Acquisitionists in the 1960's and 1970's have interpreted the semantic and syntactic patterns evident in children's two-word combinations under one of three analyses. These consist of (i) combinations of closed classes of constant terms (pivots) with a set of open class forms (Braine 1963), (ii) a set of surface structures reduced by transformations from underlying structures displaying semantic relations (Bloom 1970), or (iii) a child's attempts to find positional patterns for salient conceptual categories (Bowerman 1973; Braine 1976). Each of these approaches sets out to explain an isolated set of semantic or syntactic regularities observed in children's early two-word utterances. Missing from each of these analyses, with the exception of Bloom (1970), is a description of how the syntax and semantics of these utterances are related. In addition, all of these analyses neither describe what kind of linguistic knowledge children use in creating two-word utterances or how this knowledge prepares children to be able to create more complex utterances. Consequently, each analysis fails to characterize the production of two-word utterances as a necessary stage in the development of adult linguistic competence.

A categorial approach to acquisition offers a precise representation of the linguistic knowledge underlying these early lexical combinations as well as of the stages a child experiences during the language acquisition process. Categorial grammars assume that combinatorial possibilities for linguistic categories, restricted to being either functors or arguments, are specified in their lexical descriptions rather than in phrase markers or subcategorization frames familiar from phrase structure grammars. Linguistic competence is defined, in part, as knowledge of linguistic functions and the range of arguments they may apply to. Lexical categories are partially ordered by their complexity, a notion which provides a procedure for determining the sequence of stages of language acquisition. The linguistic knowledge responsible for creating early two-word combinations, then, is defined as knowledge of an elementary order of categorial complexity which is also required for creating and interpreting more complex utterances of the language. Lexical categories and their combinations are assigned corresponding semantic values, thereby offering a principled method of simultaneously encoding both the semantic and lexical properties of categories used by children, a method which is unavailable in current phrase structure accounts. In sum, the categorial analysis proposed in this paper makes interesting and specific predictions about the nature of children's grammatical competence as well as the nature of the acquisition sequence.

In this paper, I am concerned with showing how a categorial grammar can be manipulated to describe the syntactic patterns underlying Pivot Grammars (Braine 1963) as well as those patterns implicit in children's first attempts at combining nouns, verbs, adjectives, auxiliaries and additive conjunctions cross-linguistically. In Section 1, I present Braine's (1963) original description of Pivot Grammars as well as evidence against Braine's analysis made by Bloom (1970) and Bowerman (1973). I propose a categorial grammar which describes the properties of pivot constructions cross-linguistically and which places pivot constructions within the acquisition sequence as a distinct utterance class. The acquisition sequence is based on the notion of categorial complexity, a measure by which children may infer complex categories from simpler ones already productive in the grammar. In Section 2, I extend the categorial analysis to include those utterance types incorrectly predicted by Braine's analysis not to occur at the pivot grammar stage, namely V+N combinations and N+N combinations encoding possession and location (Bloom 1970, Bowerman 1973). I show that this class of utterances, which has different
properties than pivot constructions, is nonetheless a product of the same order of complexity attributed to Pivot Grammars. In Section 3, I show that the sequence of auxiliary and additive conjunction acquisition corresponds to the sequence of orders of complexity predicted by the categorial grammar of the first section. I summarize the results of my analysis in the final section.

1.0 Two-Word Utterances and Categorial Grammars

1.1 Two-Word Utterances

1.1.1 Pivot Grammars

Braine (1963) observed that the lexical items used in the productive two-word utterances of his three English speaking subjects Andrew, Gregory and Steven (mean age 23 months) could be divided into pivot and open class categories. Pivot categories consist of a small class of frequently occurring words ('more, 'nother, byebye, other, off, allgone, hi, all, there, here, it, want), each of which occurred either only utterance-initially or only utterance-finally. Pivots appeared in combination with a set of open class categories, usually corresponding to nouns, verbs and adjectives of the adult grammar, which composed the majority of single word utterances for these children. A representative sample of Andrew's pivot utterances appears in (1.1.).

(1.1.) Andrew (Mean age: 23 months)

| more car   | no bed  | boot off | hi Calico  | all broke |
| more cereal | no home | light off | hi mama    | all done  |
| more hot   | no fix  | pants off | hi papa    | all dry   |
| more high  | no pee  | shirt off |            | all gone  |
| more read  | no wet  | water off |            | all messy |
| more sing  | no down | bib off   |            | all wet   |

Braine proposed that a child only had to learn the position of pivot words in order to construct pivot grammars. No restrictions were placed on the domain of open class words which could occur as complements to pivots in these constructions.

Pivot Grammar theory predicts that children's first productive two-word combinations should consist of those in (1.2.a.). Productive two-word utterances could consist of a pivot and open class word combination, where pivots may either assume utterance-initial or utterance-final position. Open class items were permitted to occur alone. Bare pivot utterances (P) are predicted not to occur for at least two reasons. First, Braine required pivots to be defined by their position in an utterance. Consequently, a pivot must occur with at least one other lexical item in order to be identified. Secondly, Braine required that only open class items were possible single-word utterances. Therefore, pivots could never occur alone. Combinations of two pivots (P + P) were also predicted not to occur together for the same reason. Only open class items were eligible as complements for pivots. Thus, the combinations listed in (1.2.b.) were generally prohibited in Pivot Grammars

(1.2.)a. P + O  b. *P + P  
O + P  *P  
O

In addition to these utterance types, Braine's data include a set of less productive utterances, which appeared 'to have no determinable structure' (p. 4). These utterances included pivot-like words which assumed variable positions ('allgone, byebye, pon') and noun and verb (N+V) combinations, as in (1.3.a., b.).
Less Productive Utterances in Pivot Grammars

1. Andrew
   - airplane allgone
   - Calico allgone
   - allgone juice
   - allgone outside
   - allgone pacifier

b. Steven
   - byebye back
   - byebye Calico
   - byebye car
   - Calico byebye
   - papa byebye

Braine assumed these utterances to be the result of a second phase of acquisition and did not attempt a formal characterization of them, though in Andrew's case, they occur quite frequently. Braine (1976:10) later referred to pivotal utterances like those in (1.3.a.) as the result of 'groping patterns' used by a child who is struggling to express a meaning without a sufficient syntactic rule system.

Bowerman (1973) has shown that there are interesting exceptions to the utterances ruled out by Pivot Grammar in (1.2.b.). For example, some pivots, such as 'more' do occur alone, while others do not, such as 'all'. Initially, Braine accounted for this by requiring that some pivots have membership in both the pivot class and the open class of lexical items. In analyzing data from her own subjects, Bowerman also found that some verbs, such as 'want', which occur productively in combination with other verbs, have some but not all of the same distributive properties Braine required of pivot categories, suggesting that Braine's original formulations needed to be refined. Braine (1963) reported no such productive combinations in his data.

1.1.2 Open Class Combinations

In contrast to Braine's (1963) original analysis which predicted that all O(pen)+O(pen) combinations were undifferentiated, Bloom (1970), Bowerman (1973) and Braine (1976) found restrictions and patterns within children's N(oun)+N(oun) and V(erb)+N combinations. English children's first N+N utterances encoding possession (possessor + object possessed) and location of an object (object located + location) were found to have consistent word orders, usually consisting of an animate noun followed by an animate noun (1.4.).

(1.4.) Kathryn's N+N Utterances (Bloom 1970)

Location (object located + location)
   a. tiger tail
   b. sheep ear
   c. Kathryn sock

Possession (possessor + object possessed)
   d. sweater chair
   e. Wendy elevator
   f. beanbag horse

In addition, Bowerman (1973:44) observed that particular nouns, such as 'Mommy', in general assumed fixed positions in the utterances of Bloom's (1970) subjects Gia and Kathryn. The patterns in these combinations of open class items led McNeill (1970) to include O+O as another permissible sequence in two-word utterances in addition to those in (1.2.a.). In addition, Braine (1976) found that
N+V utterances were also productive cross-linguistically and could be classified semantically as 'actor-action' sequences (examples and discussion of these utterances will be given in Section 2.1). If single-word utterances are abstracted out of Braine's original set of combinations and these N+N and V+N are added to (1.2.), the class of permissible and impermissible two-word combinations can be listed as in (1.5.a.) and (1.5.b.) respectively.

(1.5.)
a. P+O
b. *P+P
O+P
O+O

To my knowledge, no adequate explanation has been offered in the acquisition literature for the distribution of items in two-word utterances listed above. (but see Lebeaux 1988 for a characterization of a subset of pivot grammar using a Principles and Parameters approach). In the next section, I show that the pivot/open class distinction inherent in Pivot Grammar corresponds to the inherent functor/argument distinction in categorial grammars. After outlining the categorial grammar I assume in Section 1.2, I characterize the allowable utterances P+O and O+P and the absence of P+P and bare pivot utterances in 1.3. I discuss O+O utterances in Section 2.

1.2 Categorial Grammars and Child Grammars

Categorial grammars assume that categories are distinguished as functors and arguments. The recursive set of universal category types to be utilized in child grammars is defined in (1.6.), adapted from Montague (1974) and Bach (1988).

