Constraints on word meaning in early language acquisition*

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Very young children successfully acquire the vocabulary of their native language despite their limited information processing abilities. One partial explanation for children's success at the inductive problem word learning presents is that children are constrained in the kinds of hypotheses they consider as potential meanings of novel words. Three such constraints are discussed: (1) the whole-object assumption which leads children to infer that terms refer to objects as a whole rather than to their parts, substance, color, or other properties; (2) the taxonomic assumption which leads children to extend words to objects or entities of like kind; and (3) the mutual exclusivity assumption which leads children to avoid two labels for the same object. Recent evidence is reviewed suggesting that all three constraints are available to babies by the time of the naming explosion. Given the importance of word learning, children might be expected to recruit whatever sources of information they can to narrow down a word's meaning, including information provided by grammatical form class and the pragmatics of the situation. Word-learning constraints interact with these other sources of information but are also argued to be an especially useful source of information for children who have not yet mastered grammatical form class in that constraints should function as an entering wedge into language acquisition.

1. Introduction

One impressive accomplishment of young children is the degree to which they acquire the vocabulary of their native language. Not only is the rate and extent of young children's word learning impressive, it is puzzling as well. Given the limitations on children's hypothesis testing, reasoning, memory, and other information processing abilities, their facility for building a lexicon is even more striking. This is especially so in light of the well-known inductive problem that word learning poses (Quine 1960). Faced with an infinite set of

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possibilities about what a novel word might mean, the speed with which young children acquire word meanings requires explanation.

Given the importance of word learning for language acquisition, children might be expected to recruit whatever sources of information they can to narrow down a word's meaning. One powerful one, for children old enough to benefit from it, is grammatical form class. As one example, Fisher et al. (this volume) provides dramatic demonstrations of the way in which syntactic information helps constrain the meaning of a novel verb (see also Fisher et al. 1991, Naigles et al. 1992). Being able to infer aspects of the communicative intent of a speaker should provide another source of information about the referent of a novel term. A conscientious parent or other tutor might further help by arranging the environment in ways to exaggerate the salience of the aspect of the situation being labeled in the hope that their child will find it salient too. Another potentially powerful source of information young children can use to figure out the meaning of a new word comes from word-learning constraints. Constraints on word meaning may be particularly critical for babies who have not yet learned enough syntax to rely on grammatical form class to limit their hypotheses as to a word's meaning. I will argue that by the time they are ready to acquire vocabulary, children place constraints on possible word meanings, thereby greatly reducing the hypothesis space that needs to be considered. Children would not need to formulate a long list of potential meanings and painstakingly assess the evidence in support of each. Rather, they could quickly zoom in on some hypotheses that they are predisposed to prefer.

In this paper, I will consider evidence in support of three word-learning constraints: the whole-object, taxonomic, and mutual exclusivity assumptions. I will argue that the most recent evidence supports the claim that children's early word learning is guided by such constraints. For some different formulations of possible constraints see Bloom (this volume); Clark 1991; Golinkoff et al. 1992a).

To claim that children's early word learning is a constrained form of learning is not to claim that no other source of information matters. On the contrary, the recent evidence reveals some of the complex and subtle ways that word learning biases interact with other sources of information. There is evidence, for example, that word-learning constraints can affect each other. When two or more constraints converge on the same hypothesis the learning will be efficient compared to cases where the constraints conflict and one must override another. Similarly word-learning constraints interact with grammatical form class. In some cases both these sources of information lead
to the same conclusion about a novel word, but in other cases they conflict. Analogous points can be made about communicative or pragmatic sources of information and the word learning assumptions. Finally, there is emerging evidence about the ways that the processing demands of a given word learning situation can affect the use of constraints. The evidence I will review suggests that beginning word-learners rely heavily on word-learning assumptions but that these constraints are modulated by other constraints, by nonlinguistic context, by children's problem solving and other information processing abilities, and by the pragmatics and syntax of the language children hear.

2. Some preliminary considerations

In this paper, I will review studies testing the hypothesis that word-learning constraints provide young children with an essential source of information about the meaning of a novel word. That is, that such constraints provide a partial explanation for the speed with which new words are acquired. Before turning to the evidence, I will briefly consider a few theoretical issues in order to sharpen the formulation of the hypothesis.

2.1. The developmental hypothesis

One way of formulating this hypothesis is to expect word-learning constraints to be available at the start of language acquisition. This would require documenting that at least some constraints are used by babies by the time they are capable even of understanding their first word. Babies acquire their first word often by age one year or less if measured by production and probably younger if measured by comprehension. There is reason to believe, however, that the nature of word learning undergoes a marked developmental shift from the time babies are capable of acquiring their first word at say a year and the rapid word learning they become capable of by 18 months or 2 years (Bloom et al. 1985, Corrigan 1983, Dromi 1987, Halliday 1975, McShane 1979, Nelson 1973). The contrast between very early word learning and this vocabulary spurt or naming explosion has been characterized in a number of different ways. The early phase of word learning has been termed 'prelexical' (Nelson and Lucariello 1985) to emphasize that there are ways in which the first 'words' may not be word like; it has been called 'nonreferential' (Snyder et al. 1981) and 'associative' (Lock 1980) to distinguish these
early 'words' from genuine words that are referential; and it has been termed 'performative' (Snyder et al. 1981) to suggest that the early words are responses used to perform some instrumental act rather than functioning as words that make reference. Another characteristic of this first phase of word learning is that words are added to the productive lexicon very slowly. A slow accumulation of new words might proceed by some relatively unconstrained associative mechanism. Dozens or even hundreds of trials may be needed for a baby to learn, for example, to say 'bye-bye' on command. This is in marked contrast to the very fast acquisition seen around 18 months.

This developmental shift at the time of the naming explosion suggests an alternative formulation of the hypothesis that word-learning constraints are necessary for word learning. The more precise claim is that some constrained form of learning is necessary to account for the rapid acquisition of words seen at the time of the naming explosion. Babies could not be acquiring words at the rate of 30 or so a week if they were open-mindedly considering all possible hypotheses each time they encountered a novel word. Thus the main hypothesis to be evaluated here is that word-learning constraints are available to babies by the time they enter the naming explosion at roughly 18 months of age.

