is predicted by the presence of [+actor] in cells 3 and 4, which should pull responses in the \textit{have} direction.

Confirming the adult responses in Table 12.4 is the corresponding tree in (35), which shows that the German adults are using the [+inherent] feature in classifying the verbs. In other words, they seem to be basing their auxiliary choice on whether the verb is [+locomotion]. (Remember that the [-inherent] verbs are all [+locomotion], and the [+inherent] verbs are all [-locomotion].) Those [+locomotion] verbs that have a detectable endpoint are assigned \textit{be}s virtually all the time, 97 per cent. But even [+locomotion] verbs are assigned \textit{be} 52 per cent of the time when they occur with a [-telic] PP (corresponding to cells 4 and 8). On the [+inherent] side, which corresponds to cells 1, 5, 3, and 7 (where the verbs are [-locomotion]), [+telic] plays no role, but [+actor] emerges in the predicted direction.

(35) Classification tree for German adults

\begin{table}
\begin{tabular}{llllll}
 & +telic & & -telic & \\
 & +inherent & -inherent & +inherent & -inherent \\
1 'stretch' & (H) & B & H & \\
2 'dance into the room' & ?B & 39 & 82 & \\
3 'laugh' & B & 61 & 71 & \\
4 'dance in the room' & 26 & 37 & 29 & \\
5 'disappear' & ?B & B & ? & \\
6 'roll into the room' & 47 & 53 & 66 & \\
7 'sparkle' & ? & ? & ? & \\
8 'roll in the room' & ? & ? & ? & \\
\end{tabular}
\end{table}

\textsuperscript{11} Because we are evaluating the effect of the three factors [telic], [inherent], and [actor], and not [locomotion], our predictions for German do not take into account the possible effect of the Locomotion Linking Rule. If German adults treat all [+locomotion] verbs as unaccusative, this could dilute the expected \textit{have} responses in cells 4 and 8, as compared with Dutch adults. This appears to be the case.
Interestingly, when we look at the trees for the children, the results look very different from the adults. For both groups of children, [telic] is at the top, just as it is for our Dutch subjects. So German children appear to be behaving like Dutch children in some respects: when the event has no endpoint, they choose HAVE, and choose BE most often when they detect an endpoint, that is, when the endpoint is [−inherent].

However, the trees of the German children differ from those of the Dutch children in one respect. For both groups of German children, [actor] shows up as a factor within the [+inherent] [+telic] verbs, that is, non-locomotion verbs with endpoints (non-sense verbs parallel to stretch or disappear). For the Dutch children, [actor] emerged only in the 7–8-year olds, and in a different set of verbs. The fact that this factor occurs in both groups of German children in the same verbs but not in the Dutch children in the same way, suggests that the effect for the German children is not an accident, and that it may relate to the difference in the two adult systems. Exactly how, though, is a question for further research.

### 12.7. CONCLUSIONS

What do these results tell us about the questions we started with? First, syntactic unaccusativity is indeed determined by meaning in both German and Dutch. Two semantic factors appear to determine unaccusativity—[telicity] and [actor]. Subjects
use the Telicity Linking Rule for verbs with detectable endpoints, classifying them as unaccusative. They also sometimes use the Actor Linking Rule to classify verbs with detectable actors as unergative.

When both an endpoint and an actor are present for a given verb, subjects classify the verb as unaccusative. So the Telicity Linking Rule appears to take priority over the Actor Linking Rule. We proposed that this was related to the geometry of their Conceptual Structure representations.

Looking more closely at the telicity factor, all subjects find it easier to detect an endpoint for a verb if it is expressed in an explicit PP (our [-inherent] cases). When the syntactic PP cue was lacking (the [+inherent] cases), adults are more adept than either group of children at deducing an endpoint from the scene alone.

With respect to [actor], while all subjects use the Actor Linking Rule to link at least a subset of the [+actor] verbs as unergative, for the Dutch 4–5-year-old children this is only a trend, not significant, as it is for all the other subjects. Why this is the case deserves further investigation.

Although we did not predict any differences between Dutch and German (since we did not test any examples such as dance around the room, which would be unergative in Dutch but unaccusative in German), nevertheless, we do see differences in how our adult subjects classify verbs for scenes that are [+locomotion], for example, a hat shuffling around on a book, or Bert bouncing around on his head on a box. These cases are syntactically parallel to dance in the room, which has no [+locomotion] PP and no [+telic] PP either, so we expected unergative responses—which our Dutch adults gave. German adults, however, classify these verbs as unaccusative, presumably using the locomotion information in the scene alone. None of the German children do this. Like all of the Dutch subjects, they require a syntactically detectable endpoint in order to classify a verb as unaccusative. This suggests that German and Dutch both have a Telicity Linking Rule, used even by 4-year olds, and that, on the basis of positive evidence, German’s Locomotion Linking Rule is acquired later.\(^\text{12}\)

Taken all together, these results may be the beginnings of evidence that an event’s telicity and the presence or absence of an actor are two semantic universals for determining unaccusativity. Studies on other languages, and more refined studies on Dutch and German, are waiting to be done.

\(^{12}\) See Randall (1990, 1992) for a proposal about how a learner can ‘unlearn’ an incorrect rule in their grammar solely from positive evidence.
Appendix: Scenes and corresponding cells

+telic, +inherent, +actor (cell 1)
A  Bert straightens up under a picture.
B  Oscar shrivels up into himself on a red carpet (i.e., he makes himself into a ball).

+telic, +inherent, -actor (cell 5)
C  White blinds close beside Ernie, when Ernie pulls the cord.
D  A blue balloon deflates in Bert’s hand.

-telic, +inherent, +actor (cell 3)
E  Ernie ‘grimaces’ (moves his mouth back and forth in a grimace), while sitting on a book.
F  Ernie makes scissor-motions with his hands inside a blue ring, behind his back.

-telic, +inherent, -actor (cell 7)
G  A little ball and top jump around in a black saucer after a hand spins the top.
H  A green pitcher dangles on a rubber band held by a hand.

+telic, -inherent, +actor (cell 2)
I  Bert ‘mouths’ his way along a table and into a paper bag at the far end.
J  Ernie walks on his arms stuck into blue tubes, onto a pile of books.

+telic, -inherent, -actor (cell 6)
K  A red block flies off of a shovel when a fist hits the handle.
L  A yellow block rolls into a house when one end of the xylophone it is sitting on is lifted.

-telic, -inherent, +actor (cell 4)
M  Some feet move back and forth on a grey floor, twisting in and out.
N  Bert bounces on his head on a purple box.

-telic, -inherent, -actor (cell 8)
O  A black hat shuffles around on a book while a hand shakes the book.
P  A chocolate easter egg spins around on a dish after a hand gives it a spin.