(1.6.) The set of grammatical categories GCAT is the smallest set such that

i. 'e' is a member of GCAT.
ii. 't' is a member of GCAT.
iii. If A and B are members of GCAT, then (A/B), (A\B), (A\B) is a member of GCAT.

The categorial grammar assigns to each category type a child perceives and uses upon exposure to a language a subset of universal category types generable in GCAT. For example, a child may perceive a set of English categories (e.g. N, V, A, S, etc.) and assign to them a set of categories available GCAT which encode the grammatical and semantic properties the child attributes to the categories perceived. The categorial grammar includes a dictionary which assigns a subset of CATL, the set of GCAT categories assembled to encode a particular language L, to each morpheme acquired from exposure to L. CATL and the set of combinatory rules compose the syntactic algebra of the adult grammar.

Categories are allowed to combine according to the following combinatory rules.

(1.7.) If A, B, B/A, A\B and A\B are members of GCAT, then

A A\B ---> B   A|B A ---> B   (Functional Application)
B/A A ---> B   B\A A ---> B

Though other rules of combination have been proposed for natural languages (Steedman 1986, Moortgat 1985; 1988a; 1988b, Dowty 1988), I will assume that children only have access to functional application in the two-word stage. The reasons for this assumption will become clear below. Syntactically, functional application is a local operation allowing a functor type to combine to its immediate left or right with the argument type specified in the denominator of its description.

A child grammar (CG) is defined as a proper subalgebra of that categorial algebra generating the linguistic data to which a particular child is exposed. Where CGn is an adult grammar, every CGi in the
set \( \{CG_1, \ldots, CG_{n-1}\} \) consists of a non-recursive set of categories used by a child in constructing a lexicon of category types for language production. Sets of child grammars are ordinally related by categorial complexity. For each pair \( \{CG_i, CG_j\} \) in a sequence of child grammars \( \{CG_1, \ldots, CG_i, CG_j, \ldots, CG_{n-1}\} \), \( CG_j \) is one order of complexity above \( CG_i \) in a manner to be made precise below.

Note that allowing GCAT to be recursive generates an infinite set of category types. Complex categories differ from less complex categories in this set under two notions of categorial complexity, which I label Resultant Complexity and Argument Complexity. Under Resultant Complexity, a category \( A \) is more complex than another category \( B \) if \( A \) has more arguments in its description than \( B \) does. Formally, a category of type \( ((((B|A_1) \ldots |A_{n-1})|A_n) \) is one order of Resultant Complexity above a category of type \( ((((B|A_1) \ldots |A_{n-1}) \) where \( A \) is a member of the set of primitive arguments in \( CG_i \), \( B \) is the resultant category, and \( | \) indicates local combination in any direction.

Given this definition, the category in (1.8.b.) is one order of Resultant Complexity above (1.8.a.) because (1.8.b.) includes one more argument in its description. Likewise (1.8.c.), (1.8.d.), and (1.8.e.) are one order of Resultant Complexity above the category in (1.8.b.). Resultant Complexity determines category complexity quantitatively; that is, it counts the number of primitive arguments in a categorial description.

(1.8.)

\[\begin{align*}
a. & \ A \\
b. & \ B/A \\
c. & \ A\backslash(B/A) \\
d. & \ A\backslash(A\backslash B) \\
e. & \ (B/A)/A
\end{align*}\]

Resultant Complexity describes, for example, the valency of predicates. Assume that the primitive GCAT categories ‘e’ and ‘t’ have been assigned to the CAT\(_\text{English}\) categories N(oun) and U(tterance) respectively (cf. fn. 4). One-place predicates like English intransitive verbs, assigned to type N\(\backslash\)U in the present theory, are considered Pred\(_{2\text{Res}}\), (of the second order of Resultant Complexity), two-place transitive verbs, assigned to type N\(\backslash\)(U\(\backslash\)N), are considered Pred\(_{3\text{Res}}\), and so on for the set \( \{\text{Pred}_1, \ldots, \text{Pred}_n\} \).

Argument Complexity describes the complexity of a category by the type of its argument rather than the number of primitive arguments in its description. A category \( A \) is more complex than another category \( B \) if \( A \) includes a more complex argument in its description than \( B \) does in a manner to be made precise directly. Formally, a category of the type \( (((B|(B|A_1) \ldots |B|A)_n) \) is one order of Argument Complexity above a category of type \( (((B|(B|A_1) \ldots |(B|A))_{n-1} \). Thus the categories in (1.9.b.) and (1.9.c.) are one order of argument complexity above the category in (1.9.a.).

(1.9.)

\[\begin{align*}
a. & \ B|A \\
b. & \ (A\backslash B)|(A\backslash B)/(A\backslash B), (B/A)\backslash C/A, A\backslash C/(B/A) \\
c. & \ (B|A)\backslash B, B/(B|A).
\end{align*}\]

where ‘t’ has been assigned to \( B \)

Argument Complexity, in contrast to Resultant Complexity, determines categorial complexity qualitatively. Here we are not concerned with the number of arguments allowed in a functor's description

2 Each occurrence of | stands for \( \backslash, /, \) and \( | \), as in (1.5.).

3 The term ‘Resultant Complexity’ is used here because a functor including more than one argument in its description, for example, an English ditransitive verb assigned the category (VP/NP\_2)/NP\_1, will have a more complex result category (VP/NP\_2) after combination with NP\_1, than a transitive verb category of type VP/NP, which results in VP.
but whether the argument is a primitive argument A or a functor. The categories in (1.9.b.) and (1.9.c.)
take functors rather than primitive arguments as their arguments. In contrast, (1.9.a.) may combine only
with a primitive argument. I will show below that the qualitative/quantitative distinction in categorial
complexity makes interesting predictions about the acquisition of particular combinations of lexical items.

This dual notion of complexity is similar to Moortgat's (1988b:12) characterization of the degree
of categorial complexity as the numerical sum of a counting function which adds the number of type
forming connectives (/, \, and |) in a categorial description. Adapting Moortgat's definition to the
system described here gives the following procedures for determining the orders of Resultant and
Argument Complexity.

(1.10.) a. Order of Resultant Complexity
   i. \( \text{ord}_R(A) = 1 \) if A is a primitive member of GCAT.
   ii. \( \text{ord}_R(B/A) = \text{ord}_R(A\backslash B) = \text{ord}_R(B|A) = \text{ord}_R(B) + 1 \).

b. Order of Argument Complexity
   i. \( \text{ord}_A(B/A) = \text{ord}_A(A\backslash B) = \text{ord}_A(B|A) = 0 \) if A and B are primitive members of GCAT
   ii. \( \text{ord}_A(B/A) = \text{ord}_A(A\backslash B) = \text{ord}_A(B|A) = 1 \) if A is not a primitive member of GCAT.

Given these complexity distinctions, it is possible to characterize CG in terms of orders of
complexity. I define the lower end of the Resultant Complexity order as a BASIC CHILD GRAMMAR,
CG\(^1\)\( _{\text{Res}} \). CG\(^1\)\( _{\text{Res}} \) is composed of the categorial primitives in GCAT, namely 'e' and 't', and the
empty set of combinatorial operations. CG\(^1\)\( _{\text{Res}} \) corresponds to the single word stage of language development.

CG\(^2\)\( _{\text{Res}} \), the child grammar of the second order of Resultant Complexity, is a non-recursive set of
categories consisting of the primitive argument types (1.11.a., b.) and a set of primitive functor types
consisting of rightward looking functors (1.11.c.), leftward looking functors (1.11.d.) and functors
unspecified for direction (1.11.e.). Following footnote 4, the categorial grammar will initially assign the
primitive GCAT category 'e' to the lexical category 'N' and 't' to 'U'. As I will show in Section 1.3,
CG\(^2\)\( _{\text{Res}} \) is the order of resultant complexity for Pivot Grammars.

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4I will not discuss the one-word stage further in this paper. Following a suggestion made by
Enmon Bach, I make the following important assumption, however. It is predicted that children at
CG\(^1\)\( _{\text{Res}} \) have only two categories at their disposal which they can assign to lexical items, namely the
primitives 'e' and 't'. Thus, the child is only allowed to make a binary distinction between the types of
lexical items she enters in her lexicon. Following Montague (1974:222), I assume 'e' to be the category
for entity expressions and 't' to be the category for truth value expressions. I will assume that the
grammatical categories U(tterance)(i.e. sentence) and N(oun) are members of CAT\(_{\text{English}}\) and are assigne
the GCAT categories 't' and 'e' respectively. A child learning English, for example, learns that Ns
are used to refer to entities or objects in an environment and assigns them to category 'e'. She also learns
that particular properties, denoted by bare pivots, verbs, and adjectives, may hold of entities and object
in a particular context. The production of these items at the single-word stage are assumed to be
proportional in nature and are assigned a truth-value. I use the category 'U' to denote lexical items
used to denote truth functions. All functors are described in terms of these two primitives.
CG\text{2 Res} is the smallest set derived from GCAT such that (a. - e.) are members.

a. N  
b. U  
c. U/N, U/U,  
d. N\setminus U, U\setminus U,  
e. U\setminus N, U\setminus U,

Included in the grammar as a reduct is the combinatorial rule of functional application which simply instantiates the result category specified in the numerator of a functor, illustrated in (1.7.).