2.2. Word-learning constraints as default assumptions

Before summarizing the evidence that the word learning of 1½-year-olds is a constrained form of learning, I would like to clarify the claim. Some confusion has been generated by the terminology where 'constraints' is interpreted differently by different disciplines, especially linguistics versus ethology. I and other investigators have borrowed the terminology from the ethology of learning (see Woodward and Markman 1991 for a discussion of this perspective). Within this discipline 'constraints' on learning are formulated as default assumptions – probabilistic biases that provide good first guesses as to a problem an organism must solve (Marler and Terrace 1984, Rozin and Schull 1988, Shettleworth 1984). To take one example from Gould and Marler (1984), foraging bees must learn the color of the flowers that yield a given nectar. Purple is the default value bees hold. It is easier for them to learn about purple flowers than about flowers of any other color. Note that it is by no means impossible for them to learn sources that are other colors. Violations of the default assumption are common. Nevertheless, purple serves as a first guess, and it takes more trials or more evidence to learn values that differ from the default assumption. Turning to word learning, the hypothesis
is that children are able to make progress in word learning by use of such default assumptions (see Merriman and Bowman 1989 and Woodward and Markman 1991). These constraints on learning provide good first guesses about the likely meanings of terms. Words that conform to the constraints should therefore be easier to learn than ones that violate them. Some of the controversy surrounding such claims stems from confusion over whether constraints must be absolute or whether they function as default assumptions (Gathercole 1989, Nelson 1988, Tomasello 1992).

2.3. Are word-learning constraints domain-specific?

To clarify another potential source of confusion, I’d like to briefly consider the question of whether the word learning constraints I will consider here – the whole-object, taxonomic and mutual exclusivity assumptions – are specific to language or available to other domains. Rather than discuss this here, let me refer you to Markman (1992), where this issue is considered in detail along with speculations about the origins of the constraints. My conclusion is that there is no reason at all to believe that these three constraints are limited only to word learning and good reason to think they are available to some other domains. This is not to say that they are domain-general in that important domains are organized by very different principles. Given that analogous constraints are available to some fundamental domains, I suggested that word-learning constraints have been recruited from existing abilities that children possess rather than evolving as special purpose mechanisms only for word learning (Markman 1992). Such speculations aside, these assumptions function as word-learning constraints, not in the sense that they are domain-specific, but in the sense that they help solve the inductive problem that word learning poses.

3. The taxonomic assumption

The first assumption I will consider is the taxonomic assumption which states that terms refer to entities of the same kind. An object term would refer to objects of the same kind, a color term to colors of the same kind, an action term to actions of the same kind, and so on. Although to adults this might seem self-evident, there was reason to question whether young children would interpret terms in this way. First, taxonomic relations are not the only relations available to children. A label learned for a given object, for example,
could refer to objects of the same kind, but it could in principle refer to the object and its spatial location, or the object and its owner, or the object and a salient part, etc. This is not, moreover, just a theoretical possibility. Many studies of classification have found that not only do children attend to such ‘thematic’ relations between objects, they often find them more salient or interesting than taxonomic relations per se (see Markman 1989). When shown a car, for example, and told to find another one, children might pick a man because he drives a car rather than a truck, another vehicle. Given such findings from children’s classification, the question arises as to how children avoid such thematic interpretations of a novel word. Hutchinson and I proposed that children expect novel terms to refer to objects of like kind (Markman and Hutchinson 1984). Hearing a novel label, then, should cause children to seek out taxonomic relations even in cases where thematic relations would otherwise be more salient. There is now a substantial body of evidence that children from about 2½ or 3 expect labels to refer to things of like kind (Baldwin 1989, in press; Hutchinson 1984, Markman and Hutchinson 1984, Waxman and Gelman 1986, Waxman and Kosowski 1990). I turn now to consider whether the taxonomic assumption is available to babies by the time of the naming explosion.

3.1. The taxonomic assumption at the time of the naming explosion

Bauer and Mandler (1989) first addressed this issue in their study of the categorization abilities in very young children. As part of their study, they asked whether labeling would increase 16–31-month-old children’s tendency to sort taxonomically. Unexpectedly, however, even the youngest children in their study were sorting taxonomically from the start. That is, even with no labels children were sorting taxonomically about 75% of the time. Labeling did not increase this already high level of performance. Bauer and Mandler (1989) have thus convincingly demonstrated that quite young children are capable of sorting taxonomically. They also argue that there may not be a general thematic preference. Because of the already high rate of sorting taxonomically, however, they were unable to test whether children of this age adhere to the taxonomic assumption. That is, it is still important to know whether there are situations in which very young children show thematic preferences and, if so, whether hearing a label will cause them to shift to taxonomic sorting. Backscheider and I addressed this by changing aspects of Bauer and Mandler’s procedure that resulted in children responding taxonomically from the start.
One reason why Bauer and Mandler (1989) achieved such a high rate of taxonomic responding in their young children is that they used a reinforcement procedure whereby they briefly pretrained children to select taxonomically and maintained this selective reinforcement of taxonomic choices throughout the testing procedure. The selective reinforcement clearly mattered because in a control study Bauer and Mandler achieved an equally high rate of thematic responding by selectively reinforcing thematic rather than taxonomic responses. Since they demonstrated that selective reinforcement is a powerful way to influence children’s responses, Backscheider and I avoided selective reinforcement (as did all earlier studies with older children). Other differences between our procedure and Bauer and Mandler’s (1989) are that we used pictures instead of objects, we used items whose thematic relations we thought would be better known to 18-month-olds, and we used an up/down placement of thematic and taxonomic choices instead of left/right. Finally, Bauer and Mandler counterbalanced the position of thematic and taxonomic choices by alternating the left/right placement from trial to trial. This alternation is unfortunate especially when coupled with a reinforcement procedure. Children may have simply learned the correct answer changes sides every trial. We counterbalanced side but not by alternating from trial to trial. The major difference between the studies, however, is that we did not differentially reinforce taxonomic responding.

Thirty-three children participated in our study. They ranged in age from 18 to 25 months with a mean age of 21.5 months. The experimental materials consisted of ten triads, each containing one target picture, one picture thematically related to the target, and one picture taxonomically related to the target picture. We selected thematic relations that we thought would be highly familiar to even very young children. The taxonomic match belonged to the same basic level category as the target but, where possible, came from distinctive subordinate categories. The ten triads are listed in table 1.

