Salience and Relativity in Classification

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salience and relativity in classification

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Studies in ethnoscience have led to the discovery that some form of taxonomic hierarchy is basic to man's classification of the biological world[1] (Berlin 1976; Berlin, Breedlove, and Raven 1973; Bulmer and Tyler 1968; Conklin 1954; Kay 1971). Any number of semantic dimensions, such as those of medical, spiritual, or nutritional significance, may serve as the basis for such taxonomic organization. However, hierarchies based upon relationships in morphological structure are consistently represented among the biological classification systems of diverse human groups, generally coexisting with various functional and otherwise nonmorphological hierarchies (Berlin, Breedlove, and Raven 1973; Anderson 1967; Bulmer and Tyler 1968; Diamond 1966; Hunn 1973, 1975; Wyman and Harris 1941). Cross-cultural comparisons of morphological classification have led to the recognition of a number of formal principles of taxonomic classification universally applicable to folk biological taxonomies (Berlin, Breedlove, and Raven 1973; Kay 1971). These formal principles of taxonomy have been found to correlate with linguistic, psychological, behavioral, and ontogenetic data (Berlin, Breedlove and Raven 1973; Chambers n.d.; Dougherty n.d.; Hunn 1975; Rosch et al. 1976; Stross 1973), giving rise to speculations on the relative salience of the various levels of inclusion or taxonomic ranks within folk biological hierarchies (Berlin 1976; Berlin, Breedlove, and Raven 1973; Rosch et al. 1976).

Investigating the relative salience of categories of folk classification among the Tzeltal Mayans, Berlin, Breedlove, and Raven (1973, 1974) find folk genera to be the most salient conceptual groupings of organisms, and they generalize this finding to all folk biological taxonomies. They suggest that on the basis of a coupling of taxonomic and linguistic criteria with behavioral criteria such as frequency of use, ease of recall, gestalt recognition and primacy in development, the folk generic distinctions represent the fundamental units of any ethnobiological classification system (1973:240).

A series of experiments conducted by a group of psychologists (Rosch et al. 1975, 1976) was designed to reveal correlates of the most salient category cuts in folk systems of classification among urban Americans. It was found, as above, that "there is one level of abstraction at which the most basic category cuts are made" (1976:382). The basic categories for these authors are those that carry the most information and possess the

In response to arguments that the most basic or salient level of classification for any given domain is largely a reflection of objective reality and, therefore, consistent across human populations, this paper argues that the salience of categories within a given semantic domain is primarily a function of man's attention to or indifference toward the membership of the domain concerned. As the salience of a domain decreases, the most salient category distinctions become increasingly more inclusive.

highest category cue validity by virtue of the convergence of maximal values for a series of perceptual and behavioral dimensions at one classification level. The distinctions made at this level are the most differentiated from one another; and, they suggest, the most salient to the human perceiver. In the case of biological hierarchies they find basic category distinctions are consistently made by their sample of the American population at levels superordinate to the folk genera.

This discrepancy in the most salient category distinctions of biological domains for diverse populations will be considered below. It will be argued that no single taxonomic rank can be assumed a priori to be fundamental to the hierarchy in which it is embedded, and that the most basic categories in any given domain may range over a considerably larger number of taxonomic ranks than previously suggested. The fundamental taxonomic rank in a classification system will be seen to depend primarily upon the overall salience or cultural significance of the domain for some particular group of people. This implies that human perceivers tend to see organisms as representative of more or less inclusive categories. What the urban American classifies as a *tree* at first glance, the Tzeltal Mayan may classify as an *oak*. Further, the most salient categories for individual members of any society will be shown to vary along the same dimensions identified as significant determinants of cross-cultural variability.

The overall salience for any semantic domain will be seen to be reflected in the evolutionary status of the taxonomic classification system for that domain. It will be argued that there is a shift in the most salient taxonomic rank of a hierarchy toward increasingly more inclusive levels as the overall salience of the domain itself declines and the taxonomic structure devolves. The most basic or salient level will be shown to be a variable phenomenon shifting primarily as a function of general cultural significance and individual familiarity and expertise, and secondarily as a function of perceptual homogeneity, objective correlational structure, or the degree of internal variation in the domain membership.

general principles of taxonomy

A number of general principles of taxonomic organization have been discovered that appear to have widespread relevance for folk classification (Berlin, Breedlove, and Raven 1973). Of particular importance has been the recognition of six ethnobiological ranks. The most inclusive rank is the unique beginner, or domain head, representing the general distinction between the domains of *plants* and *animals*. Immediately partitioning the unique beginner is a set of relatively few major morphological classes demonstrating a high degree of internal diversity. The categories *tree, bush,* and *vine* are representative of life-form distinctions.

Subdividing the life-form categories are the folk genera, which are the most numerous taxa of biological hierarchies. The folk genera are characteristically homogeneous or monotypic terminal taxa. The categories *aspen, oak, redwood,* and *monkey puzzle tree* are typical folk genera. A few morphologically distinct or aberrant folk genera are not included within any life-form class but are immediately included in the unique beginner. *Bamboo,* for example, is a folk genus frequently excluded from any life-form class. These folk genera can be distinguished from the life-form classes by the relatively little internal diversity in their membership.