Grammar CG\text{1 Arg}, the child grammar of the first order of Argument Complexity, will consist of the functor categories (1.12.a.) and (1.12.b.), and rightward looking, leftward looking and directionally unspecified functors (1.12.c., d., and e., respectively).

CG\text{1 Arg} is the smallest set in GCAT such that (a. - e.) are members.

a. U/N, N\setminus U, U\setminus N  
b. U/U, U/N, U\setminus U  
c. U/(U/N), U/(U/U), U/(N\setminus U), U/(U\setminus U), U/(U\setminus N), U/(U\setminus U),  
d. (U/N)\setminus U, (U/U)\setminus U, (N\setminus U)\setminus U, (U\setminus U)\setminus U, (U\setminus N)\setminus U, (U\setminus U)\setminus U,  
e. U\setminus (U/N), U\setminus (U/U), U\setminus (N\setminus U), U\setminus (U\setminus U), U\setminus (U\setminus N), U\setminus (U\setminus U),

As in (1.11.), functional application applies as a reduct at this order of complexity.

Notably, the acquisition of an order of argument complexity greatly increases the number of possible category types allowed in CG\text{i}. The task of narrowing down the set of categories in (1.12.) to those which children seem to use is beyond the scope of this paper. However, in Section 3, I show that it is useful to regard stage CG\text{1 Arg} as a level of complexity required for the acquisition of auxiliaries and conjunctions. Interestingly, the acquisition of CG\text{1 Arg} appears to be dependent on the acquisition of CG\text{3 Res} in these constructions.

One final point needs to be made clear. Note that the rule of Functional Application in (1.7.) does not license the combination of two functor categories of the same order of Argument or Resultant Complexity. A functor may only combine with an argument which is of an order of complexity below the complexity order of the functor. In regard to the orders of Resultant Complexity we have been discussing, functional Application only allows a the combination of a primitive argument and a functor category which requires a primitive argument to create an utterance. Thus the following combinations are predicted never to occur.

* A/B B/A 
* B\setminus A A\setminus B 
* B\setminus A A\setminus B 
* A\setminus B B\setminus A 

In regard to Argument Complexity, functional application only allows a functor of CG\text{1 Arg} complexity to combine with a functor of of CG\text{0 Arg}, or functors of the form B/A, A\setminus B, B\setminus A. Thus, for example, the following combinations are also prohibited.
This restriction on categorial combinability, which will become important in later sections, is stated as the Constraint on Functor Combination (CFC).

(1.13.) Constraint on Functor Combination

The combination of two functors of equivalent categorial complexity is prohibited.

We are now in a position to characterize Braine's observations. In the next section, Braine's data will be considered within an analysis of pivot constructions across languages.

1.3 A Categorial Analysis of Pivot Constructions

The components of the categorial grammars outlined in (1.2) allow pivot types to be distinguished along the following parameters:

(a) the direction of combination required by a functor (e.g. '/', '\', 'I')
(b) whether a functor combines exclusively with nouns, or with nouns, verbs, and adjectives (noted by Bowerman 1973).

Using direction of combination as the primary determinant of pivot category type distinguishes the following functor types.

1. Rightward Looking Functor Types which correspond to the P + O utterances,
2. Leftward Looking Functor Types which correspond to O + P utterances, and
3. Functor Types unspecified for direction, corresponding to 'allgone', 'byebye' and 'pon' in (1.3.).

I take these in turn below.

I will assume that the words used by children in all examples of data in this paper are of the same category as the canonical adult categories for these words with one exception. I follow Bloom (1970) in classifying what would correspond to prepositions in adult grammars as verbs. In this analysis, I draw examples of additional pivot constructions from the following reports in addition to Braine's examples. The Swedish data is taken from Braine's (1976) analysis of Lange and Larsson (1973).

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>AGE</th>
<th>MLU</th>
<th>LANGUAGE</th>
<th>INVESTIGATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gijs</td>
<td>1;6-2;1</td>
<td>---</td>
<td>Dutch</td>
<td>Schaerlaekens (1973)</td>
</tr>
<tr>
<td>Joost</td>
<td>1;6-2;1</td>
<td>---</td>
<td>Dutch</td>
<td>Schaerlaekens (1973)</td>
</tr>
<tr>
<td>Katelijn</td>
<td>1;6-2;1</td>
<td>---</td>
<td>Dutch</td>
<td>Schaerlaekens (1973)</td>
</tr>
<tr>
<td>Gia 1</td>
<td>1;7,1</td>
<td>1.12</td>
<td>English</td>
<td>Bloom (1970)</td>
</tr>
<tr>
<td>Eric 1</td>
<td>1;7,1</td>
<td>1.10</td>
<td>English</td>
<td>Bloom (1970)</td>
</tr>
<tr>
<td>Gia 2</td>
<td>1;8,2</td>
<td>1.34</td>
<td>English</td>
<td>Bloom (1970)</td>
</tr>
<tr>
<td>Eric 2</td>
<td>1;8,2</td>
<td>1.19</td>
<td>English</td>
<td>Bloom (1970)</td>
</tr>
<tr>
<td>Kathryn 1</td>
<td>1;9,0</td>
<td>1.32</td>
<td>English</td>
<td>Bloom (1970)</td>
</tr>
</tbody>
</table>

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1.3.1 Rightward Looking Functor Types

Rightward-looking functor types combine with arguments on their right and consist of two classes. The first class has three particular properties which appear to be consistent across child languages; (1) they always appear utterance initially, (2) each functor denotes a single semantic function, and (3) they may combine with a variety of lexical items currently productive in a child's grammar, namely those I have labelled in single-word utterances as 'U' and 'N' in Section 1.2. Thus functors which combine with nouns are assigned the category U/N. Those which combine with either adjectives or verbs are assigned the category U/U.

(1.14.)

a. English: Andrew
   more car  no bed
   more hot  no wet
   more read no fix

b. Dutch: Maria
   nog oorbel  ‘more earring’
   nog af    ‘more off’
   nog eten  ‘more eat’

c. Dutch: Gijs
   nog book  ‘more book’
   nog warm  ‘more warm’
   nog draaien ‘more run’

d. Finnish: Rina
   ei susi    ‘no wolf’
   ei saa    ‘no get’
   ei tässa  ‘no here’

e. Finnish: Seppo 1
   enää pelaa  ‘anymore plays’
   enää palo  ‘anymore fire (engine)’
   enää pipi  ‘anymore sore’

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In each of the examples of (1.14.), a single functor combines with its argument to denote a single semantic notion, either recurrence, negation or desire for information. Functors translated as 'more' in English are used to denote (desired) recurrence of an event or object. Utterances beginning with a negative consistently denote (desired) absence of an event or object (but see Bloom 1970 for a more specific analysis of negation in child language). Included as well are WH-requests (1.14.e.) which denote desire for information about an event or object.

The second type of rightward-looking functor combines only with the category type N and is assigned the category U/N. Aside from this property, this functor class is identical to the first class in that they both occur in utterance-initial position and in that each functor is used to denote a single semantic function.

(1.15.)

a. English: Andrew
   other bib
   other pants
   other piece

b. English: Kathryn 2
   hi shadow
   hi children
   hi spoon

c. English: Jonathon
   two spoon
   two fly
   two bird

Kathryn used 'Hi' to acknowledge the existence of an object, and 'other' is used by Andrew to request an object different from one currently involved in a situation (Braine 1976:9). These forms were used considerably less often than the first rightward-looking functor class. Notably absent from these utterances is the combination of two pivot categories.

1.3.2 Leftward-Looking Functor Types

Leftward looking functor types corresponding to P in O + P utterances in (1.5.), are of two classes as well. The first class combines only with an N to the left as in (1.16.a.) and is assigned the category N\U. The second combines either with a verb or a noun as in (1.16.b.) and is assigned either to the category U\U or to N\U respectively.
Interestingly, these forms appear in the utterances of very few English children, and in only the prolocative construction uttered by Seppo. Leftward-looking functors also never appear in combination with other functors in two-word combinations.

1.3.3 Functors Unspecified for Direction

Functor types unspecified for direction are also divided into two classes. The first class takes a variety of lexical items either on the left or the right as in (1.17.) and is assigned the category U|U. In the second example, ‘pois’ is interpreted as a verb.

(1.17.)  Finnish: Seppo 1

tuossa ammu  ‘there moo-cow’
tuossa pois  ‘there away’
pipi tuossa  ‘sore there’
tipu .. tuossa  ‘chick .. there’

(  .  = pause)

This type is also rare in the data sets discussed here.

The second unspecified class requires the functor to combine with nominal forms to the right or to the left as in (1.18.). This class of functor is assigned the category U|N. In the data sets discussed here, unspecified types are restricted to prolocative forms in all cases except for English.