The experimental questions were preceded by a set of four warm-up questions designed to clarify the instructions and procedure but not to differentially reinforce either taxonomic or thematic responding. The warm-up questions and the experimental questions were oddity tasks, where children viewed a target picture and then selected one of two choice pictures. To begin, children were introduced to a frog hand-puppet who manipulated the pictures. They were asked to help the frog find the pictures it wanted. The children were told that the frog had just gotten a new house, and wanted things to put in its house. In order to ensure that children gave unambiguous responses, they were shown how to place the pictures they selected in the frog
Table 1
Experimental items from Markman and Backscheider's study

<table>
<thead>
<tr>
<th>Target</th>
<th>Choices</th>
<th>Taxonomic</th>
<th>Thematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting baby</td>
<td>Lying baby</td>
<td></td>
<td>Stroller</td>
</tr>
<tr>
<td>Bottle</td>
<td>Bottle</td>
<td></td>
<td>Baby</td>
</tr>
<tr>
<td>Chair</td>
<td>Chair</td>
<td></td>
<td>Sitter</td>
</tr>
<tr>
<td>Rabbit cup</td>
<td>Cup</td>
<td></td>
<td>Pitcher</td>
</tr>
<tr>
<td>Foot</td>
<td>Foot</td>
<td></td>
<td>Shoe</td>
</tr>
<tr>
<td>Glasses</td>
<td>Glasses</td>
<td></td>
<td>Eyes</td>
</tr>
<tr>
<td>Blue scoop shovel</td>
<td>Red shovel</td>
<td></td>
<td>Pail</td>
</tr>
<tr>
<td>Spoon</td>
<td>Spoon</td>
<td></td>
<td>Cereal in bowl</td>
</tr>
<tr>
<td>Toilet paper</td>
<td>Toilet paper</td>
<td></td>
<td>Toilet</td>
</tr>
<tr>
<td>Mitten</td>
<td>Mitten</td>
<td></td>
<td>Hand</td>
</tr>
</tbody>
</table>

puppet's mouth. There were two experimental conditions, the No Label Condition and the Novel Label condition.

3.1.1. Warm-up questions

For the warm-up questions, children were shown a target picture and then had to select one of two pictures, one of which was an unrelated distractor. The other picture, the correct choice, was thematically related to the target for half of the trials and taxonomically related for the other half. The items used for the warm-up questions are listed in table 2.

Table 2
Warm-up items from Markman and Backscheider's study

<table>
<thead>
<tr>
<th>Target</th>
<th>Choices</th>
<th>Taxonomic match</th>
<th>Thematic match</th>
<th>Distractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hat</td>
<td>Hat</td>
<td>Head</td>
<td>Car interior</td>
<td></td>
</tr>
<tr>
<td>Watch</td>
<td>Watch</td>
<td>Wrist</td>
<td>Road</td>
<td></td>
</tr>
<tr>
<td>Shopping cart</td>
<td>Shopping cart</td>
<td>Bag of groceries</td>
<td>Pillow</td>
<td></td>
</tr>
<tr>
<td>Hair</td>
<td>Hair</td>
<td>Brush</td>
<td>Pot</td>
<td></td>
</tr>
</tbody>
</table>

* In a single trial the child saw either the taxonomic match or the thematic match, not both. The distractor was always present.

The experimenter placed the target picture (for example a hat) on the table and asked the child to 'look at this picture' or 'see this', etc. Then the two
choice pictures were placed on a magnetic board, one above the other. (Pilot work suggested that a vertical alignment of the pictures produced fewer response biases based on position than did a horizontal alignment.) The top/bottom position of the random distractor and correct picture was counterbalanced. The target picture was held next to the top picture while the experimenter asked 'Is this another one?' and then held next to the bottom picture while the experimenter asked 'or is this another one?' When children selected the wrong picture they were told that that was not the one that the frog wanted and were encouraged to make another selection. For the warm-up questions, the frog would not accept the wrong picture - it would keep its mouth closed and shake its head, etc. When children selected the correct choice the frog opened its mouth to take the picture and enthusiastically thanked them, saying 'Yeah! Yeah! That is just the one I wanted. Thank you', kissed the child, etc. The experimenter then explained why that was the picture the frog wanted, describing either the taxonomic relation between the target and the picture or the thematic relation as appropriate. For example for the thematic pair hat/head, the frog said 'That's great! A hat goes on a head. Do you ever put a hat on your head? A hat goes on a head, they go together'. For the taxonomic pair hat/hat, the frog said 'That's great! Now I have two hats. Look, these are the same, two hats'. Thus, the warm-up questions encouraged, explained, and reinforced taxonomic and thematic responses equally.

The procedure for the two experimental conditions was similar to that of the warm-up questions with two exceptions. First, in the procedure proper there was no unrelated distractor. One of the choice pictures was thematically related to the target and the other was taxonomically related to it, as shown in table 1. Second, the frog accepted any choice the child made, that is, there was no selective reinforcement during the experiment proper.

3.1.2. No label condition

To begin each trial, the puppet placed the target picture on the table and said 'Now let's look at this picture' or 'Here's a new picture'. Then the two choice pictures were placed on the magnetic board, one above the other. Whether the thematic choice was placed on the top or on the bottom was counterbalanced such that for each child half of the time it appeared on the top and half the time on the bottom. The order of presentation of the items was randomly determined for each child. Once the child saw the target picture, the puppet asked the child to 'find another one'. It held the target picture next to each of the choice pictures, asking 'Is this another one, or is
this another one?’ The frog then held the target between the two pictures while the child selected one of them and placed it in the frog puppet’s mouth. The experimenter took the target out of the frog’s mouth as the child moved his or her choice over to the frog. Children were enthusiastically thanked on every trial, regardless of which picture they chose.

3.1.3. Novel label condition

The materials and procedure for the Novel Label Condition were identical to those of the No Label Condition except that children in this condition were told that the puppet would sometimes speak in puppet talk and the puppet gave each target picture a novel label. For example, the puppet would show the child the target picture saying ‘Now I am going to show you a sud. Look at this, it is a sud. Can you find another sud?’ When children were making their choices the puppet said, e.g., ‘Is this another sud or is this another sud?’ Ten nonsense syllables were used as the novel labels and were randomly assigned to the targets for each child.

