2001

What Every 3-year-old Should Know

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Introduction: Mary Wilson, President and CEO, Laureate Learning Systems, Winooski, Vermont.

It's my pleasure to chair this session and I'm very happy to introduce two people who don't need to be introduced. The first is Jill DeVilliers, who is the Sophia and Austin Smith Professor of Psychology and Philosophy at Smith College; and the other is Tom Roeper who is Professor of Linguistics at the University of Massachusetts-Amherst. Tom gave me a whole list of accomplishments and then said, "Well, just tell them that I've given 100 lectures in 17 different countries."

I've been very fortunate over the last six years to have Jill and Tom working as consultants for Laureate on grants we've had through the National Institutes of Health. So, I know you're going to enjoy this session. I'm sure that if you've heard some of their other sessions, you realize that they have a wealth of knowledge and information that we in our field can certainly benefit from. We'll be starting with Tom Roeper.

Tom Roeper:

Thank you. We're going to try and attack the question of what every 3-year-old needs to know and look both at what children know before the age of 3 and after the age of 3, with a particular emphasis on the growth of structure and what's entailed by that growth of structure in semantic terms. So let's look at three simple things right off the bat. There are simple words like "dog," and then "the dog." There's a word like "run," and then "runs" or "to run." What happens when you shift from "dog" to "the dog" and what does the child start off with first? What happens when you shift from a simple sentence like "man eat" to a sentence that's a complement "that the man eats" or "that the man is eating." Those are big shifts in the grammars of children and they have a lot of meaning differences.

We're going to make a claim that might strike you as rather surprising at first--that children start out with not only a simpler form, but with a more abstract meaning. When a kid says something like, "I like cake," unbelievably enough, they are referring to all the cake in the universe. They're not necessarily referring to a particular cake. The sentence "I like cake" and the sentence "I like that cake" really mean different things. What happens is when the structure gets added, a word like "that" or a word like "the," the specificity of reference gets determined. So the more structure a child has, the more specific their reference is. That's true for a verb. The more structure the child has, the more specific the reference can be. So, "run" is a very abstract reference; "runs" or "is running" is a very specific one. So this is a very interesting counterintuitive property of grammar that is emerging at around the age of 3.

Now, there are also operations that apply to this structure, and there are two that are at the core of grammar that we're going to focus on. One is the notion of a structure

inside a structure. You can see it in sentences, but you can also see it in sequences of adjectives. So if you say, "Ralph thinks that you said he was crazy" you really have three different sentences or "it stood on the shelf in the corner of the room." Again, you've got three different sentences, one inside the other.

The second operation, or relationship, is really one of discontinuous connections, or discontinuous links. So in the sentence "Paul said that he was there", "he" and "Paul" can be the same person. "He" goes back to "Paul" over intervening material. If you put it the other way around, it doesn't work. "He said that Paul was there" the two people are different people. So the "he" has to be lower in the clause than the thing it refers to. The same thing happens with "a" and "the." We say, "Sara has a book. The book is good." We know that the book we're talking about is the one we just mentioned as "a book." Children have to learn that connection. Learning that connection is an extraordinarily complicated phenomenon, and it varies tremendously across languages. There are languages that have none of these articles, so children have to solve the problem in a quite different way.

Now we're going to make a couple claims. One, that children know the simple structures and the abstract ideas that go with them. That's what I said a moment ago. Secondly, they differentiate specific from abstract by adding structure in ways sensitive to their language. And, finally, that the 4-to-6-year old is learning the operations involved. Most of this development is completely independent of dialect variation, but there are a number of places where disorder can occur, and we're just at the beginning of figuring out where those things can happen.

Now, I want to talk to you about four different things or three different things because I've collapsed them a little bit.

1. One is location and existence.

2. Another one is time.

3. And a third one is deixis and variable properties in language.

In each case I'm going to talk about it in a simple form and show how complicated it gets. So I'll start out by telling you what the final point of the grammar has to be because we always have to bear that in mind to see the complexity of the problem the child's going to have to solve.

Let's take the word "there." There are at least five different meanings. There's also parents who are always trying to satisfy children and they say, "There, there." I mean, what does a child think about that? It's the most obscure use and yet, certainly, parents do it when kids are very little. Secondly, there's the locative use, "The cat is over there." Thirdly, there's a presentational use, "There is a cat," initially accompanied by pointing. Fourthly, there's an abstract use asserting the existence of something but without a locative reference -- "there is a problem." And fifthly, there is the interaction between that "there" and the properties of the sentence of the noun it's linked with, for example, the plural, so you could say something like "there are no cats." Think of what kind of reference that is. That's a reference to nothing. The kind of thing that human beings specialize in, right? Not only politicians but even parents and children. And notice the interesting syntactic phenomenon here is that the agreement is with the noun phrase that follows the "there," not with the "there" itself. So there's some tricky syntax in there.

Do children ever do this stuff? Sure. I'll give you examples of each one of these things. "Are you done with looking at the pictures, are you gonna give them to me?" The kid hands them over and says, "there." That's a satisfaction "there." Presentational? The child says, "There dolly", "there choo-choo train"-- pointing. Then we have the anaphoric "there," and this comes in a good deal later, you'd be surprised.

"I fell down and made the hole. And there was a stick there and broke it hard and it made the hole."

"It's on the cabinet. What's my jingle bell doing up there?"

"You want to go downstairs? Is there a blanket down there?"

"He's on the top of the house and he's gonna stay there."

These children are all 3, 4, and 5. The locative "there" actually comes in later than the empty expletive "there" -- very counterintuitive. I didn't think so myself. But amazingly these are late phenomena. Does this show up in the lives of children? Easily.

You could imagine that if children don't understand "there" properly they could easily get confused. You can imagine this kid's mother says, "Would you put your hat up in the corner of the closet in your room?" And the kid goes and puts his hat up in the corner of the closet in his room. Then the mother says, "Okay, now put your coat there, too." And the kid throws it on the floor. And the mother says, "Didn't I tell you to put that up in the corner of your closet of your room?" Well of course she didn't. She said, "put it there." And if a kid didn't understand "there," he wouldn't know that "there" had to be up in the corner of the closet in your room. So computing the locative-anaphoric "there" is a complicated business which children might not get right off the bat. In fact, we have evidence that they don't.