(1.18.)

a.  English: Andrew

allgone pacifier  byebye Calico  mess here
allgone juice  byebye papa  pillow here
airplane allgone  Calico byebye  here mess
calico allgone  papa byebye  here pillow

c.  Dutch: Gijs

daar auto  ‘there auto’
daar stoel  ‘there chair’
auto daar  ‘car there’
huis daar  ‘house there’

d.  Finnish: Rina

täälä varvas  ‘here toe’
täälä heppa  ‘here horsie’
svu täälä  ‘mouth here’
ovi täälä  ‘door here’
This functor type does not occur in combination with other functors.

In sum, these directionally defined functors are assigned the following types. Note that this set of categories exhausts the set of functor categories generable at CG$_2^{Res}$ in (1.11.).

(1.19.a)  Rightward-looking  b.  Leftward-looking  c.  Unspecified

<table>
<thead>
<tr>
<th></th>
<th>i.</th>
<th>ii.</th>
<th>i.</th>
<th>ii.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U/U</td>
<td>U/N</td>
<td>U/U</td>
<td>U/N</td>
</tr>
<tr>
<td></td>
<td>U\U</td>
<td>N\U</td>
<td>U\N</td>
<td>U\N</td>
</tr>
</tbody>
</table>

Functors which combine only with nouns to create an utterance are assigned the types U/N, N\U or U\N straightforwardly, as determined by their direction(s) of combination. Functors which combine with verbs and adjectives are assigned either to the types U/N, N\U, or U\N if they occur with nouns, or to the categories U\U, U/U, or U\U if they occur with adjectives or verbs, according to their direction(s) of combination. This latter class of categories requires some explanation. What I want to claim is that verbs and adjectives are assigned the category U at the single-word stage. They are assigned to U under the assumption that they denote events or states respectively at the single word stage. That is, a child at the single-word stage uses a verb or adjective to express a salient contextual relation among sets of objects rather than a complete sentence when a child does not have the competence to express complete sentences. Following Limber (1973), a child may not have the appropriate lexical categories to express states or properties of objects at this stage and simply uses the most effective lexical item available to express the desired notions. Thus, a child may use the utterance ‘make’ to express the event ‘Mommy makes cookies’ or the word ‘tall’ to express the notion ‘John is tall’. When these lexical items are used with rightward-looking pivots, for example, the child is intending to bring about the recurrence, absence, or the information about, the particular property denoted by the verb or adjective. A child simply chooses to utter the lexical item denoting the most appropriate semantical property of the event (Drozd 1987).

I have shown so far that the categorial system as defined above provides a descriptively adequate analysis of Pivot Grammars. Furthermore, Pivot Grammars are assigned to a particular order of complexity, namely CG$_2^{Res}$, as determined by the procedure for determining Resultant Complexity (1.10.a.), and can serve as the basis for combining lexical items into more complex expressions. The categorial approach also makes several correct predictions about child grammar development and illustrates several important properties about child grammars in general. First, it is predicted that a pivot grammar will be the first CG used by a child after leaving CG$_1$, the one-word stage. This prediction correlates with a number of studies. Braine’s (1963) three English subjects as well as Bloom’s (1970) subject Eric all use pivot constructions productively while other utterance types which appear in the speech of other children, such as N+N and N+V, are slow to enter their speech with any regularity. Cross-linguistically, pivot grammars constitute a subset of many child grammars to a large degree. In addition, the P+P utterances correctly prohibited by Braine’s phrase structure rule account (1.2.b.), and generalized to apply to all functors by the CFC, are predicted never to occur by the categorial grammar approach. P+P combinations are predicted not to occur because functional application will not allow a functo to serve as the argument of another functo of an equivalent order of complexity. Correspondingly, children rarely if ever combine two pivot items to construct an utterance. For example, children never say ‘hi more’, ‘two off’, ‘allgone other’ or ‘more here’, though some of these examples seem easily derivable from adult speech. For example ‘more here’ may be derived from ‘more are here’ ‘two off’ may be derived from ‘two came off’. As a counterexample to this prediction, Bowerman
(1973:34) notes that Braine's subject Steven used his pivots in combination with other functors such as verbs (to be discussed below), uttering such combinations as 'want do', 'want get', and 'want more'. Interestingly, all of the Bowerman's examples involve the verb 'want', an intensional verb that is used often by children. There are no examples of combinations of two extensional verbs to my knowledge.

The categorial approach also illustrates the functional patterning of pivot constructions. Children appear to choose specific words from the input data to serve as pivot categories which express, in some cases, particular logical and pragmatic functions. Pivots combining with nouns, verbs and adjectives express the recurrence (more), negation (no), or desire for more information about (where) an object or event. Pivots combining solely with nouns express the acknowledged existence (hi) or number (two) of objects, as well as requests for another object ('another, another). Furthermore, there appears to be a one-to-one correspondence between pivot category and function in many cases.

In the following section, I present data on the acquisition of verbs and their arguments and N+N constructions encoding possession and location. I show that the syntactic patterning of these utterance types can be predicted by the categorial grammar if verbs and particular noun types are assumed to be functors which take particular open class categories as their arguments. Though these utterances are not found to have the same properties as pivot constructions, they follow the CFC as predicted by the categorial grammar.

2.0 Patterns of Open Class Combinations in Child Languages

In this section, I discuss the characteristics of N+N utterances expressing possession or location of objects (1.4.) and N+V combinations (1.3.b.), which comprise the productive O+O combinations (1.5.a.) discussed in Section I. Recall that the functor types discussed above were described in terms of two characteristic properties; (a) direction of combination, and (b) whether the functor combined with a 'N' or 'U' category. Each salient function is assigned to a pivot category with particular values for these two properties. Three additional properties were found to hold of pivots as well. The first is that a one-to-one relation holds between a particular semantic or pragmatic function and the lexical item chosen to encode that function. Second, the word order for at least two sets of these functors, namely the rightward-looking and leftward-looking pivots, does not appear to be set by the input language, but is assigned identically across child languages. Third, we have seen that these utterances observe the CFC.

In this section, I show that N+N and V+N utterances appear to have properties which differ from pivot constructions: (1) they denote functions other than those denoted by pivot constructions, (2) there is no one-to-one relation between function and the lexical item(s) chosen to encode that function, and (3) contrary to Braine (1976), the word order of V+N utterances is determined by the word order of the language being learned. However, they are similar to pivot constructions in observing the CFC.

2.1 Verbs and Verbal Arguments

Combinations of nouns and verbs are productive in almost all child languages. Braine (1976) and others have noted that nouns which occur in subject position in N+V sequences can be classified in most cases as actors which instantiate the action denoted by the verb in the utterance. These 'actor-action' sequences are productive across child languages with either transitive or intransitive verbs (2.1.).
Braine suggests that the ‘actor-action’ sequence be considered a semantic universal of CGs due to the prevalence of the form. Specifically, a child tries to encode a salient conceptual relation, such as the ‘actor-action’ concept, linguistically by mapping the concept into a particular word order.

One problem with Braine’s conclusion is that it is based on data from strictly SVO languages. Assuming that the notion ‘actor’ is commonly denoted by subjects and ‘action’ is commonly denoted by verbs, a child learning an SVO language might be expected to use N+V to denote the ‘actor-action’ concept based on linguistic input alone rather than on semantic criteria. Braine’s conclusion would be supported if children learning languages without strictly SVO word order used N+V to encode the ‘actor-action’ concept. Data from Maria’s acquisition of Dutch (Schaerlaekens 1973), a language which uses SVO order predominantly in matrix clauses, and SOV in embedded clauses, suggests that the ‘actor-action’ scheme is not universal in two ways. First, Maria uses both V+N and N+V sequences to express the actor-action notion, as in (2.2.).

These data show that children may use different word orders to encode ‘actor-action’ information. Thus Braine’s claim that children will encode the actor-action notion by a particular word order universally does not hold across all child languages. Rather, the word order children assign to ‘actor-action’ utterances appears to be determined by the word orders children perceive in the input language. Given Maria’s utterances, it is more reasonable to conclude that if a child is exposed to a strictly SVO language, she will use N+V to encode ‘actor-action’. If the language is SVO/SOV, the ‘actor-action’ concept will not be encoded regularly as N+V. In the latter case, a child may use the range of word orders she perceives in the language to encode the notion, or she may use universal principles to derive
a satisfactory method of encoding the notion. The fact that Maria uses V+N to encode "actor-action", even though this order is not characteristic for subject-verb combinations in Dutch, would lend support to the idea that she is using word orders made possible through universal grammar rather than the perceived Dutch word order patterns to encode the "actor-action" notion. The categorial grammar makes available to a child any logically possible word orders for V+N utterances at the two-word stage, since they all have been independently motivated to characterize pivot grammars.