The first question this study addressed was whether children as young as 18 to 24 months will show thematic preferences at all. In marked contrast to Bauer and Mandler’s (1989) findings, these young children did show a thematic bias. When children in the No Label Condition were asked to choose between an object that was from the same category as the target and one that was thematically related to it, they chose the taxonomic match only 32% of the time, which was significantly less than chance, $t(15)=4.78$, $p<0.001$. That is, they chose thematically 68% of the time. Thus, when children are not selectively reinforced for choosing taxonomic items and when the thematic relations are geared towards what would be well-known to even 18-month-olds, quite young children will reveal the thematic biases often seen in older children. This does not contradict Bauer and Mandler’s claim that these young children are capable of grouping the objects on the basis of common categories, but it does establish that when the thematic relations are well-known and when children are not reinforced for one type of response or another they prefer to organize objects thematically.

Given that for these items, these young children do show thematic biases, it then makes sense to ask whether hearing an object labeled will help them override their thematic preference in favor of taxonomic relations. As predicted, there was a highly significant effect of condition, with children in the Novel Label condition picking taxonomically fully 77% of the time compared to 32% of the time for children in the No Label Condition, $F(1, 31)=66.58$, $p<0.0001$. Children hearing an object labeled selected a taxonomic match
well over what would be expected by chance, \( t(16) = 6.75, p < 0.0001 \). Thus, these young children do adhere to the taxonomic assumption. They extend object labels to other objects of like kind rather than to objects that are thematically related.

Wasow and I have conducted subsequent studies to determine if these results would replicate with babies 16 to 18 months old. Several changes in procedure were made to accommodate to the younger children. We used objects instead of pictures and reduced the number of questions that children were asked. The experimental triads that were used are presented in Table 3. The procedure was otherwise quite similar to that of Backscheider and Markman, including use of warm-up questions. Thirty-two 16-month-olds and 32 18-month-olds participated in this study, half of each age group in each condition. As before 18-month-olds honored the taxonomic assumption. First, when in the No Label condition, 18-month-olds showed a clear thematic bias selecting the taxonomic choice only 28% of the time, which is below chance, \( t(15) = 10.97, p < 0.0001 \). When the target object was given a novel label, the 18-month-olds significantly increased their taxonomic selections, now picking a member of the same category 54% of the time, \( t(30) = 3.34, p < 0.005 \).

Table 3
Items from Markman and Wasow's study with familiar objects

<table>
<thead>
<tr>
<th>Target</th>
<th>Choices</th>
<th>Taxonomic</th>
<th>Thematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felt doll hat</td>
<td>Plastic doll hat</td>
<td>Doll head</td>
<td></td>
</tr>
<tr>
<td>White doll-size sock</td>
<td>Yellow toddler-size sock</td>
<td>Doll-size foot</td>
<td></td>
</tr>
<tr>
<td>Baby doll (approx. 5&quot;)</td>
<td>Smaller doll (approx. 3&quot;)</td>
<td>Doll-size bottle</td>
<td></td>
</tr>
<tr>
<td>Red &amp; white adult-size toothbrush</td>
<td>Pink child-size toothbrush</td>
<td>Set of plastic teeth</td>
<td></td>
</tr>
<tr>
<td>Pink plastic dollhouse table</td>
<td>White wooden dollhouse table</td>
<td>Pink plastic dollhouse chair</td>
<td></td>
</tr>
<tr>
<td>Yellow plastic pail</td>
<td>Red plastic pail</td>
<td>Yellow &amp; white plastic shovel</td>
<td></td>
</tr>
</tbody>
</table>

We did not find this labeling effect with 16-month-olds, however. The 16-month-olds did find the thematic relations salient, picking taxonomically only 34% of the time in the No Label condition, which was less than chance, \( t(15) = 3.76, p < 0.002 \). But labeling had no effect on their selections, with babies selecting taxonomically only 39% of the time in the Novel Label condition.

One possible reason for our failure to replicate the labeling effect with 16-month-olds is that in this procedure we provide a novel label for a familiar
object and then look to see how the child interpreted the label. As I will argue later, children find it more difficult to learn second labels for objects because this violates mutual exclusivity, another word-learning constraint. Other studies minimized the conflict between mutual exclusivity and the taxonomic assumptions by telling children that the novel word was a word in puppet language or a foreign language (Markman and Hutchinson 1984, Waxman and Gelman 1986). Although older children have been shown to treat mutual exclusivity as applying within a single language, not across languages (Au and Glusman 1990), 16-month-olds would not have understood a discussion of puppet language. To test the possibility that the conflict between mutual exclusivity and the taxonomic assumption was confusing the 16-month-olds, Wasow and I ran another version of the study, this time using novel objects. Thirty-two 16-month-old babies were introduced to novel triads of toys where two of the toys were similar in appearance and two were related by some thematic relation we demonstrated. For example, two honey dippers of different colors were novel taxonomic pairs and one honey dipper was scraped against a plastic grid to demonstrate the thematic relation. Babies were then shown a target, e.g., a honey dipper, heard it labeled or not, and were then depending on the condition, asked to find another one or another X (where X was the novel label). The full set of novel items used is described in table 4.

Table 4
Items from Markman and Wasow's study with novel objects

<table>
<thead>
<tr>
<th>Target</th>
<th>Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Taxonomic</td>
</tr>
<tr>
<td>Small green sponge circle</td>
<td>Large yellow sponge circle</td>
</tr>
<tr>
<td>Small orange block</td>
<td>Large blue block</td>
</tr>
<tr>
<td>Red 'person' peg, Large red propellor</td>
<td>Yellow 'person' peg, Small yellow propellor</td>
</tr>
<tr>
<td>Yellow honey dipper, Decorated PVC pipe</td>
<td>Green honey dipper, Plain PVC pipe</td>
</tr>
</tbody>
</table>
Once again we failed to find an effect of labeling with 16-month-olds. Babies selected the taxonomic choice 40% of the time when the object was unlabeled and 44% of the time when it was labeled. Our avoiding second labels for objects did not improve babies' performance in the labeled condition.

One possibility, of course, is that 16-month-olds lack the taxonomic assumption. Another is that the oddity task we have been using is insensitive to the knowledge babies have. To reveal use of the taxonomic assumption in this task, babies must inhibit a dominant response. We deliberately selected thematic choices that would be preferred by babies this age. Being asked for 'a dax' for example may not be compelling enough to prevent babies from doing what they most prefer, even if they do interpret 'dax' as referring to objects of like kind.

Thus, our failure to find the labeling effect with the 16-month-olds might be partially accounted for by the requirements of the oddity task. The taxonomic assumption may not be strong enough to allow young children to inhibit reaching for a preferred object.