In those cases where folk genera are polytypic, they are partitioned by folk specifics, such as *white oak* and *staghorn sumac*, which in turn may be subdivided by varietal taxa, such as *cutleaf (staghorn) sumac*. Folk specifics and varietal taxa are considerably less

numerous than folk genera and tend to occur only within folk generic categories of high cultural significance.

The sixth ethnobiological category has been designated intermediate. Intermediate distinctions commonly occur between the life form and folk generic levels.[2] They are uncommon distinctions in most folk biological taxonomies and have been treated as quasi categories or temporary distinctions symptomatic of ongoing change. The distinction among *leaf bearing, needle bearing*, and *frond bearing* trees is typical of intermediate distinctions.

This set of naming conventions for taxa and ranks, or levels, within taxonomic hierarchies, while not universally accepted (Conklin 1954; Bulmer 1974; Dwyer 1976), has been used in a large number of ethnoscientific investigations and will be adopted here.

In addition to the recognition of distinct ethnobiological ranks, the relations of contrast and inclusion (Kay 1971) are universally applicable to folk biological taxonomies and relevant to the following discussion. Of particular importance are the relations of (1) immediate inclusion, that is, the relation between two categories so that one includes the other and there are no intervening categories (*jack oak* is immediately included in *oak*), and (2) contrast set, that is, the complete set of categories immediately included in the same superordinate taxon (the set of kinds of *oak*, including *white oak, red oak*, and *live oak* comprises one contrast set).

general principles of naming

Correlated with the hierarchically organized ethnobiological categories are some general principles of naming behavior. It has been suggested that an excellent indication of a conceptually relevant grouping of organisms is the fact that it has an easily elicitable and widely recognized (standardized) name (Berlin, personal communication 1975). Further, within the class of named categories those distinctions most frequently referred to will tend to have relatively short, semantically opaque linguistic labels (Brown 1958:235-241). For example, a commonly distinguished category of trees is more likely to be called something like *elm* by almost all members of a community than to be labeled with either an ad hoc, nonstandardized construction like, "you know, those tall trees with asymmetrical, serrated edged leaves" (Frake 1962:30) or a standardized but complex, semantically transparent construction like "serrated leaf tree." This correlation between frequency of use and kind of linguistic name allows the nature of a linguistic label to serve as an indication of the relative significance of the category it designates.

The names of botanical categories can be distinguished as either primary or secondary lexical items (Berlin, Breedlove, and Raven 1973). Secondary lexical items are complex constructions that occur in contrast sets, all the members of which designate their immediately superordinate taxon in their own linguistic label. The following subset of folk specific distinctions within the category *oak* is exemplary: *Jack oak, post oak, blue oak, live oak, red oak, white oak*. All other category names are primary lexical items. Primary lexical items can be differentiated into simple monolexemic forms such as *oak* and *elm*, and complex multilexemic or multimorphemic forms such as *poison oak* and *monkey puzzle tree*.

A strong correlation has been observed in botanical classification between the taxonomic rank of a particular category and the linguistic nature of its name. Groupings of folk generic or life-form level specificity are (with predictable exceptions) labeled by primary lexical items, while less inclusive categories at the folk specific and varietal levels are (again with predictable exceptions) named by secondary lexical items (see Berlin,

Breedlove, and Raven 1973 for an account of exceptional naming behavior). Because unique beginners and intermediate category distinctions are rarely named in folk classifications and because when they are named the shape of the linguistic designation is highly variable, no correlation is possible for these distinctions with naming behavior.[3]

This taxonomic and linguistic evidence suggests that all folk biological hierarchies are comprised of a series of categories organized in a series of levels or ranks related by inclusion and designated by specifiable kinds of linquistic labels depending upon their taxonomic rank. The patterning suggests that the folk genera, that is, the large set of monotypic taxa requiring primary lexical designations, are the fundamental categories of ethnobiological classification systems. However, when behavioral criteria are considered it appears that psychologically the most salient level of an ethnobiological hierarchy does not consistently fall at the level identified as basic by taxonomic and linguistic criteria.

general principles of behavior

In the discussion to follow a distinction will be maintained between societies maintaining greater or lesser degrees of functional interaction with their biological environment. This distinction is operationalized as direct or indirect dependence upon the biological environment for subsistence. The contrast between the Tzeltal Mayan agriculturalists (high interacting/direct dependence) and urban Americans (low interacting/indirect dependence) that will be considered below is illustrative. The relative salience of a biological domain for some population is then a function of the degree of direct interaction with this domain as determined by extent of experience with the membership of the domain and the need to communicate about this domain membership.[4]

Comparative work among traditional peoples maintaining a high level of functional interaction with their botanical environment (Berlin 1976; Berlin, Breedlove, and Raven 1973, 1974; Conklin 1954; Wyman and Harris 1941; Robbins, Harrington, and Freire-Marreco 1916) suggests that the folk genera are psychologically the most salient category distinctions in the botanical domain as well as being taxonomically and linguistically most fundamental. The folk genera for such peoples appear to be the most commonly referred to groupings of organisms across all contexts of reference. Specifically in elicitation settings the folk genera are the most frequently named categories and the most readily recalled. One investigator notes that he was quickly provided with a separate, distinct name for what appeared to be each botanically distinct tree by an Aguaruna informant. He notes that from a resting spot on the Jungle trail, this Aguaruna informant easily listed the names (folk genera) for no less than forty distinct trees (Berlin, personal communication 1975). An early ethnobotany of the Tewa Indians similarly reports "they have a name for every one of the coniferous trees of the region" (Robbins, Harrington, and Freire-Marreco (1916:9). And Smith-Bowen remarks of the Tiv that "every plant, wild or cultivated, had a name and a use, and . . . every man, woman and child knew literally hundreds of plants" (Smith-Bowen 1964:19).