More evidence suggesting the use of non-semantically based word order regularity comes from Maria's use of direct and oblique objects. Maria consistently used both N+V and V+N productively to encode objects at the two-word stage (Schaerlaekens 1973:77). However, as Schaerlaekens observes, she consistently uses N+V to encode transitive verb-direct object relations (100%) and V+N utterances to encode the intransitive verb-oblique object relation (79%) (2.3.a. and b., respectively), though these word orders are not fixed in Dutch.

(2.3.a.)
Maria's N+V Utts.  
(N = Accusative Object)  

<table>
<thead>
<tr>
<th>Utterance</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>haar kammen</td>
<td>&quot;hair comb&quot;</td>
</tr>
<tr>
<td>bol eten</td>
<td>&quot;candy eat&quot;</td>
</tr>
<tr>
<td>boot maken</td>
<td>&quot;boat make&quot;</td>
</tr>
<tr>
<td>auto maak</td>
<td>&quot;car make&quot;</td>
</tr>
<tr>
<td>koek hebben</td>
<td>&quot;cookie have&quot;</td>
</tr>
<tr>
<td>huisje bouwen</td>
<td>&quot;house build&quot;</td>
</tr>
</tbody>
</table>

b. Maria's V+N Utts.  
(N = Oblique Object)  

<table>
<thead>
<tr>
<th>Utterance</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>zien zwijntje</td>
<td>'see piggy'</td>
</tr>
<tr>
<td>zingen kerk</td>
<td>'sing church'</td>
</tr>
<tr>
<td>steken haren</td>
<td>'put hair'</td>
</tr>
<tr>
<td>kijk haan</td>
<td>'look rooster'</td>
</tr>
<tr>
<td>geven madame</td>
<td>'give lady'</td>
</tr>
<tr>
<td>spelen ballekens</td>
<td>'play balls'</td>
</tr>
</tbody>
</table>

Here, Braine's (1976) analysis would predict that Maria's verb-object and verb-oblique object utterances are semantically-based since they have strict word orders. But this is not the case in all of these examples. If we assume that Maria's interpretations of the oblique arguments in (2.3.b.) match those of adult Dutch speakers, we may reasonably assume that these utterances encode at least three semantic functions: location, as in 'sing (in) church', theme, as in 'play (with) balls', or goal, as in 'give (to) lady'. In these cases, word order assignment, whether it is based on input data or not, appears to be one strategy available in universal grammar for differentiating verbal argument types. Moreover, it appears to be a strategy completely autonomous from semantic considerations, in contrast to what Braine would have predicted.

The data discussed so far in this section illustrate the three properties which differentiate V+N utterances from pivot constructions. First, there is no one-to-one relation between a specific lexical item and a particular function, as we have seen for the rightward looking pivots. That is, a single lexical verb form is not selected to encode a salient property associated with verbs, such as intransitivity, activity or stativity. Secondly, the functions encoded by verbs differ from those encoded by pivots. For example, I have found no pivot constructions which have denoted the 'actor-action' notion or any other verbal relation among objects. Third, the word order of these constructions appears to be determined by the interaction of the word order(s) perceived in the input language and a child's attempts at encoding salient grammatical divisions among lexical items of the same category (verbal object). Pivot categories, on the other hand, assume an invariant position in two-word utterances. It is unclear whether the word order of pivot constructions is determined by universal or language-specific information.

However, verbs, like pivots, generally do not occur together in two word utterances, with the exceptions pointed out by Bowerman and discussed in Section 1.1.2.. There are no examples in Schaerlaekens' lists of Maria's two-word utterances or those of his other Dutch subjects of verbs occurring together. If verbs are assigned to primitive functor categories, this phenomenon is easily explained by the CFC. Verbs, like pivot categories, cannot be combined by functional application. Therefore, V+V combinations are not well-formed utterances.

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5I thank Sue Steele for pointing this out to me.

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I propose, then, that verbs are functor categories which are initially assigned no direction of combination. Children use the verbal word order which they perceive or word orders which function to differentiate verbal arguments as the basis for assigning directionality to the categorial description of a verb. In terms of categorial grammar, verbs within V+N and N+V combinations are initially assigned to type UIN. They are assigned the types N\U or U/N according to the function they encode in a child's grammar. For example, Maria chose to assign the verbs in the 'actor-action' sequences as U|N (2.4.a)\(^6\), the verbs occurring with accusative objects as N\U (2.4.b.), and the verbs occurring with oblique objects as U/N (2.4.c.). These utterances are derivable within CG\(_R\), the order of complexity for pivot grammars. Thus, I have accounted for the use of V+N (1.5.b.) and utterances within the same period observed by Bloom and Bowerman.

(2.4.) Maria's V+N Utterances

<table>
<thead>
<tr>
<th>a. Actor-Action</th>
<th>b. N(_{Acc}) + V</th>
<th>c. V + N(_{Obl})</th>
</tr>
</thead>
<tbody>
<tr>
<td>weer Arnold maken</td>
<td>haar kammen</td>
<td>zien zwijntje</td>
</tr>
<tr>
<td>U</td>
<td>N N</td>
<td>U</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

2.2 Animacy and the Order of N+N Constructions

In this section, I show that word order patterns of N+N utterances denoting possession and location of an object form a natural class with the V+N utterances discussed in the preceding section. That is, these N+N utterances (1) are not restricted to specific lexical items, (2) are assigned the direction of combination consistent with the word order in the input language, and (3) denote functions which are not denoted by pivot categories. In addition, the functors proposed for these utterances observe the CFC. I also discuss Braine's (1976) suggestion that particular frequently uttered N+N combinations, which can be described as 'possessor - object possessed' or 'object - location of object'\(^7\), result from acquiring formulae by which salient conceptual relations are mapped into particular word orders, the identical process proposed for verbal constructions in Section 2.1. Lexical combinations denoting possession or location are salient conceptual relations encoded in an utterance by choosing a set of lexical items, in this case nouns, with a particular linear order. This approach makes two false predictions. The first is that children only access semantic information in constructing N+N utterances without using linguistic input to determine the order of nouns in these constructions. The second is that these possessive and locative combinations be encoded via independent semantic formulae. I begin by showing that the first

\(^6\)The grammatical derivations will be illustrated as in (2.4.) throughout this paper. Each occurrence of functional application (FA) is illustrated by a continuous line. The input above the line undergoes FA, resulting in the category in the numerator of the functor expression which is below the line. It is assumed that well-formed utterances are created when repeated applications of FA create an utterance of the category U. If such a category cannot be obtained by repeated applications of FA, the utterance is ill-formed.

\(^7\)N+N utterances corresponding to the conjunction of a subject and an object noun (Bloom 1970) are not discussed here. I will assume, adapting Brain's (1976) analysis of these utterances, that verbal objects are used to denote 'action' where the verb is too difficult to utter or to interpret. Therefore, N\(_{Subj}\)+N\(_{Obj}\) = N+V and are assumed to be analyzed as in (2.1.).
prediction does not hold cross-linguistically and follow by discussing the semantic nature of these utterances. In the next two sections, I show that utterances denoting possession or location of an object observe the three properties attributed to V+N utterances. I follow this with a discussion of Braine's theory of how these utterances do not seem to be constructed on the basis of semantic formulae, as Braine suggests. Rather, as Schaerlaekens' (1973) data and analysis suggest, particular nouns in these utterances are assigned a particular value for the feature [animate] which enable them to serve as the functors in these expressions.

2.2.1. Possession

Children form N+N utterances denoting possession by combining a noun denoting a possessor with another noun denoting the possessed object. Children cross-linguistically appear to use the appropriate word order of the language they are learning in determining the word order of these possession expressions. For example, Seppo I follows the predominant order for Finnish possessives in requiring the possessor to precede the object possessed (2.5.a.) while Gijs follows the Dutch order where an animate possessor follows what is possessed (2.5.b.).

(2.5.)a. Possessor+Possessed

<table>
<thead>
<tr>
<th>Finnish: Seppo 1</th>
<th>Possessed+Possessor</th>
</tr>
</thead>
<tbody>
<tr>
<td>isä kello 'father’s clock'</td>
<td>auto bakker 'car baker’s'</td>
</tr>
<tr>
<td>setä kello 'man’s clock'</td>
<td>paard boer 'horse farmer’s'</td>
</tr>
<tr>
<td>täti auto 'lady’s auto'</td>
<td>tutter Karel ‘pacifier Karel’s’</td>
</tr>
</tbody>
</table>

In discussing Odi's Hebrew possessive expressions, Braine (1976:40) notes that Odi similarly first uses both orders of combination and later preserves the standard possessed–possessor order for Hebrew. Thus the word order of these utterances appears to be determined by the language being learned. In addition, no single lexical noun is chosen to denote the notion 'possessor' or 'possessed object' in these utterances. Any lexical noun may serve as either possessor or object possessed with one restriction; possessors are always animate and objects possessed are always inanimate in the earliest utterances denoting possession. Furthermore, I have not found any pivot constructions of the type discussed in Section 1 which denote possession of an object. Therefore, possession expressions form a natural class with the V+N expressions of Section 2.1 rather than with the pivot constructions discussed in Section 1. I will show directly that possession expressions observe the CFC as well.