Support for this interpretation comes from work from Waxman and her colleagues, who found that labels highlight categorical structure for even 12- and 13-month-olds (Waxman, this volume; Waxman and Heim 1991, Markow and Waxman 1992). Instead of an oddity task where children would need to inhibit a dominant thematic response to reveal knowledge of the taxonomic assumption, Waxman and Heim (1991) and Markow and Waxman (1992) used a manual habituation procedure which assessed whether babies could notice and distinguish two different categories of objects. The hypothesis being tested is that words should enhance babies' tendency to notice object categories. The prediction was that labeling objects should (1) increase the rate of habituation to category exemplars and (2) increase the degree of dishabituation to an object from a different category. In this procedure, babies are first familiarized with four toys from a given category (e.g., four cars or four animals). Children were presented with each toy, one at a time for 30 seconds each. On analogy with visual habituation tasks, a decrement in the time spent exploring the last toy compared with the first was used as an index of habituation. After the familiarization trials, babies were presented with a new exemplar from the old category and an object from the novel category. Here, again on analogy with standard habituation tasks, babies who had best formed the category would be expected to show a greater interest in the object from the novel category than in the object from the original category. For some of the babies the experimenter labeled the
object during the familiarization phrase saying, e.g., 'Look at the car'. For some babies the experimenter drew attention to the object without labeling it saying, e.g., 'Look at this'. As predicted, labeling the objects improved babies' ability to categorize as measured both by rate of habituation to within category exemplars and by dishabituation to a novel category (Waxman and Heim 1991, Markow and Waxman 1992). Moreover, Markow and Waxman discovered that at 12 months labeling objects improved babies' categorization even when adjectives rather than nouns were used to refer to the objects. This finding is of interest because it supports the idea that babies first treat words as referring to objects of like kind rather than treating only nouns that way. One-year-olds, presumably with minimal knowledge of grammatical form class, were better able to categorize objects if they were labeled regardless of whether a noun or adjective was used as the label.

At this point it is of interest to consider briefly Bloom's (this volume) alternative framework for constraints on word meaning. Bloom views the postulation of particular constraints such as the taxonomic and whole-object assumptions as unmotivated and corrects this in his model with an elegant system that generates constraints to conform to universal grammar-cognition mappings. Bloom's systematic analysis provides a clear statement of what the endpoint of development should be. Where we disagree is in what to attribute to the very early phases of language learning – the time before children have mastered grammatical form class. On the view I have proposed very young children will break into the system by assuming that a word refers to a whole object (the whole object assumption) and is extended to things of like kind (the taxonomic assumption). Bloom's account, which is bolstered by counter-examples to my formulation, is that children map count nouns on to kinds of individuals rather than kinds of objects. Yet, this may describe a developmental achievement rather than the initial state. Babies may treat terms as referring to objects but with time note the regularity with which count nouns refer to objects. Once this correlation is established children may then be able to metaphorically extend object-like or 'individual' status to non-objects that are referred to with count nouns such as 'a forest' or 'a lecture'. Second, on my account as well as Waxman's, young children rely on word-learning constraints before they have mastered grammatical form class. Very young children should err by treating adjectives, for example, as referring to kinds of objects. The work just described (Markow and Waxman 1992) is one source of evidence that before children have mastered the noun/adjective contrast in English, adjectives as well as nouns enhance one-year-old's attention to kinds of objects.
Labeling has been found to enhance even younger babies’ attention to objects. Baldwin and I found that babies from 10–14 months old attended more to toys that had been labeled compared to ones that had not (Baldwin and Markman 1989). In a second study, we compared labeling to another powerful means of directing babies’ attention, namely pointing. Although labeling did not increase babies attention over pointing at the time pointing occurred, during a subsequent play period babies attended more to toys that had been labeled than to those that had not. Thus, labeling may sustain babies’ interest in objects beyond the time the labeling occurs. By helping babies sustain their attention to relevant objects, this labeling effect may help babies notice and remember the word-object correspondences. It is not yet known whether this labeling effect is caused by labels per se or whether other nonlinguistic sounds would have the same effect (see Baldwin and Markman 1989 for other possible explanations as well). So far, the existing data are inconsistent. Waxman and Balaban (1992) have found that words but not tones increased attention to object categories in 9-month-olds. On the other hand, Roberts and Jacob (1991) found that music as well as words facilitated object categorization in infants. Whether the effect is specific to words or not, words do heighten babies’ attention to objects and object categories.

Taken together, then, the experimental findings document that babies from 12–18 months (and maybe even younger) use the taxonomic assumption to help them determine the appropriate referents of a word. This conclusion from the experimental data is supported by the results of Huttenlocher and Smiley’s (1987) study of naturalistic data. They generated a set of criteria to distinguish thematic (complexive) extensions of words from taxonomic extensions, arguing that not every use of a word by a young child should be taken as a simple label of an object. They followed several children from the time of their first word (around 13 months for most of the children) and periodically recorded both the words children produced and details of the situation and context in which utterances occurred. For example, a child who reaches towards a cookie jar saying ‘cookie, cookie’ with an insistent request intonation, should not be interpreted as labeling the cookie jar as a cookie. Instead, the child is most likely requesting a cookie. Using coding categories that capture reasonable interpretations of children’s utterances, they found that from the start children use words to refer to objects of like kind. Thus, evidence from experimental and naturalistic studies alike indicate that the taxonomic assumption is available to babies who have not yet undergone the naming explosion.
Although the taxonomic assumption goes a long way in reducing the kinds of hypotheses babies need to consider in figuring out the meaning of a new word, it by no means solves the problem. Babies may be led to treat novel words (or nouns) as referring to kinds of objects but that still leaves open the question of which kind. This problem has been extensively addressed by Waxman and her colleagues and is reviewed in Waxman (this volume). To briefly summarize, labels facilitate young children's attention to objects at some hierarchical levels but might actually interfere with their ability to categorize at other levels. Young children hearing a noun expect it to refer to categories either at a basic or superordinate level of categorization, but do not expect it to refer to the distinctions made at subordinate levels of categorization. Rather, they expect this level of detail to be indicated by adjectives. Waxman's work reveals the interaction between use of word-learning constraints, grammatical form class, and conceptual structure.