The tendency to rely on folk generic distinctions in naming behavior and daily interaction suggests that the most significant category distinctions are made at this level. Two additional observations reinforce this conclusion. The first concerns the process of identification by which objects are recognized as members of particular named categories. The second is primacy in ontogenetic development.

Hunn (1975) reports that the psychological processes involved in classifying flora and fauna as members of some generic category involve holistic, or gestalt, perception while

feature identification is required for classification at more subordinate levels. This distinction in identificational routines holds for people for whom the domain of interest is a significant or highly salient one. In such cases the folk genera are the least inclusive categories to be recognized in a gestalt fashion, and assignment of some stimulus to a generic category occurs prior to identification at the specific or varietal level (with some exceptions for anomalous species). It is at the generic level that categories seem to be maximally distinct.

Bulmer and Tyler (1968) come to much the same conclusions in their investigation of the classification of frogs among the Karam of New Guinea: "We believe that our evidence demonstrates that Karam nonetheless perceive frogs as grouped into 'natural kinds' or 'speciemes' (roughly equivalent to folk genera) marked off from each other by multiple distinctions of appearance, habitat and behavior" (1968:379). And they write further that the "Karam taxonomy is largely based on the people's appreciation of natural species [folk genera]" (1968:350).

Evidence from ontogenetic development is further suggestive of the primacy of the folk genera. Stross (1973), who investigated the acquisition of ethnobotanical nomenclature among Tzeltal Mayan children, found that the typical Tzeltal child begins to acquire botanical terminology by learning the generic names for culturally significant plants. From this starting point the child differentiates and generalizes plants simultaneously as he continues to increase his inventory of generic categories. Stross's research relied upon children's abilities to name about two hundred distinct plant specimens along a standardized plant trail. Diachronic development was inferred from the synchronomic variation in the ability of children of different ages to classify plants. Figure 1 summarizes Stross's results and presents the sequence he posits for the acquisition of ethnobotanical terminology.

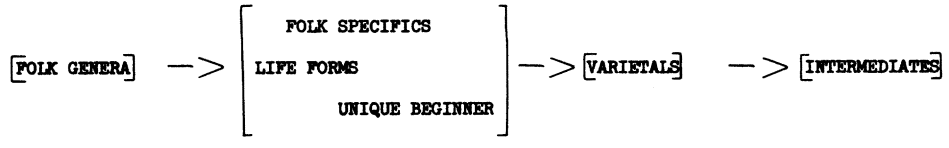

Figure 1. The sequence for the acquisition by Tzeltal children of botanical categories at distinct taxonomic ranks. The linear sequence implies that at least one member of any taxonomic rank indicated will be acquired before any categories at a rank on its right.

By age four the Tzeltal child typically knows more than one hundred botanical terms, the bulk of which are folk genera. The life-form terms are included in his repertoire at this age but are not yet defined appropriately. Even so, some notion of the core concept of each life-form category has developed, and flora of relatively low salience may be recognized as members of a particular life-form category or other suprageneric category before the appropriate generic designation is learned. By age six the child's definition of the life-form categories closely approximates the adult model. Since folk genera are acquired throughout childhood (and adulthood as well), the child continues to learn new generic distinctions subsequent to his mastery of the life-form categories. For the bulk of the plant world, however, particularly for salient members, the first classification learned is at the folk generic level.

In sum, the taxonomic, linguistic, and behavioral evidence from populations maintaining a high degree of functional interaction with their botanical environment point to the folk generic level as the most fundamental and most salient level of the taxonomy. Figure 2 illustrates the convergence of these criteria at the folk generic level.

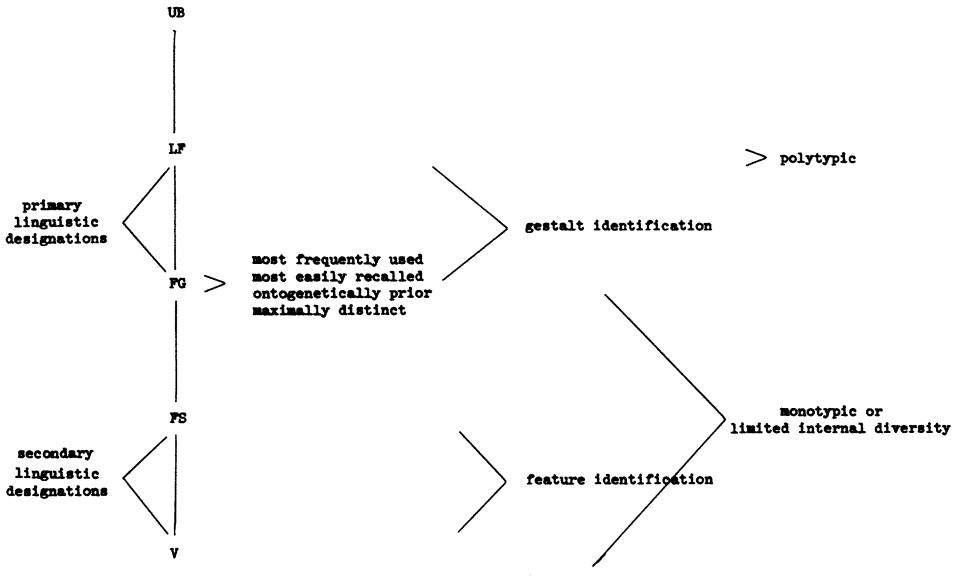

Figure 2. The features associated with categories at particular ethnobiological ranks by peoples for whom the biological environment is highly significant. These features determine relative salience of the categories at distinct taxonomic ranks.