Here's the existential "there" that kids use surprisingly early – 2;9. "There was an alligator." "There's some people." So you do find it at a surprisingly early age. In addition, we did a study of when these things appeared -- the deictic form, the expletive form, and the anaphoric form, and in each instance, very early on, notice the expletives, 2;5, 2;3, 2;9, then 3;5 for Adam, but he uses "it" earlier; an African American kid, Sarah 3;1. In every instance for these nine children, the anaphoric "there" came in later. This is work done by Robin Schafer and me.

So we can see that the anaphoric "there" comes in later. What is that "there?" That's the one making a discontinuous link between two different sentences. That's the one that's harder. Let's take other early examples of expletive "there." You actually find them implied. For instance, "Here there no squirrels." Or Eve's saying, "No more squirrels." That "no more squirrels" really is using the expletive notion, "There are no more squirrels." Also you find it, "There no more these." "There be no more." Here we have the "there" without the agreement yet. So what the child first gets is that "there" is an expletive. Then they figure out that agreement relationship. They could say something like, "There are no more cat." And then finally they get the "there" in two different clauses. Now, that means they get the "there" with this discontinuous relationship we've been talking about.

Let me see, there's a few more examples of Eve starting to use anaphors, and some kids actually do it before the age of three.

"I went to New York." "And what did you do there?"

"He went to Colorado. He working there."

"Who's eating there? I think you'd better go in the living room."

So we do find some early uses. On the whole though, as we've said, it always turns out that the deictic is first, the expletive is second, and the anaphoric is third. First they point; then they can say things like, "No more soap" or "There is no more soap" and, finally, they can say, "I put my hat in the corner of the room and I put my coat there, too." So that's the story with "there."

In addition, we did an experiment. And you can try this out, if you have any kids that are in Communication Disorders, give it a shot. We had a felt board, and in a small corner of the felt board we put a water can. And then we said, "Here's a dog. And we want you to put this dog on the felt board, too." So we say, "The garden has a water can in it, and a dog is there." So you would imagine that they'd put the dog in the garden, which is just in the corner of the felt board. So we say, " Now the garden has a water can in it, and there's a dog." Now by saying, "There's a dog," we haven"t really said it's in the garden. So this "there" is kind of locative-free. And the other "there" is locative. And we wanted to see whether the children treat these "theres" like expletives, without a location, or do they take it given a locative interpretation? Intuitively, you'd think they'd go for the locative, and that's exactly what they don't do. They do the opposite.

We found that in the very young children, for the anaphoric case, got it 29% in the last location. And the non-anaphoric case, 29% in the last location. That is, they treated those two sentences exactly the same, and preferred not to have it in that small garden area of the felt board that we had. As it goes up, you can see adults are 90% anaphoric correct, 43% the non-anaphoric one went in the last location, too. Well, that's not wrong. If I say, "Here's a garden with a watering can in it, and here's a dog" it's not wrong to put it in that location, it's just not required. So, that's what we found that they did. So

what's the achievement here? First, the "there" goes to context. Then, there's a discontinuous link inside the sentence. "There are no cats." The "there" is linked to the "no cats." Then, there's a binding across sentences. You make a reference in one sentence, and you refer back to it in the next sentence. That seems to be what's happening before and after the 3-year-old range. That's what children need to know. That's what I wanted to say about locatives and existentials.

Now let's take a look at time. I'm only going to talk about a few things here. There's an interesting phenomenon here, and here's where we can get a little more technical and really see the structures that children use. Time is, like everything else, unbelievably complicated and very abstract. The essential time reference in English present tense doesn't refer to present tense. You say, "John runs." It's referring to what he does in general; it's not saying he's running right now. People who speak German and other foreign languages very often make that mistake. A colleague in our department, you ask him, "Where's Bill?" And he said, "He sits in the hall." Well, that's not right. You have to say, "He is sitting in the hall." because "he sits in the hall" implies that he does it all the time. It doesn't make a reference to what he's doing right now. So English doesn't really refer to the present tense. And children don't use it much either.

Now, we notice the tense involves a higher element. And I'm going to illustrate that in greater depth in a minute. "John did not sing." You don't say, "John singed not." And you don't say "John not singed." So the tense reference can be separated from the verb. And it seems to be closer to the subject, and higher up, as we'll see, in the sentence. So one of the jobs for a child in learning about time, is to learn about tense. And in learning about tense what they have to do is to see where it fits in the structure.

Notice, and I'm not going to talk about this but just to get a sense of what the adult grammar is like, we do very complicated composing of tense relationships. So, you say, "John must have had been seen", five-part verb, you are really composing a complicated array of reference to different kinds of time.

There are also very interesting links, discontinuous links for time, which a student of ours, Bart Hollebrandse, has studied in a very interesting dissertation. You probably don't think about this, but you use past tense to refer to present very easily. So, has anybody ever come up to you and said, "What did you say your name was?" It's an odd thing, because presumably it's still your name, right? So why are they saying, "What did you say your name was?" Well, that "was" is just a copy of the "did" up here. It doesn't imply I changed my name. If somebody said, "He wanted to eat a fish that was still alive." Now, if it was alive, doesn't that mean it's dead? But, of course that means it is alive, right? And, similarly, if somebody says, "I knew you were six feet tall," it doesn't mean you're no longer six feet tall, right? So that "were" is not a real past tense. It's a copy of a past tense in the higher clause. You copy the one up top down on the bottom. It goes from top to bottom. Not bottom to top, as you can see here.

By the way, there's a limit on it. So, you can't copy into a relative clause. If I said, "Did you know the boy was here?" it could mean that the boy is here right now. But if I used a relative clause and said, "Did you know the boy that was here?" That means the boy who's already left. So you put in a relative clause and you cut off that time relationship between clauses. These are things that kids get a little later, when they're 4 and 5. There are also interesting relationships for discourse and time relationships. So, for instance, if I say, "John climbed the mountain and then Bill climbed the mountain,

too," the implication is that he did it afterwards. But if I said, "John climbed the mountain and Bill climbed the mountain then, too" it implies that he did it simultaneously. So, the "then" doesn't give you a fixed relationship all by itself between clauses, it depends on where the "then" occurs in the sentence.