Not only does the taxonomic assumption leave open the question of which kind of object is being referred to, it even leaves open which object is being referred to. As Baldwin (1991) pointed out, in normal environments that babies find themselves in, there are often many candidate objects around that could serve as potential referents for a new word. Even if babies are prepared to treat a novel word as referring to, say, a basic level category, they must figure out which one. One possibility is that babies may treat a novel word as referring to whatever novel object they are attending to. Whenever babies and adults are focussing on the same object, this would lead babies to correctly identify the referent of a novel term. On those occasions, however, when the adult was in fact labeling an object other than the one the baby was focused on, the baby would wrongly interpret the new word and would make a mapping error. Such mapping errors appear to be very rare, although there is evidence that babies learn words more readily when parents tend to label what their baby is attending to (Tomasello and Farrar 1986). Baldwin (1991) suggested that babies could avoid mapping errors if they monitored the speaker's focus of attention. If babies recognize that the object they are interested in is not the one the speaker is attending to, then they would know not to treat the word as a label for their object. Baldwin tested whether babies use information about a speaker's focus of attention in inferring the referent of a novel word or whether they mapped a novel word to whatever novel object they were interested in. To test this, she provided novel labels to 16-19-month-old babies in one of two conditions. In the 'discrepant' label condition, babies were given a toy to play with. Once the experimenter was assured that the baby was examining the toy the experimenter provided a
novel label saying, e.g., 'It's a toma'. Instead of looking at the baby or the toy, however, the experimenter gazed into an opaque bucket as she said 'It's a toma'. Thus, the baby heard the novel label while looking at a novel toy but while the speaker looked into a bucket that contained a second toy. In the 'follow-in' labeling condition, the experimenter looked at the visible toy while she provided the novel label.

In the follow-in labeling condition, babies of both ages treated the novel word as referring to the visible toy. Of more interest is what happened in the discrepant conditions. The results were quite clear: at neither age did babies treat the novel word as referring to the visible toy even though they were looking at the toy at the time they heard the label.

By monitoring the eye-gaze, posture, direction of voice, or some other cues to the speaker's focus of attention babies avoided making a mapping error. The 16–17-month-olds avoided errors by simply failing to learn the new word. The 18–19-month-olds not only avoided errors, but were able to infer that the new word referred to the object that was hidden in the bucket at the time of labeling. Baldwin's results reveal how babies' use of word-learning constraints is coordinated with their construal of the communicative intent of the speaker.

4. The whole-object assumption

The whole-object assumption states that babies should treat a novel label as referring to an object rather than a part, substance, color, movement, etc. There is some controversy as to whether young children treat a novel label as referring to the shape of an object rather than the object per se. Some studies have found that young children will extend an object label to things of the same shape rather than those of the same color, or texture (Au 1989, Au and Markman 1987, Baldwin 1989, Landau et al. 1988, Ward et al. 1989). One interpretation of these findings, however, is that children are treating the terms as referring to whole objects of like kind, and that shape is a particularly reliable clue to an object's taxonomic category. Soja et al. (1991) reinforce the conclusion that it is the object, not the shape, that children are responding to in that they do not treat words as referring to the shape of non-solid substances even when different substances were arranged into common shapes. Baldwin (in press) has found that, on the one hand, children will extend a label on the basis of shape when there is no obvious taxonomic category, but, on the other hand, children will extend a label on the basis of
taxonomic category even when the objects in question do not have the same shape. Moreover, Landau (this volume) along with Becker and Ward (1991) have found that preschoolers treat novel terms as labels for objects rather than shape in that they treat a term for a worm-like animal as referring to another worm twisted into a different configuration. (Landau, however, argues for a different interpretation of these results. In particular she argues that children are still responding on the basis of shape but shape now is defined as the possible shape transformations an object of a given shape can undergo.) In addition, there are developmental differences in the way this whole-object bias interacts with grammatical form class (Landau et al., in press; Landau, this volume). Older children and adults will treat a novel noun as referring to the kind of object but treat an adjective as referring to a property such as texture. But the youngest children treated even novel adjectives as referring to kinds of objects. Here again we see that when knowledge of grammatical form class is weak, word-learning constraints such as the whole-object assumption dominate the child's interpretation of a novel term.

Taken together, these findings suggest that children attempt to honor the whole object and taxonomic assumptions per se, rather than treating words as shape terms. Further support for the whole-object assumption comes from studies that have documented that children interpret a novel term as a label for an object and not its part (Markman and Wachtel 1988, Mervis and Long 1987) and for an object over its substance (Markman and Wachtel 1988, Soja et al. 1991).

4.1. The whole-object assumption at the time of the naming explosion

Although the whole-object assumption has received experimental support, only Mervis and Long (1987) examined babies around the age of the naming explosion. Moreover, none of the studies (except perhaps Landau's, this volume) provided a strong test of the whole-object assumption. Babies might map words onto objects not because of a whole-object assumption per se, but simply because objects are salient and babies might map novel words to whatever is most salient at the time of labeling. Thus a stringent test of the whole-object assumption requires examining whether babies treat novel words as referring to objects even when an object is not the most salient aspect of the environment. Woodward (1992) has provided such a test.

Woodward (1992) had babies view two video monitors. On one screen babies viewed a dynamic substance in motion, such as flowing lava. On the
other screen the babies viewed a static novel object. When the screens were
turned on and babies allowed to watch freely, they clearly preferred the
swirling substances to the static objects. Thus, Woodward created a situation
where the object was less salient than the substance in motion. On some trials
babies heard a label that could be interpreted as referring either to an object
or substance. The prediction from the whole-object assumption is that
hearing a label should cause babies to shift attention more to the whole
object. This hypothesis was confirmed for 18-month-olds (though less clearly
for the 24-month-olds). Around the time of the naming explosion, then,
babies treat novel words as referring to objects per se, rather than to
whatever is most salient.

Testing a somewhat different hypothesis, Echols also has evidence sug-
gest ing that well before the time of the naming explosion babies honor the
whole-object assumption, but that younger babies (8- to 10-month-olds) may
not. Echols (1990, 1991) asked whether young babies might map labels to
whatever in the environment is consistent rather than to objects per se. She
used an habituation/dishabituation procedure where babies heard labels
either in the presence of consistent objects with varying motions or consistent
motions with varying objects. Trends in the pattern of habituation and
dishabituation led Echols to speculate that there is a developmental shift from
8-10 months to 13-15 months in how babies are affected by labeling. The
younger babies appeared to focus on what was consistent when they heard a
label while the older ones focused on objects per se. The older babies were
only 13 to 15 months old, however.

