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THE COGNITIVE BASIS OF CLASSIFIER SYSTEMS

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There have been two general hypotheses about the composition of noun classes in a classifier system. Works such as Allan (1977) and Adams and Conklin (1973) focus on the inherent properties which all (or at least most) of the members of a class share and try to provide an exhaustive list of the semantic features which serve as the basis for classification in natural language. They explain the recurrence of particular features in different languages on the basis of human perceptual faculties, explicitly treating noun classes as cognitively-based categories. Denny (1976), on the other hand, sees classifiers as a means of partitioning the world into a set of functional classes. "Nouns have more to do with what is out there in the world, and classifiers more to do with how humans interact with the world" (Denny 1976). Noun classes are socially determined categories, and class assignment is made on the basis of an object's primary social function.

Each of these two perspectives accounts for a certain range of the known facts about classifier systems. In particular, a cognitive approach provides the clearest explanation for the frequent similarities between the (inanimate) noun classes in widely varied languages, while a social/functional approach more effectively deals with classifiers of social rank, which are based on status rather than 'inherent' characteristics. However, some of the predictions made by a strong version of each claim are incompatible with the other view. In this paper I show that the two views of classifier categories are not incompatible, but complementary. In essence, I claim that classifiers set up socially-based cognitive categories -- ultimately deriving from basic level categories.

A classifier is an independent morpheme which "denotes some salient perceived or imputed characteristic of the entity to which the associated noun refers" (Allan 1977). The most common type of classifier (and the type which I am primarily concerned with) is the numeral classifier, which is so named because it occurs obligatorily (between the number and the noun) in counting constructions. The closest thing English has to classifiers occurs in measure phrases such as:

8 head of cattle
5 sheets of paper
9 gallons of gas

The word which immediately follows the numeral picks out some characteristic of the noun that is being counted. Sheet tells us that paper is flat, two-dimensional: it can only occur with

TABLE 1

Semantic Features of Noun Classification (Allan 1977)

1. Material
   a. animacy
   b. abstract nouns
   c. material
2. Shape
   a. saliently one-dimensional
   b. two-dimensional
   c. three-dimensional
3. Consistency
   a. flexible
   b. hard or rigid
   c. non-discrete
4. Size
5. Location
   a. inherent location
   b. contingent location
6. Arrangement
   a. objects in specific, non-inherent configuration
   b. position
   c. objects in non-inherent distribution
7. Quanta

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nouns having this property. In a classifier language, this type of construction is generalized to include what would be count nouns in English. A prototypical example is Mandarin Chinese.

liang <u>zhi</u> qianbi	'two (long-thing) pencils'
yi <u>ben</u> shu	'one (flat) book'

The most comprehensive cross-linguistic examination of classifier systems was made by Allan (1977). Allan looked at the noun classes in more than 50 languages and compared the kinds of things that were grouped together by classifiers. He found a small set of features which appeared again and again as the "defining criteria" for noun classes. These features are listed on Table 1.

Allan (1977) notes that, with a few exceptions, these properties which are picked out by noun classifiers are 'inherent' properties of an object rather than contingent ones. The exceptions (5b, 6, and 7) serve as the basis of categories in non-classifier languages as well, while categories based on the first five properties are found only in classifier languages[1]. These results suggest that the distinguishing feature of a classifier language is having a system which groups nouns according to their inherent characteristics.

Allan's claim is actually much stronger than simply that classifiers group nouns by inherent properties. His very specific list of features (Table 1) limits the range of possible classifier systems fairly radically. What is most interesting is that a majority of the properties are either visual or tactile, to the exclusion of smell, taste, and sound. The shape of an (inanimate) object is by far the most common basis for its classification. Nearly every classifier language has a classifier for long skinny objects (i.e. objects which are extended in one dimension), and classifiers for flat (two-dimensional) and round (three- dimensional) objects are also very common. Adams and Conklin (1973) go so far as to say that (besides animacy) extension in one-, two-, or three- dimensions is the only "primary" basis for noun classes, the other features being "secondary" parameters which are used in combination with shape to increase the number of classes[2]. They quip, "the semantics [of classifiers]...are observable to those who have eyes to see (the nose to smell is not necessary)."