These are not easy things for kids to get, but we're starting to do experiments on them that pull them out. Where do children start out? They start out without tense. Here's some examples I pulled out of a paper we did recently.

"Where go?"

"Where go bye-bye?"

"Where waving?"

"Where going?"

The -ing shows up, but there isn't a real full tense marker.

"What call it?"

"Why say right now?"

"No do suitcase"

"No take suitcase."

"No hurt head."

"No drop boot."

Lots of complicated syntax, but no tense initially. Even the Wh- expressions are there. You know this is not simple stuff, but there is a tense thing that seems to get in their way.

Now I'm going to get technical, so hold your hat. But I think you can follow this. How do we know where the tense is? If we look in a negative sentence you can see a sentence like "You did not talk" and we don't say "You talked not." But if the "not" were

not there, what you would say is "You talked", right? You would associate this talk with the tense marker, the "did." "Did" is really "-ed" with a "d" in front of it, it's just a little consonant harmony. It's really "You -ed not talk" and it ends up being "did." We wouldn't do that; we would say "You talked" instead of "You did talk." But if you didn't move the verb up to pick up that "did," what you should do is actually say "You did talk." That would be the natural thing to do at that point. You have to move the "talk" up to get the "-ed." That's a piece of the structure that children have to figure out.

Do they figure it out right away or do they do something without movement? Well, there is evidence that children actually initially for a small period of time don't do the movement, but show their knowledge of the structure by putting in the "did" So, you've got kids saying things like:

"Jenny did left with Daddy."

"I did rode my bike."

"I did catch that bee."

"I did jump in."

"I did put it on."

" I did jump."

"I did turn it off."

"I did paint this one and I did paint this one and I did paint this one."

"Do it be colored?"

"You don't be quiet."

"Allison didn't be mad."

"This didn't be colored."

"Did there be some?"

"Does it be on everyday?"

This is really clear evidence from a child about the structure of the grammar that is different from what the adult says. So, the child is being truer to this "IP" node, this Inflection node above the verb, than the adult is by saying sentences of this kind. And these things show up with 2-year-olds.

Now what does a child learn after the age of 3? Well, he learns about sequential tense. Bart Hollebrandse did a study in which he gave kids sentences like:

"Yesterday Johnny read a newspaper. Today he's reading a magazine. And tomorrow he will read a book. What did Johnny say he was reading?" Notice that's ambiguous. It's going to pull out two, isn't it? It's going to pull out either " a newspaper" because that's what he was reading or it's going to pull out the tense copying relationship "a magazine" because that's what he is reading, but it doesn't allow a reference to the future. We can't say "a book", so we get two out of three possible readings there. And the children interestingly enough seem to give you all three. They seem to treat this bottom verb as if it didn't exist for either past or the future. That's a rough statement of it, but there is initially an overgeneralization of the sequence of tense relationship that children will start exhibiting at a little bit older age.

Let me take a look then at the discourse relationship. This is a paper that's in process.

"Mr. Smith painted a fence. Look here, he got paint all over himself. He went home and drank a lemonade. Was he wearing a hat then?"

This is the case where the guy is wearing a hat while he's painting, but not when he's drinking lemonade.

"Was he wearing a hat then?" "No. He wasn't wearing the hat when he drank the lemonade."

"Was he wearing a hat before?" The answer should be "yes." He took off the hat as he started to drink the lemonade. So he's painting the fence with the hat on, he takes the hat off, starts to drink the lemonade. Was he wearing the hat then? "No." Was he wearing a hat before? "Yes." Children make a lot of mistakes; they say "no" in both cases. That is, "Was he wearing a hat before?" is treated as if it meant "Was he wearing a hat then?"

These are the discourse relationships between sentences; they're not easy to get. It takes kids a little bit of time before they can do it. Their achievement is in fact to create this discourse link across sentences. In general, what we find is these discontinuous links occur first inside sentences, then across sentences. So that was the point I made before, that the anaphoric "there" was different from the expletive "there." The expletive made a link inside the sentence: "There are no children, there are no cats" and then to the locative across sentences. The same thing is true with time. The sequence of tense is easier then getting this "then-before" relationship across sentences. Sequence of tense is within a particular sentence.

Now we've talked about locatives and we've talked about time. Now let's talk about how variables work. What are variables, where do you find them, how do children handle them? First, they're part of individual words relating to context. So they're an abstract property that's linked to a particular word. Then children have to learn to treat

these variables in more complex environments. There are quite a variety to be aware of. First there is a context variable. If I said, "Put your finger here," you put your fingers on your own noses, not on my nose. If you all put your finger on your own nose you treated the word "here" as a variable with reference to your own body. It's a complicated reference. If I say, "Does everybody have a bag nearby?", well, that "nearby" means does each person have a bag nearby them. So the "nearby" is construed differently for each person. It's really kind of complicated.

The same thing is true for the word "here" or a word like "that." Say a kid has a book. And another kid visits and looks at the book and says "Gee, I have that at my house." Well, "that," although it's the most deictic word in the world, you're just pointing, it's still abstract because it's treating the book not as a physical object because the physical object couldn't be in two places. It's treating the book as an idea which represents two instances of that book: the same book in two different places. And that's true with almost all of our references.

What it means is that really referring to a specific object is extremely difficult. You can't even do it with "the" so easily either. If I say, "Does everybody have a pencil? Please pick up the pencil." That means each of you picks up your own pencil. So "the" pencil doesn't refer to a specific pencil. And if I said, "Does everybody have a pencil? Please pick up the pencil." and you picked up your neighbor's pencil, that would be the wrong pencil. It would be "the" pencil for your neighbor, but not "the" pencil for you. So even "the" is not completely specific in its reference.

There are also event variables as we mentioned before. "He plays baseball" refers across a set of times. There is an explicit variable "every boy," and there is a variable in a

formal feature like "who," which has a variable inside it. It calls for an exhaustive set.