Woodward's visual preference study and Echols' habituation studies both
suggest that the whole-object assumption is in place by the time of the
naming explosion. By focussing children's attention on objects as the most
likely referent of a novel word, the whole-object assumption greatly reduces
the number of hypotheses children need to consider for the meaning of a
novel term. The whole-object assumption thus promotes the rapid learning of
object labels. While the whole-object assumption can account for the speed
with which children acquire names for objects, it poses an obstacle for
learning terms for parts, substances, colors, texture, and other properties of
objects. With only the whole-object assumption to guide their interpretation
of novel words, babies would be limited to learning only object labels. One of
the functions of the mutual exclusivity assumption discussed next is that it
can override the whole-object assumption, freeing children to learn a greater
variety of terms.
5. The mutual exclusivity assumption

The mutual exclusivity assumption leads children to prefer only one label for an object. This assumption is stronger than a related one of contrast (Clark 1987, 1990, 1991), which is that any two words contrast in meaning. Although words such as 'car' and 'vehicle' contrast in meaning with one being a superordinate of the other, they violate mutual exclusivity in that one object can be called both 'car' and 'vehicle'. In some cases, mutual exclusivity comes into conflict with the whole-object assumption. Suppose a child hears a novel word, say 'finial' in the presence of a novel object, a pagoda. On the whole-object assumption, the child should (mistakenly) treat 'finial' as referring to the pagoda. Suppose instead that another child who has learned that a pagoda is called 'pagoda' also hears the novel word 'finial' in the presence of the pagoda. Here the whole-object and mutual exclusivity assumptions are brought into conflict. As before, the whole-object assumption would lead children to interpret 'finial' as referring to the pagoda. In contrast, children who know a pagoda is called a 'pagoda' are led to avoid treating 'finial' as yet another word for the same object. By rejecting 'finial' as a second label children would then be motivated to find some other referent for the term. Thus, mutual exclusivity can motivate children to find salient parts, substances, and properties of objects as referents for novel terms. As predicted by mutual exclusivity, preschool children are in fact better able to learn novel terms for parts and substances if taught on objects with known labels (Markman and Wachtel 1988). More generally children should be better able to learn a variety of property terms when taught on objects with known labels. Mutual exclusivity can then help override the whole-object assumption allowing children to interpret the novel word as something other than an object label.

Mutual exclusivity may also enable children to override the taxonomic assumption to enable them to better learn proper names (Hall 1991). While the taxonomic assumption leads children to interpret new terms as referring to objects of like kind, proper names refer to particular individuals, not kinds. Hall (1991) predicted that children should be better able to learn proper names for familiar objects with known labels than for objects without known labels. To test this Hall (1991) relied on the logic first put forward by Katz et al. (1974). Katz et al. taught children a new label for an object. They then looked to see whether children restricted the new term to the labeled object or whether they extended it to a highly similar second object. Choosing the original object above chance was taken as evidence children treated the term as a proper name; indifference between the two objects was taken as
Evidence they treated the term as a common name. Katz et al. (1974) manipulated two sources of information about whether something might be a proper name or not. The first was grammatical form class, in particular, whether the novel term took an article or not, e.g., 'a dax' vs. 'Dax'. The second was the type of object that was labeled, in particular, animate-like things which are appropriate referents of proper names, in this case dolls, versus inanimate objects unlikely to be treated as unique individuals, in this case blocks. Their results for girls suggested that when both the grammatical form class and the conceptual domain were appropriate, girls treated the novel term as a proper name. That is, when a doll was called 'Dax', girls interpreted Dax as a name for that doll and not the other one. When the doll was called 'a dax', girls treated the term as applying to both dolls. No matter whether the block was called by common or proper name, girls treated the new word as referring to both blocks. A partial replication of this study suggested that 18-month-old girls would also distinguish between proper and common names for dolls. These results did not hold up for the boys, however. Two-year-old boys were at chance for all object selections, even when hearing a proper name for a doll.

Gelman and Taylor (1984) replicated the Katz et al. (1974) study with some improvements and modifications. They addressed the concern that evidence for treating a term as a common noun was undifferentiated from chance performance. By adding other distractors to the response set, they avoided this problem. Gelman and Taylor (1984) also used unfamiliar rather than the familiar objects that Katz et al. had used. Testing somewhat older children (2–3-year-olds), Gelman and Taylor found that boys as well as girls treated terms as common nouns except in the case where proper names were used to refer to animate-like objects (stuffed animals).

To return to Hall (1991), then, the question is whether, along with grammatical form class and conceptual domain, mutual exclusivity is used to help children learn proper names. By overcoming the tendency to treat a novel label as a second term referring to things of like kind, mutual exclusivity could promote the interpretation of a new term as a proper name. Second labels for objects should be more likely than first labels to be construed as proper names. To test this Hall ran a partial replication of Gelman and Taylor (1984), running only the condition that resulted in proper name interpretations in the prior work. That is, two- and three-year olds were taught proper names for animate objects. They were taught in one of two conditions: either the animate objects had known names or they did not. Overall, Hall (1991) again replicated Gelman and Taylor (1984) and Katz et
al. (1974) with children treating the novel term as referring to the individual object labeled at above chance levels. Moreover, as predicted, children were more likely to treat the novel term as a proper name when they already knew another common name for the object. Combining the results of Hall (1991) with those of Gelman and Taylor (1991), we can conclude that young children recruit information from three sources to determine how to interpret a novel term: When the conceptual domain is appropriate, when the syntactic information is consistent with a proper name interpretation, and when mutual exclusivity can help override the taxonomic assumption, young children are most likely to treat the term as a proper name.

These studies with parts and substances and proper and common names lead to the general conclusion that some word-learning constraints can be used to moderate or override others. Mutual exclusivity can override the whole-object assumption leading children to learn terms for parts, substances, and other attributes of objects. It can also override the taxonomic assumption, thereby helping children interpret a proper name as a term for a unique individual.

