The Acquisition of Word Meaning: An Investigation into some Current Conflicts

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The last few years have seen a rising interest in the question of how children acquire the meanings of words. In recent literature on the subject, several areas of conflicting opinion have begun to come into focus. In this study, three such conflicts are investigated through the analysis of spontaneous speech data from two children.

Briefly, the issues to be discussed are as follows: 1) What kinds of cues do children use as a basis for extending words to novel referents early in development? 2) Do all the referents for which a child uses a particular word share one or more features or are words typically used 'complexively', such that no one feature is common to all referents? 3) How do children organize and store word meanings? Controversy has centred on whether word meaning is described most accurately as a set of semantic features or in terms of prototypical referents or 'best exemplars'.

The data referred to in the following analyses come from my two daughters, Christy and Eva. Christy is the older child by 2-1/2 years. I kept detailed records on both children by taking extensive daily notes and by tape recording periodically from the start of the one-word stage. Fairly complete records are available on the way in which almost every word was used from its first appearance in the child's speech to about 24 months. Data on word use continue beyond that point but are more selective.

BASES FOR EXTENDING WORDS TO NOVEL REFERENTS

Word for Objects. In her 'Semantic Feature' theory of the acquisition of word meaning, Clark (1973, 1974b) has argued that children's extensions of words to novel objects are initially based primarily on perceptual similarity. That is, objects that are referred to by the same word are perceptually similar in some way, particularly with regard to shape, and, to a lesser extent, size, texture, movement, and sound.

Nelson (1974) has recently argued strongly against this view. Citing Piagetian theory in support, she contends that children initially lack the ability to analyze objects into perceptual components like 'round' or 'four-legged' and to use these components in isolation as a basis for classification. Nelson argues instead that children at first experience objects as unanalyzed wholes and classify them in terms of the actions associated with them and the relationships into which they enter. They regard objects as similar if they are functionally similar, e.g., if they are acted upon or act spontaneously in a similar way.

Unlike Clark, Nelson views the perceptual characteristics of objects as playing a secondary rather than a primary role in the way children form concepts. Perception is secondary because it is used not as the basis for classification but simply to identify an object as a probable instance of a concept even when the object is experienced apart from the relationships and actions that are concept-defining.

The theories of Clark and Nelson make divergent predictions about how children initially use words for objects. Clark's theory predicts that a given word will be used for objects that are perceptually similar, regardless of function, while Nelson's predicts that the word will be used to refer to objects that either function in the same way, regardless of perceptual properties, or that the child predicts would function in the same way on the basis of similar perceptual properties. Both the perceptual and the functional accounts

of categorization agree on the salience of sponta-
neous motion as a basis for classifying animate crea-
tures, vehicles, etc. Thus, the conflict is primari-
ly over the relative importance of static perceptual
features like shape.

Nelson (1973a) has presented some experimental
material in support of her claim that shared function
rather than similar perceptual properties is the primary
basis for children's early object concepts, but the data
are limited (only one concept, 'ball', was investigated).
Previously-reported naturalistic data on children's
spontaneous use of words for novel objects offer little
support for Nelson's theory. For example, some of the
overextensions reported in the diary studies that Clark
(1973) drew from in formulating her perception-based
theory are clearly incompatible with a theory that
stresses the prepotence of shared function (cf. Clark,
1975). ('Overextension' refers to the child's applica-
tion of a word to a referent that an adult regards as
lying outside the semantic category labelled by that
word, e.g., 'doggie' for a horse.)

The spontaneous speech data from the two sub-
jects of the present study provide further strong evi-
dence against the theory that functional similarity
predominates over perceptual similarity in the child's
classification of the objects to which his early words
refer. In all the data from both children, there is
only a handful of examples of overextensions of words
to new objects purely on the basis of similar function
in the absence of shared perceptual features, and these
occurred relatively late, after many object words were
already known. In contrast, there are scores of exam-
ples of overextensions based on perceptual similarity,
especially shape, in the absence of functional simila-
rity, and many of these occurred during the early period
of word acquisition.

These data would not be incompatible with
Nelson's theory if the instances of overextension based
on perceptual cues could be interpreted in accordance
with Nelson's proposal that perceptual cues are used
primarily to predict the function of an object so that
the object can be identified as a member of a known
function-based category. However, this interpretation
is not possible in many instances. Rather, the child-
ren often disregarded functional differences, i.e.
gross disparities in the way objects act or can be
acted upon, that were well known to them in the in-
terests of classifying purely on the basis of percep-
tual similarities. Some examples illustrating this
phenomenon are presented in Table 1.   Eva, for
example, used the word 'moon' for a ball of spinach
she was about to eat, for hangnails she was pulling off,
for a magnetic capital letter D she was about to put on

TABLE 1. Overextensions based on perceptual
          similarities, counter to known
          functional differences.

Age given in years, months, days.

All examples in all tables are spontaneous; there was
no prior modelling of the word in the immediate context.

All utterances were single words unless otherwise marked.

M = Mummy;   D = Daddy

1. Eva, 'moon' (selected exx.) 1;3.26 (first use):
    looking at the moon, 1;4.2;looking at peel-side of
    half-grapefruit obliquely from below, 1;4.19:play-
    ing with half-moon shaped lemon slice, 1;4.23:
    touching circular chrome dial on dishwasher, 1;4.24:
    playing with shiny rounded green leaf she'd just
    picked; touching ball of spinach M offers her,
    1;5.2: holding crescent-shaped bit of paper she'd
    torn off yellow pad, 1;6.16: looking up at inside
    of shade of lit floor lamp,1;6.21: looking up at
    pictures of yellow and green vegetables (squash,
    peas) on wall in grocery store, 1;6.29: looking up
    at wall hanging with pink and purple circles, 1;7.7:
    pointing at orange crescent-shaped blinker light on
    a car, 1;8.4: looking up at curved steer horns
    mounted on wall, 1;8.11: putting green magnetic
    capital letter D on refrigerator, 1;8.11: picking
    up half a cheerio, then eats it, 1;8.13: looking
    at black, irregular kidney-shaped piece of paper on
    a wall, 1;11.20: 'my moon is off' after pulling off
    a hangnail (a routine usage).