This view of a single most salient level of classification is a normative one. In general, taking the whole domain into account and all of the various contexts in which botanical classification occurs, we see that the folk genera comprise the most salient distinctions. In the case of highly salient cultigens or marginal plants of little or no significance, the most salient, most usual or frequent, level of classification may vary. We will return to a consideration of this kind of variability in the discussion to follow. For the majority of plants, however, the folk generic classification is more salient than either the superordinate or subordinate categories by which a plant may be classified.

On the basis of the principles derived from the comparative study of classification as summarized above, it might be expected that not only in the specific cases mentioned but in all cases of biological classification, the folk genera are psychologically the most salient category distinctions. However, a number of recent investigations suggest that this is not the case. Rosch and her colleagues (1976) propose (like the ethnoscientists before them) that there is one level of abstraction at which the most basic category cuts for a particular domain are made. In contrast to the ethnoscientists they conclude that this level is superordinate to the folk genera.

They characterize the basic object level categories as the most inclusive categories whose members possess significant numbers of attributes in common, are used by means of similar motor programs, possess shapes that are significantly similar, and can be identified from average shapes of members of the class. These basic categories are further characterized as the most inclusive categories for which a concrete image of the category as a whole can be formed, the first categorizations made during perception of the environment, the earliest categories sorted and the earliest named by children, and the categories that are most codable, most coded, and most necessary in language (Rosch et al 1976:382). They suggest that these categories best reflect the correlational structure of the world.

Working with Americans living in an urban setting, Rosch and her colleagues applied a series of tasks focused on these dimensions to a number of domains of concrete objects, including some biological domains. Categories at these levels of inclusion, life form, folk generic, and folk specific, were generally considered in these tasks. In the domain designated by the life form *trees*, for example, the folk generic categories *maple, birch*, and *oak* and their respective folk specifics *silver* versus *sugar maple*, *river* versus *white birch* and *white* versus *red oak* were used. Occasionally the unique beginners *plant* and *animal* were involved.

Rosch et al. (1976) hypothesized that there is a basic level of abstraction in classifications of common objects, which is the most inclusive level at which members of a class share a significant number of attributes. That is, members of basic object level categories are expected to share significantly more attributes in common than do members of superordinate categories; while members of categories subordinate to the basic object level should not share significantly more attributes in common than do members of basic level categories. The number of shared attributes for category members was determined from subjects' free listing of attributes for both object names and visually presented stimuli. Nonbiological domains, such as *tools* and *clothing*, showed significantly more shared attributes within categories corresponding to the folk genera of biological domains, categories such as *hammer, saw*, and *screwdriver*, than across these same categories. In the case of *plants* and *animals*, however, numbers of shared attributes were roughly consistent for categories occurring at all three levels: life form, folk generic, and folk specific. This suggests that for these domains (*trees, birds*, and *fish*) the life-form level, the most inclusive level at which members of a class share significant numbers of attributes in common, is the basic object level.[5]

Similarly, it was found that for biological domains the life-form level is the most inclusive level for which virtually the same sequence of motor behavior is appropriate for interacting with all members of a class. This is again in contrast to the nonbiological domains, where the motor programs are virtually identical for members of the generic like categories *hammer, saw*, and *screwdriver* but share little in common across these same categories.

A naming task yielded corroborative evidence. Subjects were found to name biological stimuli consistently at the life-form level (*tree, bird*, or *fish*) rather than at subordinate levels (*oak* or *white oak*). Further investigation showed that they not only preferred to name at the life-form level but that in most cases they could not name at any subordinate levels. That is, American subjects could not classify stimuli as members of any particular folk generic or folk specific category.

Investigation of shape similarity among category members was not extended to the botanical domain but was applied in the domain of *animals* including the subgroups *dog, cat, fish*, and *butterfly*.[6] A significantly greater overlap in shape was found for each of the subcategories above than for the superordinate category *animal*. Averaged shapes of members of these subcategories were readily identifiable, while an "averaged animal" was not. These results suggest that *dog, cat, fish*, and *butterfly* are perceptually more homogeneous and therefore, according to Rosch and her colleagues, more basic or salient categories than is the unique beginner. Rosch et al. appear to assume that these four categories are of an equivalent degree of abstraction. However, for at least some speakers of American English this is not the case. *Butterfly* may be a folk generic category immediately included within the life form *insect*, which is, in turn, immediately included within the unique beginner *animal*.[7] *Dog* and *cat* are either folk genera or intermediate categories immediately included within the life form designating furry animals variously referred to as *mammal* or *animal* in a restricted sense (Gal 1973). *Fish* (again for at least

some speakers of American English) is a life form category that is immediately included within the unique beginner *animal*.