The examples in (2.5.) also suggest that Braine's (1976) suggestion that the word order of possession utterances is derived by semantic formulae does not hold cross-linguistically. Recall that Braine required particular semantic formulae, in this case possession and location (Braine 1976:57), to be encoded by a particular word order universally. It is clear from the examples in (2.5.) that children use the word order of the input language as the basis for assigning word order to possession utterances. What remains is to explain why all possessors are animate and objects possessed are inanimate in the earliest uses of these utterances. I show that a categorial grammar can be manipulated by using the CFC to account for the early use of these utterances as well as their sequence of acquisition.

In order to characterize possession utterances within the categorial framework, we must first determine which nouns in these expressions are functors and which are arguments. One of the nouns must be assigned to a functor category and one must be assigned to the argument category specified for that functor. The criteria Braine used to separate pivots as predicates (functors) in Section 1 are absent here. No single lexical item is being chosen to denote the 'possessor' or 'object possessed' notions in these expressions, as in pivot constructions. Also, there is no fixed word order for these utterances universally. The one feature which appears to isolate these utterances is animacy. Let us begin by assuming that animacy is a salient feature in a child's conceptual semantics which she may use to express a functional relation among objects. Given this, at least three questions arise; (1) Is animacy the
correct feature for determining possession expressions, (2) which feature value defines the possession relation, and consequently, (3) which noun in the utterance is to serve as the functor.

In regard to the first question, Schaelaekens assumed that [+ human] is the primary (i.e. canonical) value for possessors used in the earliest grammars. Inanimate objects are used as possessors only in more advanced Dutch CGs. For example, Gijs, and Maria initially require possessors to be human during the two-word stage and only at the three-word stage do they begin to use nonhuman objects as possessors (Schaelaekens 1973:140). In categorial terms, Schaelaekens' assumption would be consistent with the notion that [+ human] is a salient feature of objects which is used to distinguish possessors from other objects. Nouns denoting humans may function as possessors which combine with inanimate objects to form utterances. However, this does not appear to be the relevant distinction once data from other children are added to Schaelaekens data. For example Seppo, Jonathon, and Kendall use both humans and animals ([+ animate]) as possessors and inanimate possessed objects at the two-word stage. Though more data is required to make a definite conclusion, [+ animate] and not [+ human] appears to be the feature determining possessors cross-linguistically. In all of these data sets, the object possessed is [-animate]. Thus, assuming animacy to be the appropriate feature and adding the possession expressions from Seppo, Jonathon and Kendall to Schaelaekens' original scheme for the sequence of acquisition, the following stages emerge.

(2.6.)

<table>
<thead>
<tr>
<th>Possessor</th>
<th>Object Possessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joost</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Katelijn</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Kendall</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Seppo (1,2)</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Gijs</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Maria</td>
<td>[+ animate]</td>
</tr>
<tr>
<td>Diederik</td>
<td>[± animate]</td>
</tr>
<tr>
<td>Arnold</td>
<td>[± animate]</td>
</tr>
<tr>
<td>Jonathon</td>
<td>[± animate]</td>
</tr>
</tbody>
</table>

The question remains as to which value licenses the possession function between two objects. If we assume that [+animate] is the appropriate value, under the categorial approach, this implies that possessors are functors which take inanimate objects as their arguments. This predicts the pattern at Stage 1, for example. The CFC is satisfied because there are no combinations of two animate noun functors at this stage. However, under this assumption, we could not account for the combination of animate possessors and animate possessed objects in Stage 2 in (2.6.) since this would amount to the combination of two functors, violating the CFC. On the other hand, by assuming that the object possessed is the functor, the acquisition sequence appears to observe the CFC. Under this latter assumption, at CG$_2^{Res}$, inanimate possessed objects are functors which must combine with animate possessor arguments. Late in this stage the restriction is relaxed so that both animate and inanimate objects may serve as the possessed object, as in adult grammar, without violating the CFC. Eventually, the possession relation is grammaticalized, and the animacy value for both possessor and object possessed loses its significance in determining the word order of the relation. Note that only in the final stage, named Stage 3, do children produce two inanimate nouns in combination, corresponding to the combination of two functors. The late emergence of inanimate noun combinations to denote possession is predicted by the CFC.

In sum, animacy, rather than [+human] appears to be the appropriate feature determining the possession relation. The negative value for animacy is the feature defining the function. In the conceptual semantics, inanimate objects may function as possessed object predicates which look for possessors as their arguments. In the lexicon, nouns assigned the feature [-animate] are functors which...
take nouns denoting possessors as arguments. A sample derivation for this utterance type is given at the end of Section 2.

2.2.2 Location

Location expressions are formed by combining a noun denoting a particular location with another noun which denotes an object without a designated location. Thus the former noun is used to designate the location of the latter noun. These expressions appear to have the same properties attributed to possession and V+N expressions discussed above; namely, (a) the word order of the nouns is determined by the word order of the language, (b) locative function assignment is not assigned to a single lexical item, and (c) the locative function is not one which is assigned to pivot constructions. For example, Seppo appeared to acquire the word order of the locative expressions in the Finnish data he was exposed to. Finnish locative expressions take the form N + N_loc or N_loc + N although the first type is dominant. However, Seppo's mother used the non-dominant order rarely (Bowerman, p.89). At 23 mo., Seppo used both orders (2.7.a.). At 26 mo., he used only the dominant word order, N + N_loc, productively. In Dutch, a lexical item denoting an object follows the noun denoting the object's location. Gijs follows this order without exception (2.7.b.).

(2.7.a.) Seppo 1

\[
\begin{array}{ll}
\text{N + Location} & \text{N + Location} \\
\text{auto talli} & \text{bloemen water} \ 'car garage' \ 'flowers water' \\
\text{ankka vettä} & \text{Katelijn bed} \ 'duck water' \ 'Katelijn bed' \\
\text{ankka puu} & \text{rook toren} \ 'duck tree' \ 'smoke tower' \\
\text{tipu kenkä} & \text{Location + N} \\
\text{talli . . bmbm} & \text{car garage . . car'} \\
\text{ulo takki} & \text{'to- outside coat'}
\end{array}
\]

(Examples in (2.7.a.) are taken from Braine 1976:23)

Interestingly, these N combinations are crucially different from the use of prolocatives in the child languages considered here (see the description of unspecified functors in Section 1.3.3.). Generally, prolocatives (U|N, U|U) form a class of pivots unspecified for combinatorial direction. Therefore they are free to violate the word order of the language. However, N+N expressions denoting location appear to follow the word order of the language. Also, apparently any noun may be used in these expressions. Thus these are not like the pivot constructions as defined in Section 1 but resemble the open class combinations discussed in this section. In addition, many nouns are used to denote either the location or the object located in these utterances. Thus there is no one-to-one relation between a function and a particular lexical item. Also this particular location function is not one which has been assigned to pivot constructions, assuming that the use of prolocatives has a deictic function whereas the N+N location utterances denote specific named locations.

Though there is not enough data available to make a definitive conclusion here, animacy appears to be the feature used to create the location expression as well. The sequence of acquisition illustrated for the Dutch children in (2.8.) is, again, derived from a combination of data from Schaerlaekens (1973:145) and other sources (Bowerman 1973, Braine 1976).
On the surface, the development of location expressions is almost identical to that of possession expressions. Initially, each noun denotes an object with a specific value for animacy. Later, the construction is grammaticalized and the animacy value loses its role in determining the functions of the nouns in the expression. However, the identity between possession and location expressions ends near the end of CG2Res. In late CG2Res, the semantic restriction on the noun denoting location has been relaxed.

Recall that in the possession expressions, the restrictions on the [-animate] noun denoting the object possessed seemed to be relaxed first. Only at Stage 4 do two nouns denoting animate objects appear in the location expressions of these children. Using a categorial approach including the CFC, these data would suggest that the positive value for animacy is the one which defines the location relation between objects. At CG2Res, animate nouns denoting located objects take inanimate nouns denoting objects requiring a designation for location as arguments. Only at stage 4 are two animate nouns combined to form a location expression, as predicted by the CFC. This conclusion is consistent with Schaerlaekens' account of Dutch acquisition. Moreover, location expressions under this analysis observe the CFC.

In conclusion, I have shown that N+V combinations and N+N combinations denoting possession or
location have properties that distinguish them from pivot constructions. First, the functors in these utterances are not denoted by a single lexical item, as was the case for pivots. Rather, I argue that a single abstract function is assigned to verbs, nouns denoting possessed objects and nouns denoting located objects. For verbs, the function is 'relation among sets of objects' and for nouns a particular value for animacy. Using the categorial grammar of Section 1, I argue that children interpret the notions 'possessed object', 'located object' and verbal relations as functions taking nouns into utterances. The nouns and verbs denoting these functions are assigned the category UJN, their direction of combination being determined by the perceived word order of the input language, rather than by semantic criteria, as Braine (1976) proposed. Secondly, No single verb or noun is chosen to encode these functions in all cases. Second, I have shown that the word order of these expressions appears to be determined by the word order of the input language, rather than by Braine’s semantic formulae. That is, a child sets the direction of combination for the functor in these expressions as it is perceived in the input language or to encode salient differences between verbal arguments. In contrast, particular pivot constructions had the same word order cross-linguistically. Thirdly, the functions encoded by N+N and N+V utterances are mutually exclusive with functions encoded by pivot constructions.