2. Christy, 'snow' 1;4.10 (first use): as handles and
    eats snow outdoors, 1;4.16: looking at white tail of
    her spring-horse; touching white part of a red,
    white, blue toy boat; looking at a white flannel
    bed pad, 1;4.17:after drops bottle and it breaks,
    spreading white puddle of milk on floor.

3. Christy, 'money' 1;3.30 (first use): holding a hand-
    ful of pennies, a button, and a bead taken from a
    bowl; she has often played with these; 1;4.11:
    scratching at wax circles on a coffee table, 1;6.7:
    putting finger through round, penny-sized hole in
    bottom of new plastic toy box,1;7.14: feeling cir-
    cular flattened copper clapper inside her toy bell.

the refrigerator, and so on. These objects all
have shape in common with the various phases of the
real moon, but the child's actions upon them were
completely dissimilar.   The other examples illus-
trate a similar disregard for known functional dif-
ferences among the objects in question. Such examples
of classification on the basis of perceptual cues
counter to known functional differences weigh heavily
against Nelson's proposal that perceptual cues play
a secondary, purely predictive role in the child's
classificatory operations.

          A second factor that counts against the func-
tion-based theory of how children form object concepts
and attach words to them can be mentioned only briefly.
Nelson proposes, as a logical corollary of her theory,
that 'when instances of the child's first concepts come
to be named, it would be expected that they would be
named only in the context of one of the definitionally
specified actions and relationships' (1974:280).   In
other words, 'the name of an object will not be used in-
dependently of these concept-defining relations at this
point; early object word use would be expected to be
restricted to a definable set of relations for each con-
cept' (1974:280).   According to Nelson, this hypothesis
'describes accurately what is usually termed the holo-
phrastic stage...' (1974:280).

          The early object-naming behaviour of Christy
and Eva does not accord with this prediction. Most of
their first object words (e.g., 'ball', 'bottle', 'dog',
'dolly', 'cookie') were initially uttered not when the
children (or others) were acting upon the objects in
question (or, for animate objects, watching them act)
but when the objects were static, seen from a distance
ranging from a few feet to across a room (see, for exam-
ple, nos. 1, 2 in Table 3, p. 272). This suggests that
the role of function ('actions' and 'relationships') in
the child's early formulation and naming of concepts is
less crucial than Nelson proposes.

          It is possible that the age at which particu-
lar words for objects are first uttered is a critical
factor with regard to this issue. That is, the earlier
an object name is acquired, the more likely it is that
it will be uttered in connection with concept-defining
actions, etc. However, Christy's and Eva's first ob-
ject words were learned at 14 and 13 months, respective-
ly, which is toward the lower end of the typical 'holo-
phrastic' stage to which Nelson suggests her hypothesis
applies.   This indicates that even if Nelson's function-
based theory accurately describes the acquisition of
object words that are learned unusually early, the the-
ory specifies constraints on the child's methods of

formulating concepts and/or identifying new instances of existing concepts that no longer necessarily operate during most or, depending on the child's age at the start of word production, all of the holophrastic period during which the early lexicon is established.

Words for Non-Object Concepts. Words that do not refer to objects often figure importantly in children's earliest lexicons (e.g., Bloom, 1973; Nelson, 1973b). How are these words acquired and extended to novel referents? Something other than perceptual similarity is clearly involved in the acquisition of words like 'more', 'allgone', 'up', etc., since the objects or activities involved in the contexts in which children say these words are extremely varied. For many such words, the governing concept or cross-situational invariance involves a certain kind of relationship between two objects or events or between two states of the same object or event across time. Despite Nelson's (1974) emphasis on the importance of relational, functional concepts, her theory does not explain how words for actions and relationships are acquired. This is because in her theory, actions and relationships are the givens by which objects are classified; there is no account of how these concepts themselves are formed, nor is it explicitly recognized that they, no less than object concepts, in fact are categories summing across non-identical situations. (See Bowerman, 1976b:124 for further discussion.)

Words that reflect the child's recognition of constancies across his own subjective experiences or reactions to diverse events are particularly resistant to interpretation in terms of similarities among perceptual attributes or functional relationships. Nelson (1973b) has observed that many children acquire words of this type (a subgroup of 'personal-social' words, in her study) relatively early. Some examples from the Christy and Eva data of words that were extended to new situations on the basis of similarities in subjective experience are given in Table 2. The recurrent element in the use of 'there!' seems to have been a sense of having completed a project, for 'aha!' it was an experience of surprise at some unexpected object or event, for 'too tight' it was a feeling of being physically restrained or harassed, for 'heavy' it was a sense of physical effort expended on an object.

To conclude, the implications of the various arguments presented above on the nature of children's early bases for classifying are that an adequate theory of the acquisition of word meaning has to be flexible enough to account for the child's ability, even from a very early age, to classify experiences on the basis of many different kinds of similarities. Theories built

TABLE 2.   Words extended to novel situations on the
            basis of subjective experiences.

1.   Eva, 'there!' At 12-1/2 months in connection with
     the experience of completion of a project: as M
     finishes dressing her; as she gets last peg into
     hole of pounding board; after she carefully climbs
     off a high bed, etc. Drops out until 17th month,
     then 1;4.24: after getting a difficult box open
     (D has just shown her how), 1;4.25: after sticking
     each of several vinyl fish on side of bathtub,
     1;4.26: after getting a rubber band onto handle of
     kiddicar, etc.