"Who was in the car the night of the murder?" Then you get bound variables where

"Every boy thinks he can have a hat." The "he" refers back to "every boy" but each boy is

making a thought about himself, or "he" is an external agent that's different for all of the

boys. But the linked one is the interesting one. That's called a bound variable. So

children have to figure all these things out.

Finally, let me mention a couple more. Another one is a paired variable. We say,

"Who bought what?" You have to have an exhaustive set between the "who" and the

"what." This three-word sentence is very complicated. There are 2 people, 2 things, and 2

pairs. Person 1 bought thing 1, and person 2 bought thing 2. And, finally, we have the

interaction of variables so if you say, "Every boy has used every color," we have to

compute these "everys" independently. Children have a lot of difficulty with this up to

the age of 6 and 7. And if you've heard of our discussion on the Dialect Sensitive

Language Test, these kinds of problems show up distinctly with disorders and we're in

the process now of figuring out how to say what that disorder is and how extensive it is.

What does a child get first? Well they presumably get these specific words with

deixis pretty quickly. And there are also experiments that the DeVillierses have done

where kids get the difference between "put the hat here", "put the hat there", "take this or

take that." This shows that children at a fairly young age can get these deictic terms in

their variable properties.

In an experiment that I did with Ana Perez, we looked at the term "home." Very

interesting word. It has several different references. One of them is a speaker reference,

always referring to the person's home, but it can also be a reference to the subject, and it

also functions as a variable. So let's take a look at how that works. But first let's look at how children use the word "home." Then I'll show you the experimental cases.

Very young kids say, "Kitty go home," "Joshua home." In the CHILDES database, only 5 out of the first 145 cases of Adam's use of "home" used a determiner. They're always using the bare noun. "This is my home" was one of them. "He likes flowers and takes it in the home" is another one, but the use of the "home" inside a preposition coincides with its first use with a determiner phrase. Before that, it's always just bare, and as a bare element, it has several different properties. It's egocentric in a sense. If you say "Adam home" he's referring to his own home, but it's not egocentric if you say, "Man over there home" where the "home" means at the man's home, not at Adam's home, right? It's speaker-oriented if you say "Cromer home" or "dirt home", referring to the home of the speaker, and it's not speaker-oriented if you say "Joshua home" meaning Joshua's at his own home or "man over there home." It's subject-oriented if you say "Joshua home" or "man over there home" but not subject-oriented if you say "Chromer home" or "dirt is home". So each one of these kinds of claims about the fundamental relationship of home turns out to be false. The child can use them in all these different ways without difficulty at a very early age. That is essentially at the two-word age.

Now there are other cases that work this way too. "You are big. Now you can climb a ladder." is sort of logical and timeless. But "you can climb a ladder *now*" seems to mean to refer right to this moment. The general claim, as we said before, is that bare elements are inherently abstract and context-free -- that nouns refer to kinds and verbs refer to actions and adverbs refer to variable elements with personal references like

"here" and "now." How do children actually communicate exactly what they really want? Well, they have other methods to do that too. They can point. For instance, you can have a bunch of cakes, and you say, "what do you want?" and the kid says, "I want cake." Then the mother says, "Which one do you want?" and the kid says, "that one" or they just point at it. There are lots of ways in which we can get specificity across without using our grammar.

So what are the achievements here? Before the age of 3, the child is associating a variable interpretation with a word and linking it to context. What's the challenge? The challenge is to locate the variable in the syntax, to define specificity with the higher structure that we've been referring to. Well, what occurs after the age of three? Let's take a look at a very simple sentence -- "who went home." Now notice, "who" can refer to a whole bunch of people – all of you, all of us, we're all going home pretty soon. But each one of us has to go to the right home. If everybody here went to a different person's home, it wouldn't be going home. So, the "home" is linked pairwise with each "who," right? If I said, "who went to a home?" then we could go to anybody's home. But if we go home, it's got to be our own. It "distributes." In "who went home," each "home" distributes across all the "who's." It's exhaustive, that is, you have to give the full list of everybody who went home, if you leave one out it's not right. And it accommodates in a certain sense. That is, we figure out who is "who" by looking at a certain domain. If I say, "who's going home?" you would probably look around this room and people would raise their hand. You wouldn't answer, all the people in the entire world who happen to be on their way home. So, when I say, "who is going home?" you think, "who in this room is going home?" You make an accommodation for the domain over which that

"who" is supposed to be applied. In cases like "who bought what," you'd say x goes to y, z to w, q to r, and answer it in that fashion.

Well, Ana Perez and I decided to do a little experiment by creating a counter-pragmatic environment to see when children understood the connection between the variable in a word like "who" or "every" and the hidden variable inside the word "home." Here's how we did it. We had some toys -- a barn, and a chicken coop, and a house. And we said to the kids, "The sheep lives in the barn and the chicken lives in the chicken coop. Grover lives in the house, and he loves to play with his animal friends. Some days they play outside, and other days they play at Grover's house. Today they played outside until it started to rain. Grover said, 'let's play at my house for a little longer.' And then, everybody went home." Now, "everybody went home" means they didn't go to Grover's house. He said, "let's all play at my house," and then we said, okay, now everybody went home. But that means they are not going to Grover's house – each going to his own home. So, pragmatically, the story said they all ought to go to Grover's house. But, syntactically, it said, no, each person is going to their own home. And that's exactly what the children did. They had the chicken go to the chicken's place, and Grover went to Grover's home, and the sheep went to the sheep's home, and each person went to their own place. Then, by contrast, we gave them the sentence, "everybody went to *his* home." Well, the "his" now introduces the possibility that they could go to Grover's home. It's possible that everybody could go to their own home; this one's ambiguous. Sentence A is not ambiguous. It means just everybody going to their own home. But given the pragmatic bias, we predicted and found that when you say "everybody went to his home," indeed, they went to Grover's home.

The second clause case was a case where we had the quantifier outside the sentence and we said "Everybody wanted the Lion King to go home." In that case, the Lion King goes to his own home and that's everybody's home. So we reversed the implications there. There we found that the kids never linked it to the quantifier. This was varied across a bunch of different cases.