5.1. Mutual exclusivity as a guide to a word's referent

Another advantage of mutual exclusivity is that it can provide an indirect means of inferring the meaning of a novel word. Suppose a child hears someone use a novel object label, for example 'Look at the gadget' or 'Please bring me the gadget'. The child looks around and sees one or more objects with known names - say, a ball, and a novel object, say, a garlic press. By mutual exclusivity the child should reason that 'gadget' can't refer to the ball because it is 'a ball', so it must refer to the garlic press, the only novel object around. In this case the child can fulfill both the whole-object and mutual exclusivity assumptions and use them to infer the meaning of a novel word. Adults and children alike use mutual exclusivity to figure out which object a novel label refers to without anyone explicitly pointing to or otherwise indicating the object (Au and Glusman 1990, Dockrell and Campbell 1986, Golinkoff et al. 1992b, Hutchinson 1986, Markman and Wachtel 1988, Merriman and Bowman 1989).

Golinkoff et al. (1992b) went a step further and documented not only that mutual exclusivity provides children with an indirect means of inferring the meaning of a novel term but that that term then functions as a familiar word in the child's lexicon. They showed that after 2½-year-olds used mutual exclusivity to infer the referent of a novel term, they treated the referent as an
object with a known label which in turn prevented the children from accepting another novel label for that object.

Two-year-olds' success at using mutual exclusivity to infer the referent of a novel term belies the inferential requirements of this task. The logic of this problem is of the form of a disjunctive syllogism: 'The novel word must refer to either object A or to object B. It is not A (by mutual exclusivity), therefore, it must be B'. Hutchinson (1986) has found, in fact, that this logic of the problem may pose a problem for developmentally delayed children even when they are matched in mental age to normal children. In her task, normal and developmentally delayed children were given pairs of objects where one object had a known name and the other did not. The normal children were 2, 2½ and 3 years of age and, as expected, at all age groups they chose the unfamiliar object at above chance levels as the referent of a novel label. The performance for the developmentally delayed children showed a marked developmental difference with children matched in mental age to the 2½- and 3-year-olds selecting the novel object at above change levels, but with children matched in mental age to the 20-24-month-olds failing to do so. These children did not select the novel object as the referent of the novel word even though normally developing children of 20-24 months did. It was not until retarded children reached a mental age of 28 months that they seemed capable of using mutual exclusivity to infer the appropriate referent of a novel term. One possible reason for this delay is that the logic of the problem is particularly slow to develop in the delayed children.

5.2. Mutual exclusivity at the time of the naming explosion

There are two concerns that have been raised about whether children around the age of the naming explosion can use mutual exclusivity to infer the meaning of a novel term. The first is that this use of mutual exclusivity has been documented only in children from two years of age and up. Studies with younger children are needed. Second, an alternative explanation for these results has been proposed by Merriman and Bowman (1989). They argued that children might map a novel word to a novel object in these studies because they are predisposed to fill lexical gaps – to find first labels for objects. Thus, when children encounter an object for which they do not know a label, they should seek out its name. Children might be mapping the novel label to the novel object because they desire a name for the novel object, not because they reject a second label for the familiar object.
Wasow and I have addressed both of these concerns in a recent set of studies (Markman and Wasow, in preparation). We asked whether children at around the age of the naming explosion can use mutual exclusivity unaided by a bias to fill lexical gaps to infer an appropriate referent of a term. The lexical gap hypothesis states that in the presence of a novel object, children will seek its name. With no novel object visible, no lexical gap can be created. We ruled out the possibility of children using a lexical gap strategy by not having a novel object visible at the time of labeling. At the time they heard the novel label children saw only a familiar object and a bucket which served as a possible location for objects. The prediction from mutual exclusivity is that upon hearing a novel label children should reject it as a second label for the visible familiar object and search for an appropriate referent. This search could consist of looking around the room, or on the floor, etc. or by wanting to see what is in the bucket. We found that babies as young as 15 months of age can use mutual exclusivity to reject a second label for an object and to motivate them to search for another potential referent. In this case, not only do the babies need to use the disjunctive logic to reject the label as a label for object A, they infer it applies to some unknown object B that is not visible at the time. It is remarkable that this very demanding test of the use of mutual exclusivity is passed by such young babies.

Another less demanding test of the use of mutual exclusivity in young children is to see whether mutual exclusivity simply causes children to reject second labels for objects, without requiring the children to make any inferences beyond that. The prediction is simply that second labels for objects should be more difficult to learn than first labels. Although there are a number of studies that document young children are capable of learning second labels for objects (Banigan and Mervis 1988, Mervis et al. 1991, Taylor and Gelman 1989, Tomasello et al. 1988, Waxman and Senghas 1990) all except Mervis et al. (1991) were conducted for other purposes and none of these compared the learning to first labels. The prediction is not that second labels should be impossible for young children to learn, but rather that they should be harder because children prefer not to have second labels for things.

Liittschwager and I tested this hypothesis with 18- and 24-month-olds (Liittschwager and Markman 1991). Children were briefly taught either a first label for a novel object or a second label for an object with a known first label. The results for the 18-month-olds were as expected – they successfully learned a new first label for an object but failed to learn a second label. The results for the 24-month-olds were more complicated and reveal another subtlety to the way constraints on word learning work. Not only did the 24-
month-olds successfully learn a new first label after brief training, but they learned a second label just as well. These young children clearly violated mutual exclusivity to acquire this second label. We then ran a second study with 24-month-olds to see what would happen if the task were made somewhat more demanding. Now children were required to learn two new labels rather than just one — either two new first labels or two new second labels. In contrast to the earlier results, the two-year-olds now showed evidence of using mutual exclusivity. They succeeded at learning two new first labels but failed to learn the second labels for objects. This suggests another way in which word-learning constraints function as default assumptions: children may rely on the default assumptions more heavily when the demands of the task increase.

6. Conclusions

Word-learning constraints were presented as necessary to help children cope with the inductive problem involved in learning a novel word. An unconstrained, unbiased learning mechanism would be forced to consider too many hypotheses and would be unable to converge on a candidate meaning in a reasonable amount of time. Some constraints on hypotheses are required to explain the fast learning actually seen at around 18 months to two years of age. I reviewed evidence for three specific constraints — the whole-object, taxonomic, and mutual exclusivity assumptions. Recent work reveals that all three assumptions are available to babies by the time of the naming explosion. Even for young children, however, other sources of information about a word’s meaning may be available. When several sources of information, such as grammatical form class, eye gaze of the speaker, and all three word-learning constraints converge, word learning should be especially efficient. Yet there remain many interesting issues to be resolved about the complex and subtle interplay of word-learning constraints with each other and with other sources of information about a word’s meaning.

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