2.   Christy, 'aha!'. From 1;6.10 in many different
     situations involving her experience of discovery
     and surprise, e.g., 1;6.10: as opens book and
     sees new picture; after gets up during the night
     and finds bowl of peanuts on table; it was not
     there earlier, 1;6.13: when M comes home with
     paper bag, 1;6.14: when sees D taking out a cake,
     1;6.15: after sticks hand in cannister and finds
     rice in bottom; as finds piece of candy on M's
     dressing table, 1;6.16: discovering and looking
     into box, 1;6.17: coming upon M who is furtively
     eating a cookie; finding unexpected pile of tiles
     in a corner of house.

3.   Eva, 'too tight'. From 23rd month, protest in
     situations involving physical restriction or inter-
     ference, e.g., as M holds her chin to give her medi-
     cine; pulls down her sleeves;bends her legs up to
     change diapers as she lies on back;washes her ears,
     pulls on her hands to wash them over a sink.

4.   Christy, Eva, 'heavy'. In situations involving
     experience of physical exertion (often unsuccess-
     ful) with an object, whether or not it is actually
     'heavy', e.g., Christy, from 1;9.12: carrying
     books, etc., 1;9.16: trying to lift a packet of
     oatmeal out of a box above her shoulder level; it
     is stuck; pushing on and squeezing a small plas-
     tic cup (which does not bend), 1;9.21: trying to
     lift soap bubble bottle as D holds it down. Eva,
     1;11.30: 'too heavy', trying unsuccessfully to
     unhook gas pump line on toy gas station.

around only one basic class of similarities, whether
perceptual or functional, are too restricted to account
for the rich diversity of ways in which children can re-
cognize constancies from one situation to the next.

THE STRUCTURE OF CHILDREN'S EARLY WORD-CONCEPTS

Recent theorizing about the acquisition of word meaning has been predicated in part on the assumption that children identify words with one or more stable elements of meaning. In other words, it is assumed that all the referents to which a child extends a particular word share attribute(s), whether these attributes are perceptual or functional, and that the meaning of the word can be described in terms of these attributes or features. For example, all referents for a child's word 'dog' might share the perceptual feature 'four-legged' (Clark, 1973), all referents for the word 'ball' might share the functional features 'can be rolled/bounced' (Nelson, 1974).

This recent emphasis on words for which all referents are characterized by one or more common features contrasts with earlier accounts of the acquisition of word meaning. Theorists like Werner (1948), Vygotsky (1962), and Brown (1965) emphasized that children do not consistently associate a word with a single contextual feature, or set of features; rather, they use words 'complexively', shifting from one feature to another in successive uses of the word. Bloom (1973) has suggested that both kinds of word usage may occur in early development, but not typically at the same time. She argues that the association of words (at least words for objects) with consistent feature(s) requires a firm grasp of the concept of object permanence. Complexive usage reflects lack of that concept, according to Bloom, and occurs early in the one-word stage, while consistent usage does not occur until the concept is fully established during the second half of the second year.

The data from Christy and Eva do not support Vygotsky's sweeping claim that 'complex formations make up the entire first chapter of the developmental history of children's words' (1962:70), nor are they consonant with Bloom's more qualified stage hypothesis. Both children used some words for both object and non-object referents in a consistent, noncomplexive way virtually from the start of the one-word stage. In addition, they used other words complexively, but this kind of usage was not confined to the earliest period. Rather, it tended to flower a few months after the production of single-word utterances had begun and continued on well into the third year and, for certain words, even beyond. Moreover, the children's complexive use of words was somewhat more common for words referring to actions than for those referring to objects, which does not accord well with Bloom's view that complexive usage results from lack of firm mental representations of objects. In short, the complexive and the noncomplexive uses of words were not temporally ordered stages; rather, the two types of word use were contemporaneous.

Noncomplexive Words. Some examples of words used con-
sistently for referents sharing one or more features from
early in the one-word stage are given in Table 3. Examples
1 and 2 are words for objects (cf. also examples 2 and 3 in
Table 1), while examples 3 and 4 are words for actions. The
latter two examples are particularly interesting because
they demonstrate how two children can differ dramatically
in the concepts they attach to the some word, despite what
is probably fairly similar input (see Bowerman, 1976b:135,
for discussion). Notice that Christy's word [α:] ('on'
and 'off'; it was not clear if these were two words or one,
as she did not pronounce final consonants at this time) was
overextended to refer to virtually any act involving the
separation or coming together of two objects or parts of an
object. Adults would refer to many of these acts by the
words 'open', 'take apart/out','unfold', or 'close', 'join',
'put together/in', 'fold'. Eva's word 'off', unlike
Christy's, was initially used in a restricted range of con-
texts from the adult point of view. It referred only to the
removal of clothes and other objects from the body and did
not generalize beyond this domain for several months. During
this time Eva simply did not have a way of referring to
other kinds of separation, although she engaged in activi-
ties involving separation and joining just as much as
Christy had.

Complexes. Several different types of complexive
thinking have been described in the literature on con-
cept formation (e.g., Vygotsky, 1962; Olver and Hornsby,
1966). Discussions of children's early complexive use
of words most frequently refer to the type Vygotsky
(1962) called 'chain complexes'. In forming a chain
complex, whether in a block sorting task or by the use
of a word, a child proceeds from one item to the next
on the basis of attributes shared by two or more con-
secutive items but not by all the items. In other
words, there is no stable attribute nor set of recurrent
attributes associated with the concept. For example,
item B shares something with item A (e.g., shape), item
C shares something with B (e.g., colour) but perhaps
not with A, and so on. Despite the frequency with
which children have been described as typically forming
chain complexes in their early use of words, few
examples of the phenomenon have actually been presented
in the literature.