It is interesting that Rosch et al. (unwittingly?) selected subcategories that fall at different levels of taxonomic inclusion for at least some urban Americans. This suggests that for them as well as for their subjects, basic object level can vary across taxonomic ranks within a domain depending upon the salience of various subgroupings. The basic level for *fish* is more inclusive than the other three, probably because of subjects' minimal contact with living fishes. This is analogous to the high salience of life forms in the domain of plants. The level of greatest salience for dogs and cats, however, is more specific because these creatures are highly significant for urban Americans. The case for butterflies is less clear. The basic object level for them ranges from folk generic to life form as *insect* varies from life form to unique beginner. *Butterfly* is a salient category, possibly due to both the distinctive morphological structure of butterflies and their prevalence among the limited biota of urban America.

If we set aside this kind of intradomain variability (to which we will subsequently return), the data of Rosch et al. suggest that the basic object level within taxonomies of biological entities is suprageneric for populations maintaining minimal direct interaction with their biological environment.

These conclusions for urban American adults have been confirmed by Chambers (n.d.), who investigated the classification of trees by five San Francisco Bay Area residents. Using a variety of tasks (sorting, elicitation of names, identification, and recognition), she finds that informants rely on suprageneric levels of classification. Her informants were able, for example, to list up to fifty tree names and could recognize over one hundred names as referring to folk generic categories of trees, but their identificational abilities were considerably more limited. Informants were only able to identify particular specimens as members of the appropriate folk generic category for ten to thirty-four distinct folk genera. For the majority of these they could either only recognize prototypical specimens or they overgeneralized the category to include a number of related but distinct species of trees. Chambers found that classification of a specimen at suprageneric levels, either as *needle bearing, leaf bearing, frond bearing*, or just as *tree*, involved gestalt recognition, but that identification at the level of the folk genera typically involved a feature identification routine similar to that proposed for the identification of subgeneric categories by Hunn (1975).

Neither in the work of Chambers nor Rosch et al. is it clear which suprageneric level tends to be basic within the domain of trees: the intermediate opposition of *leaf* to *needle* to *frond-bearing trees* or the life-form category *tree* itself. Chambers's (n.d.) data seem to suggest the former is more significant. She notes, for example, that in the case of one informant, they had essentially only one label for the whole realm of evergreen conifers, and that label was *pine*. Occasionally when a specimen corresponded to an ideal type image, *redwoods* or *junipers* might be correctly identified as such, but even in these cases they remained conceptually *pines*. In most cases, even if a specimen could be correctly identified at the folk generic level, it was more likely to be called *pine*.

Rosch et al. failed to include intermediate level distinctions in their experiements. However, on careful examination of their data, the importance of intermediate level distinctions is apparent. When Rosch and her colleagues asked subjects to list the attributes shared by members of the category *tree*, they elicited a series of attributes the first mentioned of which is specific to *leaf-bearing trees*, that is, leaves. Other attributes, while not specific to *leaf-bearing trees*, were more characteristic of this category of trees than of, for example, *frond-bearing trees*. These attributes include bark, wood, and sap. It is possible that although Rosch et al. were asking for attributes of *trees* in general, they

were eliciting attributes of the most commonly encountered intermediate category of *trees*, *leaf-bearing trees*. Since their examples of folk generic categories of *trees*—*oak*, *maple*, and *birch*—are all *leaf-bearing trees*, the experimental design itself may have focused informants on this intermediate category. It is, therefore, unclear as to whether the basic object level falls for Americans for the domain of *trees*. It is clear, however, from the results of both Chambers and Rosch et al. that the level is superordinate to the folk genera.

Ontogenetic development provides further evidence that the most salient level of the botanical domain for urban Americans is suprageneric. The classificatory abilities of six American children living in Berkeley, California who ranged in age from three to eight years was investigated by Dougherty (n.d.). Each child participated in a series of naming and identification tasks over a period of months. Diachronic development was observed over the period of the investigation and was further inferred from the synchronic variation in children's performances. Although the number of children observed was small, the evidence suggested a developmental sequence.

Early in the urban American child's development of classificatory skills in the domain of plants is the acquisition of life-form distinctions and intermediate level distinctions within these categories. During the third and fourth years of age, a Berkeley child segregates the plant world (for which he has no unique beginner designation) into a few major classes. The Berkeley children in this age range distinguished *trees* (tall woody plants) from *plants* (small herbaceous plants) from *cactae* from *bushes* or *grasses*. As the child grows older the number of life-form distinctions gradually increases to about eight or nine.

Within each child's early life-form domains he makes a number of subordinate distinctions. Unlike the Tzeltal child these are not folk generic distinctions but intermediate ones. The distinctions within the domains of *trees* and *bushes* oppose *leaf-bearing* to *needle-bearing* to *frond-bearing* members. The children create such labels as *leaf tree*, *pine needle tree*, and *pine cone tree* to designate these classes. Within the domain of *plants*, flowering specimens are consistently distinguished from leafy ones.

Like the Tzeltal children, the Berkeley children also learn folk generic names among their first plant designations. Unlike the Tzeltal child, however, relatively few such labels were included among the earliest learned plant names for Berkeley children, and those few generally referred to plant products, such as *banana* or *spinach*, for which the child could not identify the plant of origin. In some cases the child was unaware that the product he could label originally came from a plant. In the case of *spinach*, for example, one child knew only that it was something to eat that could be obtained in a can.