Finally, the categorial analysis of these utterances predicts that N+V and N+N constructions resemble pivot constructions in that they are both predicted to appear in the same stage, CG²Res, and that they both observe the CFC. The apparent difference between the two classes of utterances is that noun and verb combinations are used to denote perceived conceptual relations among objects while pivot constructions are used to denote pragmatic or logical relations. I summarize the categories I’ve presented so far at the end of the next section.

3.0 Extensions of the Categorial Approach: Auxiliaries and Conjunctions

In this section, I present a categorial analysis of the acquisition sequences of two categories, the conjunction ‘and’ and auxiliaries. I show that the early uses of these categories can be subsumed under CG²Res, the grammar proposed for the two-word utterances described above. I show that three-word utterances using conjunctions and auxiliaries require the acquisition of CG²Res, one order of Resultant Complexity above the order minimally required for two-word utterances presented so far (cf. 1.8.c, d., and e.). In addition, I show that the CFC observed at CG²Res is also observed at CG³Res. Finally, I show that the use of auxiliary verbs with main verbs constitutes a qualitative change in child grammars, which can be characterized as the acquisition of the first order of Argument Complexity described in Section 1, example (1.9.).

3.1 Auxiliaries

The fact that children learning English do not use English modals or the auxiliary ‘be’ correctly in Y/N- and WH-questions in the early stages of development has been widely noted (Klima and Bellugi 1973; Brown 1973; Hyams 1986; Kuczaj 1986). What has not been described in terms of a general theory of acquisition is how ‘be’ is used in these early stages. Several distributional properties seem to hold of early uses of auxiliary ‘be’ forms across child languages. Children consistently begin using ‘be’ forms only to begin an utterance, to end an utterance, or in simple adjectival predicate constructions. Kuczaj’s (1986) report of the development of auxiliary ‘be’ forms in the declarative utterances of his subject Ben (25-28 mo.) shows that his use of ‘is’ at this stage is restricted to utterance final or utterance initial position, or to a position between a subject noun and an adjectival form (3.2.). Similarly, Schaeferlakens’ subject Gijs productively uses ‘is + X’ at 18 months and tentatively expands his utterances to include
grammatical subjects at 25 months (3.1.).

(3.1.) Dutch: Gijs (app. 18 mo.)

is weg ‘is gone'
is nat ‘is wet'
is binnen ‘is inside'
is daar ‘is there'
is koud ‘is cold'

(25 mo.)

soep...is warm
trein...is weg
is weg...schuiver
is toe...deur
is uit...boek

... = pause

Hyams (1986) finds that modals and contractible ‘be' forms appear in the speech of children learning English almost immediately after the emergence of obligatory subjects. In analyzing data from Bloom (1970) and Bellugi (1967) she finds that four of the six subjects studied restructured the auxiliary category at nearly the same time (app. 27 mo.) The emergence of modals in particular marks a new stage in the acquisition of auxiliaries. Before modals emerge in language production, auxiliaries are not used with verbs or verb phrases and many times occur without subjects, a point I will return to below.

Similarly children learning Hindi (Varma 1979) and Hebrew (Bar-Adon 1971) begin using auxiliary ‘be' forms to begin or end short utterances with nouns and adjectives. Only later do these children begin to combine auxiliaries with verb forms. Varma's subject, Choti, began using auxiliary 'hai', corresponding to English 'is', earlier than English children (app. 17 mo.). Hindi auxiliaries occur sentence-finally and Choti picked up this property early using 'hai' consistently in its correct form by age 20 months.

Two assumptions must be made here for my analysis to be clear. First, I assume that Gijs interprets weg ‘gone' as an adjective. A closer look at Dutch participles and Gijs' use of them is required here to determine the nature of Gijs use of weg. I will leave this as an empirical question.

A more difficult problem for my analysis involves the use of prolocatives with auxiliary ‘be'. The distribution of prolocatives discussed in Section 1 suggests they are assigned to the pivot category U|N. This type assignment predicts that utterances like here is should not occur, since both is and here are functors and are not combinable, if the CPC is to be observed. More research is required here to determine the nature of prolocatives. For this paper, I will assume, following a proposal by Braine (1963;1976), that all lexical items which are used at the single-word stage by a particular child are available to combine with pivots at the two-word level (also see Section 1.1.1.). I extend this to all functors at CG^2_{Res}. Therefore, I predict that Ben, for example, used here as a bare prolocative and assigned it the category ‘U' in his single-word stage. It is therefore able to combine with is of category U\U at CG^2_{Res} to form here is. In sum then, prolocatives may either be functors (pivots) or primitive arguments. Those used at the single-word stage are assumed to be primitive arguments. Those used as in Section 1 are assigned to a functor category.
Immediately after Choti’s first utterances of the auxiliary, she began to form present progressive and infinitive forms which were always in third person singular form, as in (3.4).

In spite of age differences, Choti’s use of ‘be’ is similar to those found for Gijs and Ben. All three children use third person singular ‘be’ only with nouns and adjectives initially. Later they begin to use ‘be’ with verbs. With the addition of Hyams’ conclusions stated above, the chronological sequence of acquisition can be schematized as in (3.5).

They earliest utterances reported for Gijs and Ben are two- and three-word combinations of auxiliary ‘be’ with nouns, adjectives, or prolocatives. If it is assumed that prolocatives are primitive arguments, these utterances can be derived as in (3.6).

The next apparent stage in the development of the auxiliary category for these children, $CG^3_{Res}$, involves combining the auxiliary with two arguments, which can be either nouns, assigned to type N, or
adjectives which are assigned to type U (cf. fn. 4). Verbs do not appear with auxiliary categories at this stage for any of the children. Recall from Section 1.2, that the use of two primitive argument types requires the acquisition of the third order of Resultant Complexity (cf. (1.9.) and discussion). However, the combination of two functors is prohibited at this complexity order.

\[(3.7.)a.\] Gijs b. Ben c. Choti

\[
\begin{array}{ccc}
\text{soep is warm} & \text{This is hot} & \text{pani accha hai}
\\
N & N \backslash (U/U) & U
\\
N & N \backslash (U/U) & U
\\
U/U & U/U & N \backslash U
\\
U & U & U
\end{array}
\]

The acquisition of modals involves a qualitative change in the child’s grammar. Modals are verbal categories which take a verb as an argument (3.8.a.) or both verb and subject noun arguments (3.8.b.). In order to make the necessary combinations to construct these utterances, a child must learn that certain functors (auxiliaries) may take functors (verbs) as well as primitive arguments as arguments.

\[(3.8.)a.\] Choti b. Eric

\[
\begin{array}{ccc}
\text{kar-raha hai} & \text{It doesn’t go}
\\
U/N & N \backslash U/(N \backslash U) & N \backslash U
\\
U & N \backslash U & U
\end{array}
\]

Given categorial complexity, categories taking functors as arguments are of the first order of Argument Complexity CG\textsuperscript{1}Arg. Therefore a child must acquire this order of Argument Complexity to create these utterances.

The proposed category types for AUX ‘be’ and modals in these examples are listed in (3.9.). For this paper, I will assume that the other logically possible categories generable at these orders of complexity (cf. Section 1.2) are found in child languages of the appropriate chronological age as well.

\[(3.9.)\]

CG\textsuperscript{2}Res\textsuperscript{1} \quad \text{AUX:be:} \quad U/U, U \backslash U, N \backslash U,

CG\textsuperscript{3}Res\textsuperscript{1} \quad \text{AUX:be:} \quad N \backslash (U/U), U \backslash (N \backslash U),

CG\textsuperscript{3}Res\textsuperscript{1, Arg} \quad \text{AUX:be:} \quad (U/N) \backslash U,

\text{AUX:modal:} \quad N \backslash U/(U \backslash N).

Note that, generally speaking, the chronological development of the use of auxiliaries matches the order of acquisition predicted by the categorial grammar. A child first combines ‘be’ forms with a single primitive argument, then with two primitive arguments. This is followed by the acquisition of the first order of Argument Complexity. At present, I have no explanation for why Argument Complexity appears to be acquired only after the acquisition of the third order of Resultant Complexity.

### 3.2 The Conjunction ‘and’

Reports of the use of additive conjunctions (translated as English ‘and’) suggest a pattern of use
similar to that described for auxiliaries. Children begin using additive conjunctions utterance-initially before either a noun or adjective, followed by a period in which nouns or simple utterances are conjoined. Later, conjoined VPs or PPs appear. Dromi and Berman (1986:383), observing the use of Hebrew coordinate and subordinate conjunctions by 102 Israeli preschool children, noted that their subjects mainly use the conjunction 've', utterance initially as a 'semantically empty' discourse marker (up to approximately 41 mo.). Braine (1976:50), citing work by Lange and Larsson's (1973) transcription of Embla's utterances (20–25 mo.), notes that Embla began using the conjunction 'och' ('and') in approximately her 23rd month only to begin a noun utterance or to conjoin two nouns. In a more complete analysis, Lust and Mervis (1980:284) (L+M) found that 80% of the coordinations used by their 32 English speaking subjects (ages 2;0–3;1) used 'and' either to conjoin two nouns or noun phrases or utterance-initially before either a noun or a sentence.