In addition, we've looked at various cases where you have pairing down to children two and a half. This is experimentation that Jill DeVilliers and I did, where you have a picture of, say, a father eating a banana and a boy eating an apple. And then you would say to kids, "Who ate what?" or "Who bought what?" So this is an experiment involving these two different cases. "The family" is what is put in there as an echo question, so we say, "The family ate fruit", and then you ask "The family ate what?" The answer may be "fruit" but if I said "The family ate fruit. Who ate what?" if you said "The dad and the boy," that wouldn't be the right answer. If you said "fruit" that wouldn't be the right answer. If you said "the banana and the apple" that wouldn't be the right answer. You have to say "The dad ate the banana and the boy ate the apple." You've got to do the pairing just right.

So interestingly enough, these kids, even younger ones, were doing it quite a bit. They were giving us pairing even in cases like "Who ate fruit?" And I think there's an interesting explanation for that. It's kind of complicated but they give it for "Who ate which fruit?" and "Who ate fruit?", less for "The family ate what?" The older kids actually did it a bit more. There were kids who gave single exhaustive responses, like the young children, 41% when asked "Who ate what?" would say, "The daddy ate a banana." Leave it at that. They didn't get the variable interpretation on it. Or they might just say

"banana" if they gave a single non-exhaustive reading only. Very young children did

this. This is an important area for communication disorders. We have found in general

that children will give singleton answers to the question "Who" when they should give a

multiple answer for quite a long time, and it seems to be an important property of

children who have difficulty with language, but we're still in the process of nailing down

exactly how to say when it happens and which children do it.

Now, you can find that kids, in summary, are doing bound variable interpretation

between 2 and 3 or a little bit older than 3. The non-exhaustive reading was minimally

present for just a few of these children at an early age. So what's the basic achievement

here? The basic achievement is putting one variable inside of another variable. It's

building a structure around these variables. It's having a variable on one part of this tree

structure and another variable down here and computing the other actions between these

variables. So this kind of structural property is a very important aspect of what children

have to learn.

Now, we've been talking about the kinds of structures and operations that

children have. What are they? To review a little bit, for the time case, we showed very

clearly there was an additional inflectional structure that that the child had to be aware of.

For the locative case, we showed absolutely the growth of agreement relations, which

involve all different kinds of structures and the connections across structures. And for

the variable cases, we've shown again, a structural property connecting these two things.

Now, I want to make one final remark about the general relationship between the

structure of language and the concepts built into it and cognitive thinking. One often

thinks that cognition proceeds language, but there are many ways in which language has

a lot of cognitive structures built into it that are only realized cognitively later. There are points of connections in complementation but there are also important disconnections. So let's take the notion of "infinity." When do you think a person understands that? Well, when they're pretty old they understand the word "infinity." It's a complicated concept, I guess. On the other hand, if you take a word like "never," it has infinity inside of it. It's got other things, it's also got negation and it's got time. So the word "never" refers to time, a negation of time, plus a notion of infinity. Now a 3- or 4-year old can understand the word "never" long before they understand the word "infinity." So, very often it's the case that inside the structure of language are concepts that are very, very complicated, that in fact children don't acquire consciously till a much later point. That's typical for biology, we can do fancy physics with our arms and legs. We don't understand physics until we're older, so we shouldn't be too surprised by the fact that very sophisticated information is involved in the grammar of very young children. Thank you.

Jill deVilliers

What Tom didn't mention was that we have a one-page handout here and the introductory remarks that he made are contained in the front of the handout. But on the back of the handout is the kind of scheme that we're following as we go through. First of all, the abstract ideas that children have at an early age and then what you might expect of the expression of those ideas in a child who's younger than 3; and then a child who's older than 3 and then also a list which may be a little obscure that talks about the structural achievements that seem to be necessary for the child to get the full grammar that encodes these complex ideas. So, Tom has just talked about the idea of variables.

He's talked about deixis, words like "here" and "there" and "I" and "you." He's talked about existential words like "there." And he's also talked about time words, in particular, having to do with tense.

And what I want to do to complete the story is talk about the last four ideas in this chart -- the notion of kinds, the notion of intentionality, the notion of aspect, and the notion of modality. Now, we realize these kinds of ideas that we have listed on the left-hand side of this page have virtually no representation in textbooks about language acquisition. What we're talking about are things that people are just beginning to explore and to realize they're encoded in language. And so you're getting hit with a lot of very new ideas today. And I'm hoping that you can take some of them away with you in an appreciation of what a young child knows, and also what a child has to know in a sense of developing it at an age later than 3.

I just want to begin by giving you a very quick portrait of the kind of grammar that we're working with and its assumptions. And I know that this might be a shock to some of you, but I just want to acquaint you with some of these slightly more technical expressions that we're using because if we refer to IP and DP and CP and so forth, and you haven't a clue of what those things refer to, then it's not helpful for us to use those terms.

Some of you in the audience who haven't done linguistics for awhile or haven't done it in a sophisticated way may still have a nice simple conception of a sentence in your head. That is, a sentence consists of a noun phrase and a verb phrase. And if that were all we have to know, we would be very happy. A child has to learn to put a noun phrase together with a verb phrase and that's how to make a simple sentence. But in

contemporary linguistic theory, that simple picture has gotten elaborated in three ways. The three ways are: First of all, that the good old-fashioned noun phrase is now considered to involve an additional functional category above it. So that when you say something like "the dog" you've actually got a separate head above that simple noun phrase that hosts that definite determiner, the "the" in what's called a determiner phrase. So you have more structure above the simple noun phrase. And that's controversial, not everybody agrees with it, but it's been necessary to propose more structure to accommodate a wider range of meanings than the original kind of grammar could accommodate.

In addition, the verb phrase has something higher above it which counts as the IP, or the inflection phrase, and there's a specifier position, and there's a head position, and then there's a complement to that head. So the noun phrase is the complement to the determiner, the verb phrase is the complement to the head, which is the place where, for example, modals reside and tense resides. Tom mentioned that words like "dig" and so forth belong in this tense place, which is essentially the inflection phrase. So that's an additional complication to the simple picture.