Up to four years of age, Berkeley children consistently distinguished and named plants only at suprageneric levels in marked contrast to the Tzeltal children, who at the same age consistently named at the generic level in addition to and more often than naming at more superordinate levels. The Berkeley children did perceptually distinguish a few anomolous plant specimens and exclude these from their named categories, but they had no linguistic designations for such plants. The exclusion seems to be based entirely on immediate perception rather than learned classification.

As the Berkeley child's knowledge of the botanical world expanded and his classificatory system continued to develop, classification on the intermediate level proliferated. Children subdivided the life-form domains in terms of numerous intermediate level distinctions: members with leaves, needles, berries, flowers, or thorns. Distinctive but often temporary or seasonal traits formed the basis for this intermediate classification. During this same stage (approximately five to six years of age) the Berkeley children learned their first consistent folk generic distinctions. The plants initially

designated at this level were typically found in the family garden or were species commonly used for ornamentation or food, that is, highly salient members of the plant world. *Rose bushes, blackberry bushes, fuschia,* and *western cactus* are examples.

Gradually the Berkeley child's dependence upon temporary characteristics diminishes and the life forms are resubdivided on the basis of more permanent morphological features but still at an intermediate level. Folk generic distinctions continue to be acquired and by eight the Berkeley child typically includes about a dozen folk generic distinctions such as *eucalyptus, redwood*, and *maple* in his repertoire. By eight years of age the child has also acquired his first specific designations. *Domestic* versus *wild strawberries* is one example.

From seven or eight on, the number of perceptual/conceptual distinctions that the Berkeley child can make consistently is increasing. Many of these he may never learn to label. One child, for example, consistently recognized *atlas cedar* and *canary island pine* as distinct kinds of *trees* although he could not linguistically differentiate them. Simultaneously, and somewhat paradoxically, as the child's ability perceptually and conceptually to distinguish plant specimens outstrips his ability to name these distinctions, he begins to acquire a repertoire of folk generic plant names, such as *avocado, begonia* and *hens and chickens*, that he may never learn to associate with any actual referent.

Figure 3 presents the general acquisitional sequence observed for the Berkeley children's development of ethnobotanical classification.[8] In terms of both the number of distinctions acquired and the specificity to which classifications can be extended, the eight-year-old Berkeley child lags well behind the six-year-old Tzeltal child. As Chambers's (n.d.) evidence shows the ethnobotanical knowledge of urban American adults may develop minimally beyond that of the eight-year-old child.

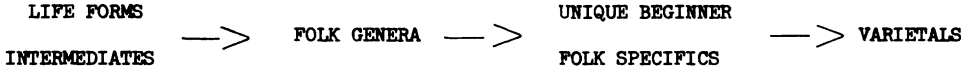

Figure 3. The sequence for the acquisition by urban American children of categories at distinct taxonomic ranks. The linear sequence implies that at least one member of any taxonomic rank indicated will be acquired before any categories at a rank on its right.

Work by Rosch et al. (1976) provides further data on ontogenetic development and shows that basic level categories are acquired before superordinate distinctions. They found that the categories *dog, cat, butterfly*, and *fish* are acquired prior to the more inclusive category *animal*. In a series of triad sorts given to children three to seven years of age, they found that performance was virtually perfect for all children at the basic level, but that superordinate sorts (sorts that depended upon mastery of the category *animal*) improved for children from three to four years of age. That is, basic level sorts were equally easy for all age groups, while mastery of the superordinate level was not achieved until four years of age. Unfortunately, categories subordinate to the basic level were not included in these experiments.

The evidence presented from the investigations of biological classification among urban Americans suggests that categories superordinate to the folk genera are typically more salient in biological domains than are the folk genera themselves. As Figure 4 shows, the greater salience of life-form and intermediate categories over all subordinate distinctions is reflected in frequency of use, ease of recall, ontogenetic priority, and gestalt identification. Informants find these categories to be well differentiated from one another and to contain little internal diversity. In classifying, particularly the botanical environment, few distinctions of greater specificity than the intermediate categories are

made. Although these categories may be known to contain distinguishable members, these members are not habitually distinguished and, for most informants, are not identifiable.