Even within the two prominent sense domains not every possible criteria is picked up on. For instance, color is not an attribute on which classification can be based. Therefore, we should not find a language which has a noun class consisting of only green things[3]. The reason that color is not a good basis for classification (although it is often an inherent characteristic) may be that it is much more subject to recognition error. Color changes in different light conditions, while an object's shape remains constant. Allan (1977) points out that the properties on his list are not coincidentally those which Locke identified as the "primary qualities of bodies." Joseph Greenberg has also pointed out that you rarely find color in the dictionary definition of an object, but always a description of its shape.

As an added bonus, the properties on Table 1 can be independently verified as cognitively salient. For example, Eve Clark (1976) has shown that these same features serve as the basis for children's over-extension of lexical items during acquisition. "The basis for categorization discernible in the child's early uses of words often bears a strong resemblance to that found in actual classifier systems. In both, visual perception appears to play a major role in determining category membership" (Clark 1976). The most frequent over-extentions are based on shape, e.g. the word moon to all round objects, or stick to all long objects. And "one notable absentee from the kinds of over-extension found in children's speech is color" (Clark 1976).

All of these findings support an explanation for classifier semantics which resides in the perceptual apparatus of the human species. "The properties chosen as criterial for category membership...are presumably those that are most salient...These natural categories may be universal precisely because they have a common cognitive basis" (Clark 1976). This perceptual basis of classification negates the extreme cultural relativism which might be construed from the superficial diversity of attested systems. Classifier systems around the world differ only in which perceptual data they choose to pick out. As Brown and Lenneberg (1954) put it: "In general it looks as if there is a potential for sensory discrimination characteristic of the whole human species. Language communities do not differ in this potential but rather in their manner of categorizing potentially discriminable experience."

Importantly, this difference in manner extends not only to the choice of noun classes, but also to the assignment of a given object to a particular class. Claiming that classifier categories have internal consistency is not the same as claiming that the class of an object is predictable. "The relationship between noun and classifier...is typically explicable, but not always predictable..." (Allan 1977). Every object has a large number of discernible characteristics, and languages can differ in their choice of which features are important for classificatory purposes. For example, the word for 'table' might be put into the class of three-dimensional objects (as it is in Malay), but is more often classed as two-dimensional since the (flat) functional surface is its important characteristic.

Often the decision is based on a conventional image that the culture has of the object in question. In Mandarin, yizi 'chair' is classified with objects that have handles (ba) -- because traditional Chinese chairs have handles on them. In some cases, a language does not make a conventional decision about salient features, and the choice is left to the speaker. Different features are salient in different situations, so a given noun can take more than one classifier, depending on which feature the speaker wishes to highlight (cf. Table 2).

The indeterminacy of classification and the role of conventional imagery creates a situation in which classes can (and almost invariably will) lose their semantic transparency. Once Chinese speakers become familiar with handleless chairs, the ba class is not limited to objects with handles. And if the cultural image is lost over time, the class becomes even more opaque. The apparent arbitrariness of the noun classes in a language like, e.g., Dyirbal (Dixon 1982) is not a problem for

TABLE 2. Burmese (Becker 1965)

myi?te ya?	'river one place' (e.g. destination)
myi? te tan	'river one line' (e.g. on a map)
myi? te hmwa	'river one section' (e.g. a fishing area)
myi?te 'sin	'river one distant arc' (e.g. a path)
myi? te owe	'river one connection' (e.g. tying two villages)
myi? te 'pa	'river one sacred object' (e.g. in myth)
myi? te myi?	'river one river' (the unmarked case)

this type of analysis as long as the features on Table 1 are not taken as strict necessary and sufficient conditions on membership, but rather as the basic distinction between classes[4].

A much more problematic area for the cognitive/perceptual analysis presented here is that of animacy. Every classifier language has an animacy distinction, often with more than one animacy class. Even English has a residual animacy distinction in words like someone vs. something or everyone vs. everything (Allan 1977). But as Allan (1977) points out, animacy is not an inherent characteristic of an object but an 'imputed' one, and is futhermore highly culture specific.