And then sentences have something above them. Sentences are not just IPs but are in fact CPs. If you have an embedded sentence you can see it most clearly. For example, in a sentence like "He said that the boy is coming," that "that" is a complementizer and it has a particular place in the tree that then the sentence follows. If this is an embedded sentence you can see it most clearly, but even in a regular sentence like "The boy is coming," you have to have a place up in the front of the sentence for a question. If I ask, "Is the boy coming?" guess what…the "is" moves from its place in I

up to C. Then you have something up in the front of the sentence to catch that auxiliary phrase. Or if I have "When is the boy coming?" the "when" goes into the spec position, so there's structure above our old favorite S, NP, VP, the structure above each one of those nodes.

And what we're arguing today is that the child begins with a much simpler structure and then elaborates to accommodate those abstract ideas that are there in the simplest utterances but have no specific means of expression in the structure. So the child moves from simpler grammars to more abstract grammars, but, in the course of this, they move from abstract ideas to more particular or more specific ideas. It's kind of an interesting conundrum that we are interested in exploring.

So, with that said, let me keep going with this list of complicated ideas that 3-year-olds know that only 4-year olds express. But let me start by talking about the idea of abstract nouns. As Tom already mentioned, nouns don't just refer to specific entities, but they refer to abstract kinds and you can see evidence of this even in the speech of children younger than 3. If you read books on child language, especially if you read the diluted version that gets stuck in introductory psych textbooks, you get the statement "children refer to the here and now." That's what 2-year-old children are obsessed with, is talking about the immediate world around them. Well, guess what? They do more than that. They also refer to abstractions.

For example, a child says "Want cookie." There's probably not a cookie in front of him right now. He had an idea in his head and he's asking for a cookie, and he's hoping someone will bring him one, but it's not in reference to something that's present. It may just be a desired element. We'll come back to that when we talk about

intentionality. Or "buy ice cream." The child's walking on the street with the mother and it isn't that he suddenly just sees one. Or the child could refer in play to generic types. The child might say something like "doggy have tail." It's not a statement about a particular dog; he's just made an observation about the world. "Hey, dogs have tails. I don't. But dogs do." I was once playing with a deaf child with very limited language, who managed to convey the idea that horses don't drink coffee. A very interesting observation. His mother was trying to get the little plastic horse to drink the coffee and he made the observation "oh, horses don't drink coffee." So, that's a reference to a kind; it's not a reference to a specific.

So, in the grammar of contemporary linguistics, kinds like this, abstract kinds, are sometimes represented as just simple noun phrases. But specific or familiar referents need this extra structure; they need a DP [determiner phrase]. So, ironically, as the child moves towards the specific, they also have to build more grammar to accommodate it. So, the child eventually has to know the difference between "I don't want a cookie. I want the cake," this particular piece in front of me. Or "a dog has a tail" might be a comment about a kind, but he may also point to a particular dog and say "Look, the dog has a tail." The child has to be able to make that discrimination between indefinite and definite, specific versus kinds, and so forth. The 3-year-old is starting to get these determiners straight, but the process continues until well after age 5 in just the kind of way that Tom was proposing.

So, I am just quickly going to show you some data from a task that we reported on at ASHA last year in a poster. And we tested some AAE-speaking children and some SAE-speaking children because we were interested in differences or similarities in the

way articles are used in those two dialects and the real story is there's no difference between the two dialects in very broad terms. But we decided we would use a new elicitation task to try to get the children to use articles, but without having anything that they could point at because we wanted to avoid having specific referents there in the environment. So we tested five different conditions of article use and I think the best way to illustrate them is to give you a little sample from the test.

For example we have a question that asks about the part of an already mentioned whole. So if I say "Sally was gong to eat a banana, but first she had to take something off of it. What was it?" The answer is "the peel." Now it's interesting because "the peel" is part of something that's been already mentioned. In a second condition, I could mention something like "a cat and a bird were sitting in a tree. They were friends. One of them flew out of the tree. Guess which?" Well, then you have to refer to one of them. Hopefully, you refer to "the bird", although it's not unlikely for a child to say "the cat." But, you say "the bird" because it's already been mentioned -- a bird, a cat. Now you refer to a particular one. And this is another one we tried : "I bet you have something hanging on the wall in your room. What is it?" Now this is something that the child takes pride that he knows about, but you don't know about, so the child should use an indefinite -- "a picture, a mirror." We were rather alarmed to get the response from one child who said "my sister." I don't even want to go there, but hopefully they give us a normal response or something that is likely to be on the wall. Here's another one. "Tyrone is going to take a nap and he wants to cuddle with something. What does he need?" "A blanket." Not "the blanket." "Think of a baseball player. Can you imagine what one looks like? What does he have?" "A glove, a bat, a hat."

So, in this way we were able to elicit the different kinds of articles from children and see if they could manage all of these very subtle ideas. And, basically, what we found is that the task went very well for these age ranges between 3 and 6, and both the AAE speakers and SAE speakers were good at particular kinds of these articles. They were very good at supplying the part "the", like the banana example, or the non-referential "a", like "a blanket", or the predicational "a", like "a bat" for the baseball player. But they had considerable difficulty with the familiar "the" condition. So quite often, if you said "a bird and a cat were sitting in the tree. Which one flew out?" the children would say something like "bird." They wouldn't say "the bird." So they had trouble linking that definite "the" with the preceding sentence in which it was introduced with an indefinite. And that's just the kind of thing Tom was referring to. They may know local rules about the use of definite and indefinite, but when it comes to making a connection across a stretch of discourse, just as they had problems with the locational "there", they also have problems with "the." So, it gives you a little window into what's still difficult to understand and it's only perhaps at this point that the child has a fully mature distinction between noun phrases and determiner phrases because they can find agreement between determiner phrases in different parts of a sentence.

Let me continue with the second idea that relates to determiner use and articles, but this one has to do with another abstraction that we want to call intentionality. Now, it's not quite the same as intention, although they are related notions because they have to do with the mind and its contents. And so, again the notion that we want to get across is that verbs and phrases don't just refer to the here and now, but they also refer to possibilities, to things that are not in the immediate environment -- to things in the mind,

to things in the imagination. So, back again to the case like "want cookie." The child might not, in fact, have one in front of them when they say this sentence. Or, the child says "want driving" and they haven't done it yet. They're describing what will happen when he's given the toy car and he starts moving the wheel. So the pre-3-year-old, the child of 2, can express these ideas with very simple sentences, but they have hardly any structure to support it. They say things like "want cookie." They don't have any of the kind of marking that would indicate the differences to an adult language. How do they get this eventually?