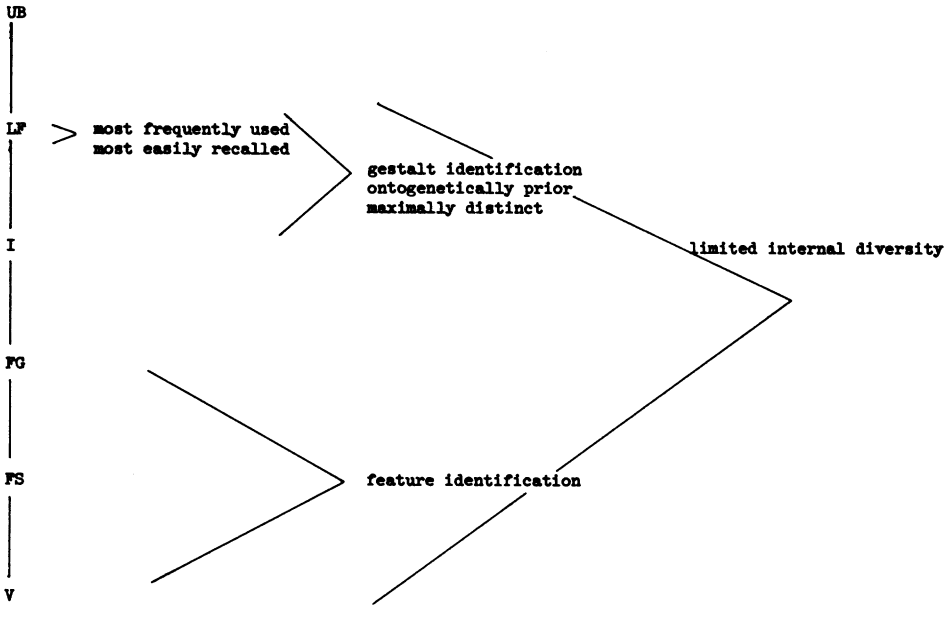

Figure 4. The features associated with categories at particular ethnobiological ranks by peoples for whom the biological environment is of marginal significance, requiring minimal direct interaction. These features suggest the relative salience of categories at distinct taxonomic ranks.

relativity of basic object level

While the number of societies sampled above is limited, the generalization is likely to prove correct that the most salient or fundamental categories in biological classification are not fixed by nature but vary as a function of an individual's or a culture's degree of interaction with the domain concerned. Minimal significance of some segment of the environment is reflected in the decay of the classificatory system. Urban Americans are ignorant of the attributes that characterize groupings of organisms subordinate to the major life-form classes. Americans involved in the experiments of Rosch et al. were able to provide few attributes characteristic of subordinate groupings of trees that were not also generally characteristic of all trees. Populations interacting consistently with their botanical environment would likely expand the list of attributes associated with particular folk generic and folk specific categories of trees by adding features characteristic of the bark, wood, sap, foliage, or habitat. The motor programs associated with groupings of organisms are also related to the significance of those organisms for some population. In contrast to the passive motor routines that characterized Americans' interactions with trees (Rosch et al. 1976), specific motor programs for planting, harvesting or felling, extracting sap, or stripping bark might be represented among the motor routines associated with distinct categories of trees by nonurban peoples.[9]

Chambers (n.d.) has shown that urban Americans are unable to identify and name distinct folk generic categories of *trees*. Berlin (1972:83) claims many contemporary urban Americans know virtually no specific names for kinds of plants and may recognize

folk generic names only as belonging to the appropriate domain without being able to associate them with any referent. He suggests that only the more inclusive life-form names such as *tree* or *grass* are useful terms for urban Americans referring to the botanical portion of their natural environment.

A review of extensive speech samples collected from a young urban American child during the early stages of her linguistic development (Rosch et al. 1976; Brown 1974) shows that she makes no reference to any members of the botanical domain. At the same time she does refer to some members of the animal kingdom. This again suggests minimal significance of the botanical domain for urban Americans.

Such low significance of a domain leads to a rise in the level of the classificatory hierarchy that is perceived as most basic or salient.

Simultaneously this decreased significance is reflected in attrition or devolution of the taxonomic system. The more specific category distinctions, that is, the least inclusive levels of the taxonomy, are gradually lost (Berlin 1972). Devolution does not progress as Rosch et al. suggest it might, that is, by decaying at levels both superordinate and subordinate to the basic object level, which thereby leaves the basic level distinctions as the primary (and eventually the sole) distinctions in the domain (1976:426). Devolution involves instead a gradual attrition of the lower levels of the taxonomy. As the original basic object level itself becomes subject to this attrition, more inclusive categories become increasingly more salient. Gradually these more inclusive categories become the most salient distinctions in the domain.[10]

The question that remains is to what extent the objective structure of concrete objects constrains the level of inclusion at which basic category cuts may occur. Rosch and her colleagues suggest that within any given domain the correlational structure of member objects is such that the categories that will be most salient for human perceivers are determined by the objective structure "out there." Typically, they suppose, within any one domain, there is only one potential level that will be perceived by human observers as basic. Some domains, they suggest, are structured such that two levels are potentially basic. In these cases cultural focus will influence which of the two levels will be perceived as basic. From the perspective of Rosch et al., factors such as individual expertise and familiarity may also influence the relative salience of category distinctions, but this is only supplementary to the naturally occuring objective distinctions among objects. For instance, the animal domain, according to Rosch et al., permits of two potential basic object levels. *Bird* may be basic for some, while *gull*, *chicken*, or *turkey* may be basic for others (Rosch et al. 1975).

There is no reason to stop here. Expertise and indifference are not atypical states for human beings with respect to particular domains. Their effects on classification are consistently significant factors determining which object classes are most salient. The limits on the degree of specificity or generality at which basic category cuts can occur must be considerably wider than has been postulated. Among a people for whom distinct kinds of trees are generally of minor importance, the most salient contrast in their classification of the botanical domain might fall at the life-form level where *tree, vine*, and *bush* contrast, or at an intermediate level where *leaf-bearing, needle-bearing* and *frond-bearing trees* contrast. For the denizen of a future colony in outer space the contrast of *plant* and *animal* might well be more salient than any subordinate categories. Among people for whom the distinctions among tree genera are consistently significant the most salient category cuts will tend to be folk generic. And more specific distinctions may be the most salient categories for highly significant members of the domain.