Chain complex formation was negligible in
Christy's and Eva's linguistic development. In all the
data from both children there is only one rather limited
example. Almost all their complexive uses of words were
'associative', a pattern that Vygotsky (1962) describes

TABLE 3.   Words used noncomplexively for referents
            with shared attributes.

1.   Eva, 'ball'. From 1;1.5 for rounded objects of a
      size suitable for handling and throwing, e.g.,
      1;1.5 (first use); as spies a large round ball in
      adjoining room; then goes to pick it up, 1;1.7:
      as picks up rounded cork pincushion; then throws
      it, 1;1.9: as looks at a round red balloon; later,
      also as handles it, 1;2.4: whenever sees or plays
      with balls or balloons, 1;2.7: as holds an Easter
      egg; then throws it, 1;2.8. after picking up a
      small round stone, then throws it, 1;2.10: as sees
      plastic egg-shaped toy, 1;2.18: as holds a round
      cannister lid, then throws it; etc.

2.   Eva, 'ice'. From 1;1.9 for frozen substances,
      e.g., 1;1.9 (first use): watching M open a package
      of frozen peas; she likes to eat them, 1;2.29:
      reaching towards ice in a glass, 1;3.2:   rushing
      towards M as M takes frozen spinach from package,
      1;3.2:   after M gives her her first taste of
      frozen orange juice concentrate; etc.

3.   Christy, [ɑ:] 'on-off' (not clear if two words or
      one). From 1;3.12: in connection with situations
      involving separation or rejoining of parts, e.g.,
      between 1;3.12 and 1;4.17 in connection with get-
      ting socks on or off, getting on or off spring-
      horse, pulling pop-beads apart and putting them
      together, separating stacked dixie cups, unfold-
      ing a newspaper, pushing hair out of M's face,
      opening boxes (with separate or hinged lids as
      well as sliding drawers), putting lids on jars,
      cap on chapstick, phone on hook, doll into high-
      chair, pieces back into puzzle, while M takes her
      diaper off, trying to join foil-wrapped torn-
      apart towelettes, etc.

4.   Eva, 'off'. From 1;2.18, in connection with sepa-
      ration of things from the body only (as request
      or comment), e.g., between 1;2.18 and 1;4.22, for
      sleepshades, shoes, car safety harness, glasses,
      pinned-on pacifier, diaper, bib. Starting at
      about 1;3.23: 'open' begins to be used in other
      'separation' situations, e.g., between 1;3.23 and
      1;5, for opening doors, boxes, cans, toothpaste
      tubes; pulling pop-beads apart; taking books out
      of case, tip off door stop, wrapper off soap;
      cracking peanuts; peeling paper off book cover,
      etc.   'Off' still used for taking things off the
      body.

in connection with children's block sorting behaviour.
In an associative complex, successive instances of the
concept do not necessarily share anything with each
other but all share at least one feature with a central
or 'nuclear' instance, e.g., the sample block given to
the child. Thus, the elements of the associative complex
are '...interconnected through one element - the nucleus
of the concept'. In contrast, in the formation of
a chain complex 'the original sample has no central signi-
ficance'. In other words, 'there is no consistency in
the type of the bonds or in the manner in which a link
of the chain is joined with the one that precedes and
the one that follows it' (1962:64).

In Christy's and Eva's complexive use of words,
the central referent for a word (which will be called
here the 'prototype' to link it with a literature to be
discussed in the following section) was, with a few
exceptions, the first referent for which the word was
used. In addition, it was the referent in connection
with which the word had been exclusively or most fre-
quently modelled. (Sometimes there were several 'proto-
typical' referents for a word; these all shared the
entire set of attributes that appear to have been asso-
ciated with the word, as judged by the child's subse-
quent overextensions, and they all figured importantly
in both the adult's modelling and the child's earliest
uses of the word.) Other referents appear to have been
regarded as similar to the prototype by virtue of
having any one or some combination of the attributes
that, in the child's eyes, characterized it.

Some examples of complexive word usage that
can be characterized in terms of variations around a
prototype are given in Table 4. Consider example 1,
Eva's use of 'kick'. Some of the referents for this
word seem to share nothing with each other, e.g., a
moth fluttering vs. bumping a ball with the wheel of
a kiddicar. But all share something with the hypo-
thesized prototypical 'kick' situation, in which a
ball is struck by a foot and propelled forward. For
instance, the moth is characterized by 'a waving
limb', while the kiddicar referent is characterized by
'sudden sharp contact' plus 'an object (ball) propelled'.
(In this example, prototypical 'kick' was not first
referent for the word, as in most of the other examples.
However, it seems to be implicit in the second referent
(a cat with a ball near its paw) and it was almost
certainly the most frequently modelled referent for
'kick'.)

Example 2 in Table 4 illustrates that for
Christy, 'night night' was associated with three primary
features that were present one-at-a-time in many of the
situations in which she used the word: beds or cribs,
blankets, and the 'nonnormative' horizontal posi⁺ⁱ

TABLE 4.   Complexively used words with prototypical referents.

1. Eva, 'kick'.

Prototype: kicking a ball with the foot so that it propelled forward.

Features: a) a waving limb, b) sudden sharp contact (especially between body part and another object), c) an object propelled.

Selected examples: 1;5.14: as kicks a floor fan with her foot (Features a, b), 1;5.21: looking at picture of kitten with ball near its paw (all features, in anticipated event?), 1;5.25: watching moth fluttering on a table (a), 1;5.22: watching row of cartoon turtles on TV doing can-can (a), 1;6.3 and 1;6.13: just before throwing something (a, c), 1;6.20: 'kick bottle', after pushing bottle with her feet, making it roll (all features), 1;8.6: as makes ball roll by bumping it with front wheel of kiddicar (b, c), 1;8.7: pushing teddy bear's stomach against Christy's chest (b), 1;8.19: pushing her stomach against a mirror (b), 1;8.20: pushing her chest against a sink (b).