The child has to express intentional noun phrases as indefinites, like "I want a cookie" versus "I want the cookie" which would be something in front of them. And then they have to differentiate clause types and the different verbs of mental state. So, for example, "He wants to go to school." He hasn't gone there yet, he's not describing his moving to school. But he wants to go to school. He wants that event to occur. "He thought he put on a hat." Now you're describing a situation where the person actually put something <u>else</u> on his head, supposedly at his sister's house he put something on his head and he recalls it by saying "look, he thought he put on his hat." You don't have to mention that this is not the thing that actually occurred. That's a classic intentional clause that's referring to a <u>force</u>, not what happened in the world. And what the child has to do to get this is differentiate between different types of embedded clauses, complement clauses, and the complicated forms that introduce them, like "that" and "it" and "whether" and "to" and they involve building those complicated structures under the CP, which is the site for these complement clauses, that involves embedding sentences in one another under verbs of different kinds. So that's what the child eventually has to get.

Now you can ask, well, what do children know at the beginning? They say things like "want cookie." Do they really understand those things as intentional?

So we came up with an interesting game. We showed the children a puppet and we showed the children a green apple in a container, and so from an angle it looked a bit like a tennis ball so there was a little bit of deception here. The child is very excited because it looks like a tennis ball and Big Bird has a racket in his hand. And then we ask "Does the puppet want an apple?" Now, the other possibility is "Does the puppet want a tennis ball?" So, in other words, we're asking both about the thing it really is, which is an apple, and we're asking about the thing that he wants, but it isn't, mainly a tennis ball. And so, how do children do on this kind of task? And what you see is that even 3-year-olds do remarkably well at saying what the puppet wants is a tennis ball, even though what it really is, is an apple. So, the children get slightly better with age, but even 3-year-olds are remarkably good at recognizing that what's being referred to here is the content of the puppet's mind, not the content of the actual thing that's sitting in front of them. So, here is my 3-year-olds data. For something like "Does it want the tennis ball?" over 68% of them say "Yes", even though that's not what it is. So 3-year-olds recognize this special property of articles, that they refer to things that go on inside the head.

The last example that I will give you for intentionality has to do with that case where I said "He thought he'd put on his hat," where, in fact, it was his sister's hat; it wasn't his hat at all. I have another situation: "The woman thought there was a bug in her drink, but it was just a piece of lemon." So we have a picture of a woman looking horrified at her drink, but then she's holding up a piece of lemon. It wasn't a bug at all. And then we ask the child "What did she think was in her drink?" or "What did she think

she saw?" And what you find is that children below the age of 4 do very poorly on this task. What the answer would be is reality, but they don't answer with reality to "Does Big Bird want an apple versus a tennis ball?" They can correctly do it when it's a noun phrase and a verb of desire. They get mixed up with verbs of mental states. They don't understand that in most cases they're not supposed to refer to the actuality; they're supposed to refer to the mental content.

So here, for example, is a graph [table to be inserted] of how they do with the kinds of verbs that take place in embedded sentences over the age range of 3 to 4. We did a longitudinal study of the same 28 children between the ages of roughly 3 and 4. And we watched how they improved over time in their comprehension of sentences like "What did she think was in her drink?" The 3-year-olds consistently say "she thought there was a lemon in her drink." No. She thought there was a bug in her drink. And 4-year olds laugh and say "She thought there was a bug, but it was really a lemon." So, there's a big shift over time in the children's appreciation that that clause is an intentional clause and you have to answer it by taking that into account.

So, children older than 3 begin to use these 2-clause sentences with embedded clauses, but these are rarely false. So the child says things like "he said he can go," "I think I'll eat one." Notice that these are true sentences that are embedded under the mental verb, but what they can't do is understand something that's a false content, like "he thought he saw a monster but it was really a dog." When you ask "what did he think he saw?", 3-year-olds will answer "a dog" and 4-year-olds will answer "a monster." So, there's real developmental growth here. Three-year-olds know some things about intentionality, but not all the things about intentionality. And, once again, that they do

know about it seems to be that aspect of intentionality that can be accommodated into a very simple clause. As soon as you get to two clauses, integration of information across two different sentences, that's where the breakdown occurs. So, 3-year-olds are good at limited scope expressions of intentionality, but they're not very good at getting agreement across multiple elements and that's the same story again.

Let me say a little bit about aspect. Tom talked already about tense and that's one aspect of the time marking that the child has to learn, but time isn't just a matter of what comes before what in a sequence. There's also this rich aspect of language called aspect that English doesn't actually represent very thoroughly, but other languages do. So, for example, there's also the matter of duration. How long did the event take? Or repeatedness. Or completion -- was it finished and done, or was it something that took a long time to finish. If someone says "I wrote a dissertation," you know it didn't happen just like that. "I sneezed." That happened just like that. That didn't take some time and a slow finish and probably a starting again to do it. So, different kinds of events that you describe have different time qualities, different ways of ending, and so forth. And those are the aspects of time marking that is total disaster in lots of languages. And even their young children show signs of their understanding and want to mark these qualities. So saying things like "I ate it up" that means it's finished as opposed to "I ate some of it." Or "again", showing that they can appreciate the idea of a whole event repeating. "He running." That is going on right now and it's taking some time, whereas "he fell." The event is over and finished. So very young children are starting to express those things, but what the child eventually has to learn is all the different aspects of time marking in their particular language. So the difference between progressive versus complex versus

generic versus habitual. So the difference between "he is running" versus "he run", "he runs" (that is, every morning I see him, he runs every day). That's not the present tense, as Tom pointed out. Or "he be running" if you speak a dialect such as AAE, that's your way of marking habitual events. So what you have to do is differentiate these different tense and aspect markings, and, in fact, AAE might have more elaborate structure above the broad phrase than SAE because we have such limited ways of expressing aspect compared to AAE. The post-3-year-old is beginning to mark these tense and aspect things on simple sentences, like saying "he is running", "he fell down", "I ate it all up", "she be sad all the time", "he likes playing." Those are all the little devices that we have in the language to mark the different meanings that, previously, were just expressed with a bare verb in the child below the age of 3. Now what they're not really good at yet is understanding those distinctions when somebody says them to the child.