The only way to make animacy fit into the picture as I have painted it so far is to claim that animacy distinctions are made by means of certain discernible properties, and that languages differ only in which properties they pick up on. In some cases animacy distinctions *are* clearly made on the basis of perceivable 'inherent' charateristics. Objects which seem to move on their own (e.g. cars) are often considered animate, and mammals are frequently 'more animate' than other animals (presumably due to a genetic closeness to humans). However, these are marked cases. More frequently, animacy hierarchies extend into the social order. In many societies, people in different social classes are assigned to different classifiers. The basis for the distinctions within a society are most often age, occupation, and kinship. The cultural pantheon also plays an important role.

Jacaltec Animate Classes (Craig 1986b)

cuman	male diety	cumi?	female diety
naj	male non-kin	ix	female non-kin
ho?	male kin	xo?	female kin
ho?-ni?an	young male kin	xo?-ni?an	young female kin
unin	infant	ya?	respected person

It is interesting, and most damaging for the theory so far, that sex is never used as a primary distinction between classes (in the sense discussed above, cf. note 2). Clearly, a person's social class is not an inherent feature which is apparent by either visual or tactile means.

A much more satisfying treatment of animacy classes is given in Denny (1976). Denny suggests that the motivation behind all classifier systems is primarily a functional one. Classifiers "communicate a few especially important classes that objects fall into by virtue of the way we interact with them" (Denny 1976). The animacy distinctions within the society, he claims, are made because members of the society must *act* differently according to the social class (or kinship relation) of the person with whom they are interacting. Classifying people differently picks out this distinction[5]. His idea receives some support from the fact that languages which have classifiers based on social rank are typically spoken in highly stratified societies (e.g. Vietnamese, Burmese).

Denny (1976) points out that even inanimate classes are ultimately grounded in our interaction with the objects. "Whereas 'a river is a river is a river', one can by changing classifier convey some particular kind of interaction with a river [cf. Table 2]" (Denny 1976). Tables are most often classed with two-dimensional objects because we interact with their surface. This perspective not only explains what classifiers are "good for", but also the motivation for which feature a language (conventionally) chooses as salient for classification.

Denny (1976) claims that there are (inanimate) classifiers based solely on functional interaction, i.e. in which the function of an object is the only basis for its classification.

Burmese

the	clothing for the body (not head or footwear)
si	means of transportation

Gilbertese

kai	trees, plants, land sections, fish hooks (glossed as 'means of subsistence')

The importance of these examples is not only that the classes fall outside the list on Table 1, but that they are not based at all on inherent characteristics of the objects being classified. They appear, like animacy classes, to be the strongest kind of counterexample to a cognitive analysis.

The weakness of Denny's social/functional approach is the stronghold of a cognitive analysis, just as his theory succeeds where the cognitive analysis is weakest. Allan (1977) restricts the set of possible systems, but Denny (1976) brings back cultural relativity in full force. There is in principle no restriction on functional classes, since there is no restriction on possible cultural functions[6]. In order to integrate the two different views of classifiers, and gain the advantages of both, we have to explain why the properties on Table 1 are (at least frequently) associated with functional interaction. The most obvious suggestion is that Table 1 properties are the only ones which determine how we interact with objects.

Actually, this solution does not seem totally unreasonable. The shape and material consistency of an object are obviously important to the use(s) to which it is put. On the other hand, there are no cases where our interaction with an object is different depending on its color (except, I suppose, stoplights), so there are no classifers based on that feature. Another indication that we may be on the right track is given by Plank (1980), who claims that the properties relevant for classification are also the only semantic features on the basis of which verbs can select their objects. For example, the

TABLE 3. Jacaltec Inanimate Classifiers (Craig 1986b).

no?	animal	metx'	dog
te?	plant	ixim	corn
		tx'al	thread
		tx'an	twine
		k'ap	cloth
ch'en	rock	atz'am	salt
ha?	water		
ka?	fire		

English verbs eat and drink differ only in the consistency of the object consumed -- and consistency is on Table 1.

Craig (1986b) provides an important clue to the link between cognition and functional interaction in her analysis of the classifier system in Jacaltec, a Mayan language. Craig explored the quite reasonable idea that two different modes of classification -- a classifier system and a folk taxonomy -- might be related. She found that classifiers in Jacaltec serve to create "a magnifying glass effect" on important sections of the folk taxonomy. The biological domains which are most functionally significant to the community are singled out by their own noun classifiers. The important features of the Jacaltec system can be seen on Table 3.