2. Christy, 'night night'.

Prototype: person (or doll) lying down in bed or crib.

Features: a) crib, bed, b) blanket, c) non-normative horizontal position of object (animate or inanimate).

Selected examples: 1;3.28 (first use): pushing a doll over in her crib; from this time on, frequent for putting dolls to bed, covering, and kissing them (features a, b, c); 1;4.5: laying her bottle on its side (c), 1;5.18: watching Christmas tree being pulled away on its side (c), 1;5.26: after puts piano stool legs in box, one lying horizontally (c), 1;5.27: after putting piece of cucumber flat in her dish and pushing it into a corner (c), 1;6.3: as M flattens out cartons, laying them in pile on floor (c), from 1;6.3: while looking at pictures of empty beds or cribs or wanting a toy bed given to her (a, sometimes b), 1;6.31: laying kiddicar on its side (c), 1;7.11: 'awant night night', request for M to hand her blanket; she then drapes it over shoulders as rides on toy horse (b).

TABLE 4 continued

3. Eva, 'close'.

    Prototype: closing drawers, doors, boxes, jars, etc.

    Features: a) bringing together two objects or parts
    of the same object until they are in close contact,
    b) causing something to become concealed or in-
    accessible.

    Selected examples: starting from 1;3.23 for closing
    gates, doors, drawers (features a, b). From 1;5:
    for closing boxes and other containers (features
    a, b), 1;6.16: 'open, close', taking peg people out
    of their holes in bus built for them and putting
    them back in (a), from 21st month: while pushing
    handles of scissors, tongs, tweezers together and
    for getting people to put arms or legs together,
    e.g., 'close knees' (a), 1;8.18: 'close it', as
    tries to push pieces of cut peach slice together
    (a); trying to fold up a towlette (a, (b?)), 1;8.25:
    'open, close', as unfolds and folds a dollar bill
    (a, (b?)), 1;9.16: 'open, close', after M has spread
    a doll's arms out then folded them back over chest
    (a), 1;11.8: 'Mummy, close me', 2;1.9: 'I will close
    you, o.k.?' both in connection with pushing chair
    into table (a),1;11.14: 'that one close', trying to
    fit piece into jigsaw puzzle (a, (b?)), 1;11.30: 'I
    close it', as turns knob on TV set until picture
    completely darkens (b), etc.

4. Christy, Eva, 'open'.

    Prototype: opening drawers, doors, boxes, jars, etc.

    Features: a) separation of parts which were in con-
    tact, b) causing something to be revealed or become
    accessible.

    Selected examples:

    Christy: From middle of 17th month, 'open' starts
    to take over the function of 'off' (see example 3,
    Table 3) for 'separation' situations, both with and
    without 'revealing'. 1;4.12 (first use): for cup-
    board door opening (a, b), 1;4.19: pointing to
    spout in salt container that M had just opened (a,
    b), 1;4.28: trying to separate two frisbees (a),
    1;5.1-7: for opening boxes, doors, tube of ointment,
    jars (a, b), 1;5.26: trying to push legs of hand-
    operated can opener wider apart than they can go;
    spreading legs of nail scissors apart (both a),
    1;6.1: several times in connection with pictures

TABLE 4 continued

in magazine; wants M to somehow get at the pictured
objects for her (b), 1;6.29: request for M to un-
screw plastic stake from a block (a), 1;6.31: re-
quest for M to take out metal brad that holds 3 flat
pieces of plastic together (a), 1;7.10: request for
M to take stem off apple (a), 1;7.17: 'awant mummy
...open', request for M to pry pen out of piece of
styrofoam (a), 1;7.20: request for M to take pegs
out of pounding bench (a), 1;7.20: 'awant open
hand', request for M to take leg off plastic doll
(a), 1;7.23: request for M to turn on electric
typewriter (b), 1;7.25: trying to pull pop beads
apart (a), 1;8: request for M to turn on water
faucet (b), 1;8.5: request for M to take pieces
out of jigsaw puzzle, (a, (b?)), 1;8.6: trying to
get grandma's shoe off her foot (a), 1;8.17: 'open
light', after M has turned light off; request to
have it turned on again (b), 1;9.6: 'awant that
open', trying to pull handle off of riding toy (a),
etc.

Eva: (cf Table 3, example 4 for initial uses).
Later, 1;5.20: request for M to take apart a broken
toothbrush (a), for M to pull apart two popbeads
(a), 1;5.28: request for M to take pieces out of
jigsaw puzzle (a, (b?)), 1;6: pulling bathrobe off
M's knee to inspect knee (a, b), 1;6.9: request for
M to turn TV on (b), 1;6.18: 'open tape', request
for M to pull strip off masking tape (a), 1;7.10:
'open tangle', bringing M pile of tangled yarns to
separate (a),1;7.14: taking stubby candle out of
shallow glass cup (a), 1;8: 'open mommy', trying
to unbend a small flexible 'mommy' doll (a), 1;8.11:
unfolding a towlette (a, b); 1;9.16: 'open slide',
request for M to set slide in yard upright (a,
(b?)), 1;8.19: request for M to put legs apart (a)
1;10.20: 'I'm open it', after rips apart two tiny
toy shoes that were stuck together (a), 2;0.3: 'my
knee open', as unbends her knee (a); 2;2.1: 'I will
open it for you', before taking napkin out of its
ring for M, does not unfold it, then says 'I open
it' as report on completed action (a), 2;7.29: 'I'm
gonna leave this chair open like this, I'm not
gonnal shut it', as leaves table with chair pulled
out (a), etc.