I just finished a study with Valerie Johnson that I presented at the Boston University Language Conference this year, and what we were trying to get at is, what do children know about that 3rd person marking, that "s" marking? Do they really know what it means? Do they really know that it means generic possibilities? So you tell children a little story, I won't get into the full details, but you have this complicated family of people that we described and we had a story of the grandmother in the family who was now sick, so she had to give a job to each member of the family to do. So, essentially, for example, the boy became the one who sets the table, but we never used that in the introduction. And the mother became the one who put the frosting on the cake. And the grandpa was the one who was supposed to hit the nails into the wall. So each person in the family had a particular job and the words that we chose were very

carefully chosen to just have a bare form in the past tense, like "cut" and "fit" and "put" and "let." So you couldn't tell the tense from the unmarked verb. And then we told the children that just the day before the family was supposed to do these jobs for the first time, the pets in the family took pity on the people and did the job just once. Of course, they made some interesting mistakes in doing so. It was kind of an entertaining story. The children know this was the only time the pets did this for the family and, for example, the cat let the bird out of the cage and the monkey hammered the nail and put the nail in the wall, and so on. And then we asked the children, for example, "who let the bird out of its cage?" versus "who lets the bird out of its cage?" or "who hit the nail in the wall?" versus "who hits the nail in the wall?" And we were hoping to get a differentiation between the one who does it habitually versus the one who did it just once, and I'll show you some data that suggests children don't have a clue about this meaning of 3rd person marking and the only clue to meaning is extremely fragile. And it's actually just what you'd expect. It's the last remnant of the agreement system that we have in English. It's a very fragile clue. It's been dropped in lots of dialects of English, like AAE in particular, but also lots of Southern dialects. So, it's a very fragile clue. Children use it in SAE about the age of 3, but they don't seem to be able to use it to figure out aspects like habitual or generic at an early age.

So what 3-year-olds don't quite know is the difference between generic and present progressive or between generic and habitual. Janice Jackson, who did some work with AAE in a thesis at UMass, had a very nice example where she persuaded me that there was a difference between generics and habituals. So, for example, you can have a sentence in AAE roughly of the sort "he fights, but he don't be fighting." So, in other

words, a person could have the capacity to fight, but they don't do it on a regular basis. So there are some very subtle distinctions that the child has to get depending on their dialect. And it looks like there are things that might enter children's speech and make their appearance in what seem like reasonable contexts for quite some time before they really pin down what those distinctions are, especially when you make that a minimal clue in a comprehension paradigm. And, again, precisely what a child might need is some sense of agreement over discourse set in the rules for which kind of aspect marker is appropriate. So, it may be another one of these problems with distance dependencies.

I'm just going to put a very small amount of information up about modality, just so you get a sense of what we meant here. Not only do you have aspect as a kind of marking that occurs on the IP structure event above the verb, but you also have what you might call modality and very interesting kinds of little auxiliary verbs that you get in English, like "must" and "can" and "might" and "could." The child is beginning to mark those meanings even in the pre-3-year-old period with things like "can't do that" or something like "hey, this car doesn't open"-- a generic statement about the possibility of a car opening, or "that's gonna fall." So the child is remarking on things that are beyond tense and aspect, but they don't have a sophisticated way of doing that. What they need to acquire eventually is all of this variation in auxiliary verbs, like "can" and "must" and "might" and "could." And they involve establishing these IP nodes as a place to house all of those particular little helping verbs. And these are subtleties that we are just beginning to appreciate. For example, the word "must" has two different meanings in English. One of them is what we call a deontic meaning. So if I say "You must eat those peas", that puts you under an obligation. You may not fulfill it, but anyway, it's a

warning. This is what's got to happen. Whereas an epistemic meaning, if I see all the lights out in a house, and I say to my neighbor the next day "Wow, you must have gone to bed early last night", I wasn't giving them a directive to go to bed early; I was making a remark about the evidence in front of me from which I drew a conclusion. That's called an epistemic sense of "must." And we've just begun to explore when those distinctions begin to come in in young children.

I just want to show you one last task that we've used to ask where the children make these distinctions. We showed the children three little pictures and we told them a sentence about each one of them. We told them "this guy has a daughter and it's her birthday and she says everybody at the party has to have their own special cake. And then this guy has a bakery in town, and, wow, look at all the things in his window. And then this guy likes to go fishing. Who must bake a lot of cakes?" Now notice that there's an ambiguity that could either mean the guy who is under an obligation to his daughter to make all these cakes for her party or it could mean the baker must spend his time baking a lot of cakes because look at all the ones in his window. So we ask the question -- are both of those meanings available to very young children? And we find that, in fact, 3-year-olds much prefer the meaning of the man who's under an obligation. That's the meaning they get from "must." So only 20% of 3-year-olds interpret it as possibly referring to the baker, but that goes up to 50-50 at 4 and 5, so by then, they have both meanings of "must" available. In fact, it's very subtle because most of the time with a sentence using the epistemic "must" you have to have "he must have gone to bed early." It's a very sophisticated structure and so most of the time it's rare in just a simple sentence.

So, I'm going to stop there to leave time for questions, but I hope we've given you a sense that a young child has some pretty abstract ideas but a pretty limited means of expression. As they develop these sophisticated structures, they are able to differentiate meanings for an adult listener that allow the expression of these ideas in the grammar. What they have trouble with in the beginning is making links across structures that are more than a simple constituent. So, let me leave it there. Thank you!

Question from audience:

"Is it true that every time we pose a question that the wh-word moves into the spec position and the auxiliary moves into the C position?"

Answer: I'm assuming that's true of adult grammar. I'm not assuming that's true about the very beginning of child grammar. That is, it's possible that a child can get by with a simpler structure particularly before they have auxiliaries.