The set of "physical interaction" classifiers in Jacaltec can be divided into two types: general and specific, corresponding to the left- and right- hand columns of Table 3 respectively. "A specific classifier can...be said to correspond to an object which is naturally in a relation of inclusion...to one of the general classifiers, but has come to function as head of a class of its own" (Craig 1986b). So while a single classifier (te?) covers most plants, corn, in all its varieties, has a distinct classifier (ixim, homophonous with the noun 'corn'). Similarly, in the animal kingdom Jacaltec has a general animate classifier (no?), but dogs are classed separately (metx'). Craig (1986b) provides ethnographic evidence that dogs and corn are important cultural commodities for the Jacaltec. The classifier for each noun refers to the category which is superordinate (i.e. one level up the taxonomy) to the category of the classified object. What is interesting is not only that classifiers increase in the culturally important areas, but also that the most functional, most frequently occurring classifiers correspond to the basic level of the taxonomy.

To see the significance of the Jacaltec data we need to think about what the work on folk taxonomies and on basic level objects in general has told us. Brent Berlin and his colleagues have studied the ways in which different cultures view the biological order of the world. Their main method of study is to look at the lexicon of the languages spoken by these cultures to see how they named the species, orders, and sub-species around them. They found that languages always develop (single morpheme) words first for the genus level, and that it was also at this level where the folk taxonomy was most similar to the accepted scientific one. The explanation offered by Berlin (1972) was essentially a cognitive one. The level of genus, he speculated, was the level at which a person could most easily identify a member of the category by visual cues. This is the level at which the basic discontinuities of nature are most easily perceived. Differentiation into species often requires a closer look, and at higher levels of the taxonony, the similarities are less marked.

Later work by the psychologist Eleanor Rosch and others has confirmed that there is a "basic level" of classification in several domains at which the number of co-occuring features is maximized:

> "In taxonomies of concrete objects, there is one level of abstraction at which the most basic category cuts are made. Basic categories are those which carry the most information, possess the highest category cue validity, and are, thus, the most differentiated from one another" (Rosch et al. 1976).

One of the main characteristics of the basic level objects is that they are "the most inclusive categories for which a concrete image of the category as a whole can be formed." Also, there tends to be a generalized motor program associated with interacting with the class as a whole. So, for example, chair is a basic level category while furniture is superordinate. Rosch's experiments have shown that it is hard to create and to identify a generalized image for pieces of furniture, but easy for chairs. Furthermore, we know how to interact with any sort of chair, but we need to know what kind of furniture we are dealing with before knowing whether to sit on it or store our clothes in its drawers. At the basic level, in other words, form and function are tightly integrated.

The interesting thing about Jacaltec is that the specific classifiers refer to the basic level while the associated noun refers to a subordinate level of the taxonomy. This means that the classifier preserves the image schematic properties of the basic level which permit a generalized program for interaction with the items in the class. This is precisely the function which Denny (1976) suggested as the motivation for classifiers in general, i.e. to set up classes of objects (or persons) with which we interact similarly. Table 1, meanwhile, shows that the basis for these functional classes is primarily image-schematic. The psychological research into basic level objects provides the link between these two different perspectives -- it is the schematic image which permits us to develop a generalized interaction with the class (a good explanation of why can be found in Tversky 1986).

My interpretation of the Jacaltec facts is that specific classifiers developed *before* the general ones, in those semantic domains which have a high degree of lexical differentiation. In fact, I claim that the first classifiers in all languages arise as the result of lexical expansion, in the following way. Berlin (1972) showed that languages first lexicalize basic level categories of taxonomy. There are, however, certain portions of the taxonomy with which the culture has close contact, and more specific lexical distinctions are needed within those domains[7]. Berlin (1972) found that languages respond to this need in a very general way, and gives a detailed picture of what happens.

> "Situations of social intercourse may arise whereby one one must be able to linguistically differentiate the type-specific category from its contrasting neighbor(s). The linguistic process by which this contrast comes to be indicated is quite general. Invariably, the type-specific will be modified with an attributive-like expression" (Berlin 1972).

In other words, specific (i.e. subordinate) level nouns will contain the generic (i.e. basic) level term, plus some modifier.