5. Eva, [gi] (from 'giddiup')

    Prototype: bouncing on a spring horse

    Features: a) horse (later, other large animals and
    riding toys which one sits astraddle). b) bouncing
    motion, c) sitting on toy (especially astr̶a̶d̶)̶

TABLE 4 continued

    Selected examples: From 1;2.9: while bouncing on spring-horse or as request to be lifted onto it (a, b, c), 1;2.13: as picks up tiny plastic horse, then tries to straddle it (a, c), 1;2.14: getting on toy tractor (c), 1;2.15: looking at horses on T.V. (a), 1;2.17: getting on trike (c), 1;2.17: seeing picture of horse (a), 1;2.20: bouncing on heels while crouching in tub (b), 1;2.23: climbing into tiny plastic blow-up chair (c), 1;2.24: looking at hobby horse (a), 1;2.30: bouncing astraddle on M's legs (b, c). Later, continues to be used for pointing out horses, generalizes to other large animals like cows, and while pointing out or riding on trikes, tractors, kiddicars.

6.   Eva, 'moon'

    Prototype: the real moon

    Features: a) shape: circular, crescent, half-moon. These shapes were distinct, i.e., a stretch of curved surface not enough to elicit 'moon'. b) yellow colour, c) shiny surface, d) viewing position: seen at an angle from below, e) flatness, f) broad expanse as background.

    Selected examples: (see Table 1, example 1 for details and dates): real moon (all features); half-grapefruit seen at an angle from below (a, b, d); lemon slice (a, b, e); dial on dishwasher (a, c, d, e, f); shiny leaf (a, c, e); ball of spinach (a), spheres were usually called 'ball'. (There was perhaps a limited chaining effect here to the leaf, e.g. earlier in the day, through shared greenness); crescent-shaped paper (a, b, e); inside of lamp shade (a, b, d); pictures of vegetables on wall (a, b, d, e, f); circles on wall hanging (a, d, e, f); crescent-shaped orange blinker light (a, (b?), c, e); steer horns on wall (a, d, f); letter D on refrigerator (a, d, e, f); half-cheerio (a, (b?)); kidney-shaped paper on wall (a, d, e, f); hangnails (a, e).

an object that is usually oriented vertically. These three features are all present in prototypical 'night night' situations in which a normally vertical person is lying down in bed covered with a blanket.

For both children, 'open' was associated with a feature involving the physical separation of two objects or parts of the same object and a feature to do with something being revealed, while 'close' was associated with the opposite features of bringing together and concealment (see examples 3 and 4 in Table 4). Both members of each pair of features co-occur in prototypical 'open' and 'close' situations involving doors, boxes, drawers, jars, etc. They are found separately in such referents as turning on or off a TV, water faucet, or light (revealing and concealing without separation and joining) and taking things off or apart and putting them on or together, such as taking the stem off an apple and buckling a wrist strap (separation and joining without revealing and concealing). Examples 5 and 6 of Table 4 present similar examples of complexive word usage revolving around prototypical referents.[1,2]

Instances of complexive word usage similar to those discussed here have been remarked on by a few other investigators. For example, Labov and Labov (1974) observed that their daughter apparently identified the word 'cat', one of her first two words, with a set of features all of which characterize ordinary cats. She overextended the word to other animals that possess one or some of these features, but seemed more confident in using the word when many of the features were present. Clark (1975) notes that there are similar exemplars in the diary data from which she has drawn. She has modified her original (1973) theory of children's overextensions to account for this kind of usage by postulating that some overextensions are 'partial' rather than 'full', i.e., they are based on only a subset of the features that the child associates with the word (Clark, 1975).

To summarize, the data presented above indicate a) that children are capable of using words noncomplexively from the start of word acquisition and b) that many children's 'complexive' word usages, rather than conforming to the traditional notion of an unstructured 'chain' of constantly shifting meanings, in fact reflect an internal structure describable in terms of a set of variations around a central instance (or instances) that may be termed a 'prototype'.

These findings suggest that there is less discontinuity between child and adult methods of classification than has often been supposed. First, the data from Christy and Eva provide evidence for an early ability to classify according to superordinate features (i.e., features characterizing all concept instances), a type of concept formation often thought to be beyond the capability even of children considerably older than they were at this time (e.g., Vygotsky, 1962). Second, the particular type of conceptual structure exhibited·

in their complexive use of words, a set of variations around one or more prototypical exemplars, does not reflect a 'primitive' mode of thought that later fades out. Rather, as recent research has demonstrated, a large number of adult semantic categories are characterized by this kind of structure (e.g., Rosch and Mervis, 1975). The correspondence between Christy's and Eva's complexive word usages and the internal structure attributed to adult semantic categories by Rosch and others will be examined more closely in the following section.

THE ORGANIZATION AND STORAGE OF WORD MEANING

A number of investigators studying concept formation, the structure and/or acquisition of word meaning, or semantic memory have recently focused attention on the role played by 'prototypes' or 'best exemplars' in the internal structure of natural categories (e.g., Rosch, 1973a, b; Rosch and Mervis, 1975; Fillmore, n.d.; Anglin, in press; Smith, Shoben, and Rips, 1974). Rosch (1973b), for example found that adult subjects were able to rate exemplars of particular semantic categories such as 'fruit' according to how well they exemplified the category, and agreed with one another in their ratings.