Example (3.10.), adapted from L+M (p. 288), indicates that children begin conjoining object or subject NPs together in groups 1 and 2 (mean age: 28 mo.) and only later (mean age: 32.5 mo.) do children conjoin verbs, verb phrases and prepositional phrases.

(3.10.)

Phrasal and Sentential Coordination Using 'and'

<table>
<thead>
<tr>
<th>Complexity</th>
<th>Order and Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG3Res</td>
<td>28 mo.</td>
</tr>
<tr>
<td></td>
<td>V [N and N]</td>
</tr>
<tr>
<td></td>
<td>'Hold on Mommy and Daddy'</td>
</tr>
<tr>
<td></td>
<td>V [N and N]</td>
</tr>
<tr>
<td></td>
<td>'Look at the mores and mores'</td>
</tr>
<tr>
<td></td>
<td>[N and N] V</td>
</tr>
<tr>
<td></td>
<td>'Three and five is six, Mommy.'</td>
</tr>
<tr>
<td></td>
<td>S and S</td>
</tr>
<tr>
<td></td>
<td>'There water and there water.'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CG3Res.Arg</th>
<th>32.5 mo.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V [N and N]</td>
</tr>
<tr>
<td></td>
<td>'I have cows and cars'</td>
</tr>
<tr>
<td></td>
<td>V [PP and PP]</td>
</tr>
<tr>
<td></td>
<td>'Baby climbing up the stairs and down stairs'</td>
</tr>
<tr>
<td></td>
<td>V [N and N]</td>
</tr>
<tr>
<td></td>
<td>'this a present and a candy.'</td>
</tr>
<tr>
<td></td>
<td>[N and N] V</td>
</tr>
<tr>
<td></td>
<td>'And the mommy monkey and the baby monkey can sit.'</td>
</tr>
<tr>
<td></td>
<td>N [VP and VP]</td>
</tr>
<tr>
<td></td>
<td>'I sit down and jumped in'</td>
</tr>
<tr>
<td></td>
<td>V [PP and PP]</td>
</tr>
<tr>
<td></td>
<td>'He can get up the slide and down the stairs.'</td>
</tr>
<tr>
<td></td>
<td>S and S</td>
</tr>
<tr>
<td></td>
<td>'He light and he's big'</td>
</tr>
</tbody>
</table>

As L+M observe, there seems to be no sequence of acquisition for the S and S coordinations. Children conjoin simple sentences as early as they begin to conjoin nouns (24 mo.). The present analysis correctly predicts this fact. Sentential conjunctions of the category ((U\U)/U) are as complex as conjunctions of nouns ((N\N)/N). Therefore, they are predicted to be acquired in the same period, namely CG3Res. Recall that categories at CG3Res may take at most two primitive arguments. Thus only at CG3Res are the following derivations in (3.11.) possible.

(3.11.a) a. Mommy and Daddy

b. There water and there water

```
(\N\N)/N
---------
N\N
---------
U\U
---------

U

105```
Conjunctions of two functor categories, such as verbs, verb phrases, or prepositional phrases, are predicted to be used later since a child must first acquire competence in using categories requiring CG\textsuperscript{1,Arg}. CG\textsuperscript{1,Arg} is the first order of complexity a child will acquire which allows a functor to be the argument of another functor. Once this order of complexity is acquired, a child is able to produce a sentence as in (3.12.)\textsuperscript{9}

\begin{equation}
(3.12.); \quad \text{I sit down and jumped in.}
\end{equation}

\begin{align*}
&\text{N} \quad \text{N\textbackslash U} \quad \text{N\textbackslash U} \\
&\text{----------------------------------} \\
&\text{(N\textbackslash U)/(N\textbackslash U)} \\
&\text{----------------------------------} \\
&\text{N\textbackslash U} \\
&\text{-----} \\
&\text{U}
\end{align*}

The categorial types for the uses of the conjunction 'and' presented above are summarized as in (3.13.).

(3.13.)

\begin{align*}
\text{CG}\textsuperscript{2,Res}: & \quad \text{CONJ}: \quad \text{U/U, U/N} \\
\text{CG}\textsuperscript{3,Res, Arg}: & \quad \text{CONJ}: \quad \text{(N\textbackslash N)/N, (U\textbackslash U)/U} \\
\text{CG}\textsuperscript{3,Res, Arg}: & \quad \text{CONJ}: \quad \text{(N\textbackslash U)/(N\textbackslash U)/(N\textbackslash U)}
\end{align*}

where V and PP are members of CAT type (U/N) or (N\textbackslash U).

By comparing (3.13.) to (3.10.) one can see that the chronological order of acquisition of conjunction types generally matches the order of categorial complexity defined by the categorial grammar, as I have shown for auxiliary acquisition. Two nouns are conjoined only after a child has learned to combine an additive conjunction with one noun. This represents the acquisition of CG\textsuperscript{3,Res}. To combine verbs, as in (3.12.), conjunctions must be assigned a category of the first order of Argument Complexity, CG\textsuperscript{1,Arg}. As I have mentioned above, the acquisition of CG\textsuperscript{1,Arg} apparently requires competence in CG\textsuperscript{2,Res}, though the reason(s) for this are unclear.

I have shown in this section that both auxiliaries and the conjunction 'and' follow the sequence of acquisition predicted by the categorial grammar. In the first stage, these categories combine with one primitive category, either U or N, as we have seen for other utterance types in earlier sections. Later, the third order of Resultant Complexity is reached and these functors combine with two primitive categories. Combination with other functors is ruled out at this stage by the CFC. Once the first order of Argument Complexity is achieved, functors already listed in the lexicon may be conjoined or may be combined with an auxiliary.

4.0 Summary and CL Categories Proposed

I have proposed the syntactic types in (1.19), (2.4.), (2.9.), (3.9.) and (3.13.) for the categories I presented in this paper, which are summarized in (4.1.). As the examples show, the orders of categorial

\textsuperscript{9}It is unclear how children interpret apparent verb+particle constructions such as 'jumped in' and 'sit down'. For the purposes of this example, I will assume that 'sit down' and 'jumped in' are learned as single lexical items and are assigned the same category as intransitive verbs, namely N\textbackslash U.
complexity generally match the order of acquisition implicit in the data. All category types acquired at a particular stage are assumed to be used at a later stage until the child is exposed to enough language samples to cease using previous category combinations not reinforced by input or acquired syntactic or lexical categories and rules.

(4.1.) CG Types

<table>
<thead>
<tr>
<th>Syntactic Type(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

CG\textsubscript{1 Res} (Holophrasis)

a. Verb, Pivot, Adjective .................................. U
b. Noun .................................................. N

CG\textsubscript{2 Res}

a. CG\textsubscript{1 Res} .................................. U
b. Pivots .................................................. U/N, U\mid N, N\setminus U
 U\mid U, U\mid U, U\setminus U
c. Verbs .................................................. U\mid N
d. Conjunction ‘and’ ....................................... U/N
e. auxiliary ‘be’ (Stage 1) ................................ U/N, N\setminus U
f. N [± animate] ........................................... U\mid N

CG\textsubscript{3 Res}

a. CG\textsubscript{2 Res} .................................. N\setminus (U\setminus N), N\setminus (N\setminus U), (U/N)/N
b. Auxiliary ‘be’ (Stage 2) ................................. N\setminus (U/N)
c. Conjunction ‘and’ (Stage 2) ............................ N\setminus (U/N)

CG\textsubscript{3 Res}, \textsubscript{1 Arg}

a. CG\textsubscript{3 Res} .................................. N\setminus U/(U/N)
b. Auxiliary ‘be’ and modal ................................ N\setminus U/(U/N)
c. conjunction ............................................. (U/N)/(U/N)/(U/N)

4.0 Conclusion

I have shown in this paper that a categorial approach to first language acquisition provides a cohesive description of the sequence of grammars a child would have to hypothesize in acquiring an adult grammar of her language. In addition, I proposed an explicit characterization of the nature of the intermediate grammars themselves. In the first section, I straightforwardly incorporated the patterns of early lexical combinations observed in children by Braine (1963) into a categorial framework parameterized according to the direction of combination and whether a functor takes ‘N’ or ‘U’ as an argument. In Section 2, I extended the categorial framework to include other combinatory patterns, including combinations of verbs and arguments and the range of N+N expressions encoding possession and location. In the third section, I showed that the order of acquisition and development of particular auxiliary and conjunction category types is a function of their inherent orders of complexity. Thus language production development is a function of categorial complexity inherent in the system.
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