As a concrete example, consider the classification of juniper bushes in Navaho. At an earlier stage, Navaho had a single word for all species of juniper (*kat*). Speakers, however, often needed to distinguish between three types of juniper in the area, and the language developed a lexical distinction.

Navaho (Berlin 1972)

kat
The genus 'Juniperus'

kat	kat-nee-ay-li	kat-dil-tah'-li
'common juniper'	'strained juniper'	'cracked juniper'

Like the English glosses, each specific term has the generic level term as its root. Because the morpheme *kat* occurs in all of the specific terms, it may be reanalyzed as a classifier, as *ixim* has in Jacaltec. The lexical structure of Navaho juniper terms is parallel to that of Jacaltec corn, except that the genus level term in Jacaltec has become a classifier.

Berlin (1972) found that it is very common for the prototypical species to inherit the generic term without modifiers, as in the example. The specific term for the central category of the genera is homophonous (or polysemous?) with the generic term. For a language that develops classifiers by this process, these findings predict that early classifiers should be homophonous with the central member of the class it picks out. This prediction is borne out by several classifier languages, including Jacaltec. As noted above, the classifer *ixim* is homophonous with the noun 'corn'. Of the twenty-four classifiers in Jacaltec, twelve are homophonous with nouns that are still in use. Of the rest, two are shortened versions of nouns and six are compound forms. Only four classifiers are "not associated with any free nominal form" (Craig 1986).

There are a number of facts which lead me to believe that this basic level analysis can be extended to to other languages. First, the homophony that we find in Jacaltec between noun and classifier is very frequent. Because of this, it is often difficult to distinguish the two types of morphemes. Downing (1984) notes this difficulty in the investigation of early Japanese classifiers.

> "The problem of distinguishing classifiers from...nouns ...arises even in the most comprehensive inventory of indigenous eighth century classifiers available...where many forms...seem more noun-like than classifier-like. The line between classifiers and nouns is still difficult to draw."

My theory also predicts which nouns will tend to become the first classifiers. The hypothesized basic level origin of early classifier morphemes indicates that we should not find languages with classifiers for superordinate (or subordinate) parts of taxonomies without having them for the basic level. An indication that this prediction might be borne out is found in Adams and Conklin (1973). They note that very few languages have classifiers at the level of biological kingdom (i.e. one which classifies all (and only) plants or animals). Berlin (1972) discovered that lexical nouns for these superordinate levels of the taxonomy are rare as well, appearing only after a language has developed an extensive system at both the basic and subordinate levels. It appears that the frequency of classifiers at various levels of biological taxonomy mirrors the frequency of nouns, presumably for the same reasons.

Most convincing, perhaps, is that wherever the etymology of a classifier can be traced back to its source, that source is invariably a basic level noun. For instance, the Ojibway classifier onak, used for modes of transportation, derives from the word 'boat'. And shape-based classifiers, which have the least obvious functional motivation, derive with fair regularity from plant terms.

> "The three basic shapes of long, round, and flat...are by far the strongest metaphors which occur in the numeral classifier construction...[and] it is obvious that the plants are the source of this metaphor" (Adams and Conklin 1973).

An example is the Malay classifier for two-dimensional (long) objects, derived from a noun meaning 'bamboo'. The relationship between this important taxonomic domain and shape-based classifiers suggests to me that a system like Jacaltec's underlies many more firmly established classifier systems. The 'sketchier' shape-based noun classes result when the classifier system is expanded to new nouns on the basis of conventional imagery. Over time the classes lose their functional homogeny, but retain important parts of the schematic image.

In a language like Japanese, on the other hand, where Denny (1979) found noun classes based on function rather than shape, I would claim that as the system expanded, speakers classified new nouns on the basis of similar <u>function</u> rather than similar appearance. Even today Japanese speakers prefer a functional basis of classification. Matsumoto (1985) found that Japanese speakers (including children acquiring the classifier system) tend to classify a noun on the basis of its function rather than its shape when it could be categorized either way.

My basic position, then, is that the functional and image-schematic coherence which we find in the world's classifier languages is a result of the origins of noun classes in basic level categorization. Since cultural relativity and semantic opacity are introduced only through language-specific "chaining principles" (cf. note 3), we should expect that the prototypical members of noun classes should remain fairly stable and preserve the initial system. As a result, we don't need detailed historical studies to test the hypotheses which I introduce in this paper. We can look for evidence of the basic level in existing systems. Zubin and Kopcke (1986) show how such evidence can be found even in a completely opaque system like German gender.