To what extent, then, is objective structure a determinant of basic object level? The answer is not an obvious one. The most salient category distinctions within the domain of

furniture are established for Americans (Rosch et al. 1976) at the level at which *table, lamp,* and *chair* contrast because at this level the categories are maximally distinct in terms of their correlational structure while their internal membership is minimally diverse. Consider, however, a hypothetical society (modeled on some of the indigenous Oceanic groups) where the domain of *furniture* in general is of roughly equal salience to the people as it is for Americans, but where the correlational structure of the domain membership is markedly distinct. Here furniture is made of bamboo or wood, but whether it is a *pillow, stool, chair, table, shelf,* or *bed* its construction and shape is the same. All pieces of furniture are rectangular objects. The distinct types of *furniture* (each of which is named) vary only in size. The correlational structure of this hypothetical domain of *furniture* indicates that level at which categories are maximally distinct while their membership is minimally diverse occurs in the contrasting of *furniture* with *tools*. It is not at all obvious, however, that these categories would be more salient than subordinate distinctions.

While the correlational structure of physical objects must play a role in determining at what level of inclusion basic category cuts will fall, the primary variable in determining relative salience in domains of concrete objects is more likely the relationship of the human classifier to the members of the domain. Those classes that are seen as best reflecting objective structures vary according to the interests and attention of human groups and individuals.

notes

[1] Many thanks to Brent Berlin, Paul Kay, Eleanor Rosch, Carolyn Mervis, Roger Brown, John Gatewood, and Midge Solberg for their criticism and discussion.

An adequate characterization of the cognitive processes involved in biological classification must account for the conjunction of taxonomy with other systems of cognitive organization including prototypicality, overlapping, and ambiguous category membership (Brown 1976; Randall 1976; Rosch et al. 1976), and chains of categories related along a similarity continuum (Hunn 1973, 1976). The relative importance of the various modes of cognitive organization may vary with the nature of the domain concerned and with particular cultural and individual tendencies. However, in the classification of the biological world, contrast and inclusion and multilevel hierarchies are consistently salient features of man's classificatory behavior.

[2] Although intermediate distinctions have been observed to fall primarily between the life-form and folk generic categories, they may occur between any two of the five major ethnobiological ranks. The folk genus *oak*, for example, is partitioned by the intermediate categories *red oak* and *white oak* by many Illinois residents. Each of these intermediate distinctions includes a number of specific categories of *oak*. *White oak* includes, for example true *white oak, burr oak*, and *post oak*. Among the folk specifics included in *red oak* are the true *red oak, black oak*, and *pin oak*.

[3] The picture for the naming of ethnobotanical folk categories is not quite as simple as portrayed here. Within any given level (particularly among the folk genera and folk specifics) the nature of a category's linguistic designation is correlated with its cultural significance (Berlin, Breedlove, and Raven 1974:96-99). The greater the cultural significance of a given category, the most likely it is to be designated by a primary rather than a secondary lexeme or by a simple primary rather than a complex primary lexeme. The more salient a category is (within any particular rank), the more likely it is to be designated by a relatively brief, semantically opaque linguistic label.

[4] I wish to thank John Gatewood for suggesting this point.

[5] Unfortunately, categories superordinate to the life forms, that is, the unique beginners *plant* and *animal* were not incorporated into Rosch's experiments even after it became apparent that the basic object level might be of greater abstraction than originally hypothesized.

[6] It would be interesting to see just how similar are the normalized shapes of distinctly different trees, such as *maple, fir*, and *palm*. The overlap in shape for category members within the domain of *trees* may not be as great as Rosch et al. assumed on the basis of the three folk genera *oak, maple*, and *birch*.

[7] A survey of twenty undergraduate and graduate students at the University of Illinois shows that for about half of this group *butterflies* are kinds of *insects* that are, in turn, kinds of *animals*. For the other half of this group, however, *butterflies* are kinds of *insects*, but *insects* are not included within

the domain of *animals*. *Insects* for these informants is a unique beginner contrasting with *animals*, and *butterfly* is a major life-form category within it.

[8] Cognitive and linguistic categories are not consistently distinguished in the acquisition studies for Tzeltal (Stross 1973) and Berkeley children. These are more clearly differentiated in the supplementary study by Rosch et al. (1976) described below, but further research is required in this area.

[9] The role of cultural significance in determining basic object level may offer at least a partial explanation for the greater specificity found for nonbiological as opposed to biological domains for urban Americans (Rosch et al. 1976). The nonbiological domains selected by Rosch et al. (1976) for investigation, such as *tools*, *clothing*, *furniture*, and *vehicles*, are of high significance to Americans. Correspondingly the most salient level in these domains is less inclusive than in marginally significant biological domains. The basic object level in these nonbiological domains falls not at the level at which *tools*, *clothing*, and *furniture* contrast (analogous to the life forms of biological domains), but at the level at which *saw*, *screw driver*, and *hammer* or *pants*, *socks* and *shirts* contrast (analogous to the biological folk genera).

[10] Categories are encoded in a similar fashion. The basic objects are the first to be linguistically encoded. Since those categories that will be basic depend upon cultural emphases, the categories that will be first encoded for any particular domain may vary. It has been suggested that folk genera were the first categories linguistically encoded by man (Berlin 1972) because of the high significance of natural species to early human groups. However, life-form distinctions appear to be the first encoded and most numerous distinctions in American sign language (Rosch et al. 1976)—due, I suggest, to the marginal significance of natural species for users of American sign language.

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