Some theorists have suggested that the representation of semantic categories (word meanings) in terms of prototypical exemplars should be regarded as an alternative to the more common practice of representing word meanings as sets of semantic features. For example, Fillmore (n.d.) argues that it may often be psychologically inaccurate to describe word meanings in terms of sets of features specifying conditions that must be satisfied before the word can be appropriately used. He proposes instead that 'the understanding of meaning requires, at least for a great many cases, an appeal to an exemplar or prototype -- this prototype being...possibly something which, instead of being analyzed, needs to be presented or demonstrated or manipulated'. Anglin (in press), writing with specific reference to very young children, also suggests that word meanings are often stored in the form of prototypes or visual schemas that are not analyzed into components.   In making this proposal he draws upon Posner (1973), who has argued that being able to analyze a concept into a set of attributes or features is a relatively advanced skill, whereas the formation of prototypes is a more primitive process that does not require featural analysis.

The data presented in the last section indicate that accounting for referential prototypes does not have to be done at the expense of a featural analysis. Instead, both models can and should be combined,

as Rosch and Mervis (1975) have also argued. The data
indicate in addition that, contrary to Anglin's argu-
ment, even very young children are capable of performing
a featural analysis upon a prototypical referent and ex-
tending a word to novel referents on the basis of this
analysis.

According to the model proposed by Rosch and
Mervis (1975), explaining the existence of prototypical
referents requires reference to the way in which fea-
tures or attributes of possible referents are distrib-
uted within the category. Their model draws on Wittgen-
stein's (1953) notion of 'family resemblances'. Accord-
ing to Wittgenstein, possession of common elements is
not the sole principle by which the referents for words
may be linked together under a single concept; rather,
for many words each possible referent has at least one
and often several elements in common with one or more
other referents, but no, or few, elements are shared by
all referents. Rosch and Mervis hypothesized that the
degree to which items are viewed as 'prototypical' mem-
bers of the category labelled by a particular word is a
function of the number of attributes they have in common
with other referents for the word. As a corollary of
this, they hypothesized also that the most prototypical
referents for a given category would tend to share many
attributes with each other. These hypotheses are sup-
ported by findings from a wealth of experimental studies
that Rosch and Mervis conducted with adults.

The data from Christy and Eva fit the 'family
resemblances' model proposed by Rosch and Mervis very
well. It will be recalled that for virtually all of
Christy's and Eva's complexively used words, there was
one referent (or, occasionally, a small group of re-
ferents) that had one or more features in common with
every other referent. In other words, in one (or a
few) referent(s), the various attributes associated with
the word, as judged by the way in which the child ex-
tended the word to novel items, co-occurred or clustered
to the maximum degree possible.

How do categories structured around proto-
typical or 'best' exemplars arise? Rosch (1973b, 1974)
has argued that the prototypes for certain categories,
particularly physiologically determined ones, are salient
prior to the categories and determine the nature of the
categories. However, she doubts that all categories
evolve in this manner. Some alternative sequences would
be a) prototypes are formed through principles of infor-
mation processing subsequent to experience with a number
of particular instances of their categories (Rosch, in
press) and b) frequency of exposure to given instances
'may make some items salient in a not-yet-organized-
domain and may influence how that domain comes to be
divided' (1973:143).

The complexive categories represented in the data from Christy and Eva appear to reflect the first-and/or last-mentioned sequence. That is, the proto-typical referent was present from the beginning and constituted the core around which the subsequent category grew, rather than being an induction made later on the basis of diverse exemplars of the category. It is difficult to assess the relative importance of language-independent cognitive activity vs. linguistic input (e.g., frequency of exposure) in drawing a child's attention to particular objects or events such that they become the growing point or prototype for a category. For some of the examples in Table 4, it seems most plausible that a particular referent for a word became more salient than other referents primarily because of the relatively greater frequency with which the word was paired with that referent in the input to the child (e.g., kicking a ball for Eva's 'kick'). For other examples, a referent may have been so salient for non-linguistic reasons that the input did no more than supply the child with a word for an item that already had special status on nonlinguistic grounds and was 'ready', in a sense, to serve as a prototype (e.g., the moon, for Eva's 'moon').

Regardless of whether prototypical referents are salient for the child independently of, or because of, linguistic input, the sequence in which complexive categories structured around a prototype appear to develop is as follows: The child hears a word modelled most frequently (often exclusively) in connection with one referent or a small group of highly similar referents: e.g., 'night night' as the child or a doll is put to bed, 'giddiup' as the child bounces on her horse, 'close' as someone closes doors, boxes, jars, 'moon' as the child looks at the real moon or at pictures of the moon. The child's first use of the word also occurs in connection with one of these referents. After a variable period of time (ranging from a few days to more than a month), the child begins to extend the word to referents that are similar to the original referent(s) in specifiable and consistent ways.

What has happened? A plausible inference is that the child has imposed a featural analysis on the original referent such that she is now capable of re-cognizing two or more of its attributes independently, i.e., in situations in which they do not co-occur blended into a single package but rather are recom-bined with entirely different contextual features. For example, the 'bringing together' of parts and the con-cealment of something, which are intimately connected in prototypical 'close' situations, can now be re-cognized independently of each other, each one being associated with the word 'close'.

The attributes that the child comes to re-
cognize as components of a given prototypical referent
may be quite varied in nature. Some that are rep-
resented in the Christy and Eva data as presented in
Table 4 include perceptual properties or configurations
(e.g., flatness, yellowness for 'moon'; horse, or horse-
like animal for [gi]); associated actions (e.g.,
bouncing for [gi]); spatial relationships (e.g., hori-
zontal positioning of normally vertical object for
'night night'; separation for 'open'); purpose or end
state (e.g. concealment for 'close'); the child's
viewing position (e.g., obliquely from below for 'moon'),
and so on.