FOOTNOTES

1. Some examples of non-inherent English "classifiers":

two loops of rope	three bundles of string
a piece of paper	a kind of mammal

The "classifier" in each case refers to a temporary state of the associated noun. For further discussion, see Allan (1977).

2. That is, e.g., consistency is never the sole criteria for class membership. However, two "round" classes might be distinguished from one another by consistency.

3. Actually, finding a class whose members all HAPPEN to be green would not be a counterexample. The claim is that the greenness of the items would not be the basis for inclusion in the class. We might, for example, find a class of copper things (based on feature 1c) all of which are green.

4. That is, Table 1 features are used to construct a "background model" in the sense of Lakoff (1986), which is supplemented by language-specific "chaining principles" which recognize the role of conventional imagery. The analysis of Dyirbal in Lakoff (1986) shows how effective this approach can be.

5. However, this does not account for the fact that sex is never used as a primary discrimination. Very few societies lack a difference in the social roles of men and women.

6. At least Denny (1976) does not discuss any.

7. This expansion is caused by two simultaneous processes. First of all, close contact with certain areas of the taxonomy makes it possible for members of the culture to identify different species (rather than different genera) through a gestalt image. Furthermore, the contact results in a functional differentiation between species. The interactive motor program associated with the different species may begin to diverge, in essence shifting the basic level from the generic to the specific.

BIBLIOGRAPHY

Adams, K. and N. Conklin. 1973. Toward A Theory of Natural Classification. In Papers from the Ninth Regional Meeting, Chicago Linguistic Society.

Allan, Keith. 1977. Classifiers. Language 53.2: 284-310.

Becker, A. 1975. A Linguistic Image of Nature: The Burmese Numeral Classifier System. Linguistics, Whole No. 165, 109-121.

Berlin, Brent. 1972. Speculations on the growth of ethnobotanical nomenclature. Language in Society I, 51-86.

Brown, R. and E. Lenneberg. 1954. A Study in Language and Cognition. Journal of Abnormal and Social Psychology 49.

Clark, Eve. 1976. Universal Categories: On the Semantics of Classifiers and Children's Early Word Meanings. In Juilland, A., ed., Linguistics Studies offered to Joseph Greenberg, Vol. 3: Studia Linguistica et Philologica, 4.3. Saratoga, CA: Anma Libri. pp. 449-462

Craig, C. 1986a. Noun Classes and Categorization. Philadelphia: John Benjamins.

Craig, C. 1986b. Jacaltec Noun Classifiers: A Study in Language and Culture. In Craig (1986a).

Denny, J.P. 1976. What Are Noun Classifiers Good For? In Proceedings of the Twelfth Regional Meeting of the Chicago Linguistic Society.

Denny, J.P. 1979. Semantic Analysis of Selected Japanese Numeral Classifiers for Units. Linguistics 17, 317-335.

Dixon, R.M.W. 1982. Where have all the adjectives gone? Berlin: Mouton.

Downing, P. 1984. Japanese Numeral Classifiers. Unpublished

Ph.D. dissertation, University of California, Berkeley.
Lakoff, G. 1986. Classifiers As A Reflection of Mind: The Experiential, Imaginative, and Ecological Aspects. In Craig (1986a).
Lee, M. in press. Language, Perception, and the World. To appear in Hawkins, J., ed., Explaining Language Universals. London: Basil Blackwell.
Matsumoto, Y. 1985. Japanese Numeral Classifiers: Their Structures and Acquisition. Unpublished M.A. thesis. Sophia University.
Plank, F. 1980. Verbs and objects in Semantic Agreement. Unpublished ms. Hannover: Technische Universitat.
Rosch, E., Mervis, C.B., Gray, W.D., Johnson, D.M., and Boyes-Braem, P. 1976. Basic Objects in Natural Categories. Cognitive Psychology 8: 382-439.
Tversky, B. 1986. Components and Categories. In Craig (1986a).
Zubin, D. and K.M. Kopcke. 1986. Gender and Folk Taxonomy. In Craig (1986a).