The account presented above of the development
of categories revolving around prototypical exemplars is
at odds with proposals made by Anglin (in press) and
Fillmore (n.d.) in that it credits the very young child
with the capacity to perform a featural analysis on a
referent.[3] As noted earlier, Anglin (in press) suggests
that prototypes may be stored unanalyzed as visual
images. But if the prototype is unanalyzed, how can we
account for the child's ability to recognize attributes
of an original referent when they are separated from
each other and recombined in entirely new configurations?
In particular, an appeal to a global notion of 'visual
similarity' is inadequate to explain the child's ex-
tension of words to referents that are visually quite
dissimilar to the prototype, such as 'open' for turning
on a faucet, light, or electric typewriter as well as
for opening boxes and doors.

Another aspect of early word use that appears
to require reference to the individual features of a
prototype is the fact that some aspects of a prototypi-
cal exemplar may be more central or concept-defining for
the child than others. The evidence for this is that
the attributes of a prototype may turn up in new re-
ferents for the word with differing probabilities. Some
may always be present and hence appear to be criterial,
while others are simply characteristic but not essential.
For example, consider Eva's use of 'moon' as it is pre-
sented in Table 4. Shape was obviously the most import-
ant determinant of whether or not a given item would be
called 'moon': every referent for the word was either
round, half-moon, or crescent shaped. But in addition
to shape, almost every referent for 'moon' shared with
the prototypical real moon one or a combination of sev-
eral other less critical features: flatness, yellow-
ness, shininess, having a broad expanse as a background,
and being seen at an angle from below.

Variation in the centrality or importance of
various attributes of a prototype cannot be accounted
for when word meanings are represented as unanalyzed

wholes. In contrast, it can easily be handled by
models that represent word meanings in terms of seman-
tic features. For example, Smith et al. (1974) propose
a model of word meaning that is similar to that sug-
gested by Rosch and Mervis (1975) with the additional
specification that semantic features should be differ-
entially weighted according to their degree of 'de-
finingness' for a category. Such a provision appears
essential if we are to account for phenomena like Eva's
use of 'moon'.

CONCLUSIONS

Three main arguments about the nature and de-
velopment of children's early word meanings have been
advanced in this paper. A common element linking all
three has been an appeal for breadth and for the in-
tegration of theories that by themselves account for
only a portion of the data. An adequate theory of the
acquisition of word meaning must be sufficiently broad
and flexible to handle many disparate phenomena with
equal ease within a common framework. In particular,
it must come to terms with the following findings:
1) Children need not adhere to a single classification-
al principle in the early stages of word acquisition
(e.g., using only perceptual or only functional cues).
Rather, they are capable of recognizing invariances of
many different kinds, and consequently have a variety
of methods of classification at their disposal.
2) The concepts governing children's early use of words
are not necessarily either exclusively complexive, as
earlier theorists maintained, or exclusively super-
ordinate (i.e., with features held in common by all
members of the category), as recent theorists have
implicitly assumed. Nor do superordinate categories
necessarily replace complexive ones over time. Rather,
concepts of both types can exist contemporaneously,
neither one being more 'primitive' than the other.
Finally, 3) the representation of children's word mean-
ings in terms of feature sets or lists of conditions
that must be satisfied is not incompatible with rep-
resentation in terms of prototypes or 'best exemplars'.
Rather, both can and should be incorporated within a
single model, just as Rosch and Mervis (1975) have
advocated in connection with adult semantic categories.

Notes.

1. The characterization presented in this paper of the
'semantic features' associated with various words
is intended as schematic rather than definitive,
for two primary reasons. First, the extent to which
certain features should be broken down is not clear.
E.g., should 'sitting' and 'astraddle' be listed

separately in the meaning of [gi]? Should 'horse'
be given as a unitary feature of [gi] or should it
receive some finer analysis? Second, it is obvious
that an adequate representation of the meanings of
these words must involve more than a listing of
features; some sort of relationship holding between
the features must be specified. For example, the
temporal co-occurrence of a waving limb and sudden
contact would not be sufficient to elicit 'kick':
the two must be connected. No attempt at dealing
with these problems will be attempted here, however
(but see the treatment of relationships holding
between semantic components in Haviland and Clark,
1974; McCawley, 1971, and other linguists).

2. A number of Christy's and Eva's overextensions of
verbs reflect their awareness of cross-situational
similarities or invariances that are not explicitly
recognized in the way English words are used but
that are formally noted in the way other languages
group referents under lexical items. For example,
one 'opens' the water in Spanish and one 'opens'
the TV or radio in Finnish. An interesting re-
search question is whether there is a correlation
between the frequency with which children make cer-
tain overextensions in one language (e.g., 'open'
for the water faucet in English) and the frequency
with which the corresponding classification is
formalized in other languages. A high correlation
would indicate a close relationship between the cog-
nitive factors governing the way in which children
classify, i.e., what similarities among objects or
events are salient to them, and the way in which the
semantic categories of natural languages develop.
See Clark (1974a) for some related evidence support-
ing the hypothesis that there is a relationship be-
tween children's overextensions and the semantic
categories of natural languages.

3. There may appear to be a discrepancy between the
claim made here that the child can analyze referents
for words like 'open' into sets of attributes at an
early age and the claim made in an earlier paper
(Bowerman, 1974) to the effect that causative verbs
(including 'open') are initially 'unanalyzed' by the
child. In fact, however, the two arguments are not
incompatible because the objects of analysis in the
two cases are different: the referent event in the
case of 'semantic features' of the sort discussed in
this paper and the word itself, in terms of its
semantic relationships to other words, in the case
of the discussion of causative verbs. See Bowerman
(1976a) for further discussion of this distinction,
which corresponds to the distinction linguists have

often made between two aspects of meaning, <u>reference</u> (the relationship of a word to the (class of) item(s) which it symbolizes) and <u>sense</u> (the relationship the word contracts with other words in the lexicon) (e.g., Lyons, 1968).

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