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Folk Botanical Life-Forms: Their Universality and Growth

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Folk Botanical Life-Forms: Their Universality and Growth

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Folk botanical life-form terms are added to languages in a highly regular manner. The first life-form to be lexically encoded is always "tree" and the second, a small herbaceous plant class (GRERB). The addition of "bush," "vine," and "grass" follows with "vine" always preceding "grass." An explanation of this encoding sequence is proposed which refers to certain general principles of naming-behavior recently outlined by Witkowski and Brown (1977). In addition, size of folk botanical life-form vocabularies is positively correlated with both societal complexity and botanical species diversity. An explanation of these associations is presented. [cognitive anthropology, ethnobotany, folk classification, language universals, language change]

RECENT LITERATURE treating folk botany has shown considerable interest in uniform ways in which plants are named and classified by all human groups. Concern with universals in folk botanical taxonomy and, more generally, with principles of nomenclature and classification in folk biology has been chiefly stimulated by the important work of Brent Berlin (1972, 1976) and of Berlin, with Dennis Breedlove and Peter Raven (1973, 1974). Berlin (1972), for example, speculates that generic categories are fundamental in ethnobotanical classification and develop before other taxonomic ranks. This paper examines in detail one of these other ranks, the folk botanical life-form, showing the substantially identical way in which different languages add life-forms to their lexicons and partition the universe of plants through their use.

Regularities reported here are similar to those discovered for the domain of color by Berlin and Kay (1969). Their study reveals severe constraints upon the co-occurrence of "basic color terms" in languages. The distributional pattern described by Berlin and Kay attests to *implicational universals* in color terminology. Similar constraints upon the co-occurrence of folk botanical life-form categories exist and implicational universals are found to pertain to botanical terminology as well.

An implicational universal is apparent when the occurrence of an item in languages implies the occurrence of another item or items but not vice versa. For example, if a language has only one botanical life-form word, it always labels members of a large plant category. This term can be roughly glossed as "tree." If two life-form terms pertain to a language, one of these is always "tree" and the other identifies members of a small herbaceous plant category. Thus, the occurrence in a language of the small-plant term implies the occurrence of "tree" but not vice versa.

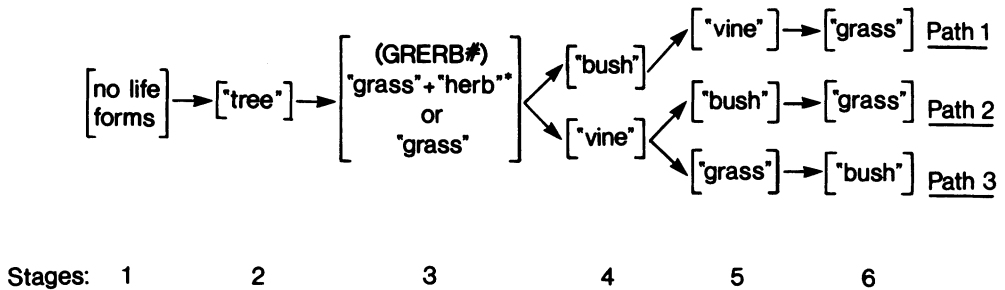
Implicational universals described for life-forms are determined from synchronic data, i.e., from comparison of the botanical lexicons of a number of languages each at a single time state. In order for these relationships to have been realized in fact, life-form words must have been added to languages (or lost by them) in a very specific order. Figure 1 presents the developmental sequence for adding folk botanical life-forms to vocabularies predicted from synchronic implicational universals.

In Figure 1 GRERB designates a category of small herbaceous plants which may include both grasses and herbs. (In this paper *herb* refers to small herbaceous plants *excluding* grasses unless otherwise indicated.) The GRERB life-forms of some languages include only grasses and of others, only herbs. (GRERB is a mnemonic derived from *grass* and *herb*.) In the growth of life-form lexicons the inclusive range of this category tends to shrink. The nature of GRERB will be discussed in detail presently.

Stages are identified in the development of life-form vocabularies. Languages totally lacking life-form terms are at Stage 1 (cf. Figure 1). Languages at Stage 2 have only a "tree" term. Stage 3 languages add a second term, GRERB. From Stage 4 to Stage 6 three other terms, "bush," "vine," and "grass," are added. The lexical encoding of "grass" at Stage 5 or 6 usually results from the division of the GRERB class into "herb" and "grass." Certain encoding options are associated with Stages 4-6 resulting in three possible paths for adding botanical life-forms (cf. Figure 1).

Berlin and Kay (1969) note a positive correlation between number of basic color terms pertaining to languages and societal complexity. Societal complexity and size of folk botanical life-form lexicons are also positively associated. Languages with two or fewer life-forms (cf. Stages 1-3) are usually spoken by peoples living in small scale societies lacking the complex political integration, social stratification, and technological sophistication of peoples who speak languages having three or more life-form terms (cf. Stages 4-6). Size of life-form vocabularies is also found to be positively correlated with botanical species diversity. Speakers of languages with few life-forms tend to live in deserts or arctic tundra regions with low botanical-species diversity, while speakers of languages with more life-forms tend to be found in temperate woodland or tropical regions demonstrating considerably more plant variety.

An hypothesis accounting for these correlations will be presented. In addition, I will offer an explanation of why botanical life-form categories are always lexically encoded in a particular order. This explanation refers to certain general principles of naming-behavior¹ recently elucidated by Witkowski and Brown (1977) in their discussion of color nomenclature universals.²



#GRERB is realized as "herb" when "grass" is encoded at Stage 5 or 6.
 **herb" refers to herbaceous plants excluding grasses.

Fig. 1. Lexical encoding sequence for folk botanical life forms (showing three possible paths for adding life form terms).

IDENTIFICATION OF FOLK BOTANICAL LIFE-FORMS

All human groups order the diversity of plants and animals in their environments by grouping them into labeled categories of greater and lesser inclusiveness. The designation *life-form* has been used to refer to the most inclusive, comprehensive of these groupings (apart from the kingdom category) regularly discovered in folk biological taxonomies.

The life-form is one of several ethnobiological ranks recognized as universal by Berlin and his collaborators (Berlin 1972, 1976; Berlin, Breedlove, and Raven 1973, 1974). Life-form categories are always found at the first level (Level 1) of hierarchic inclusion in folk taxonomies (Berlin, Breedlove, and Raven 1973). They may be preceded by a kingdom category—comparable to the English *plant* or *animal*—which constitutes a taxonomy's unique beginner or most inclusive taxon.³ Life-form classes immediately include generic taxa occurring at the second level of inclusion (Level 2). Generic classes can also occur co-ordinately with life-forms at Level 1.

Generic taxa are distinguished from life-forms since they immediately include specific classes (Berlin, Breedlove, and Raven 1973). Specific taxa are labeled by "secondary lexemes." A secondary lexeme is a linguistically analyzable expression which has a constituent marking a category immediately superordinate to the taxon it labels, e.g., *live oak*, a kind of *oak*. Secondary lexemes are evidenced only if labels of *all* taxa immediately included in the same class share the identical superordinate constituent, e.g., *live oak*, *post oak*, *white oak*, *blue oak*, etc.⁴

Ethnobotanical data collected from Huastec Mayan speakers (Brown 1972) can be used to illustrate some of the distinctions described above. Five major categories pertain to Level 1 of Huastec plant taxonomy (there is no kingdom category). These are *te?* (tree), *č'ohol* (herb), *č'ah* (vine), *huayelte?* (bush) and *tom* (grass). The first four of these are clearly life-forms since they all immediately include generic taxa, e.g., *te?* is immediately superordinate to *kukay* (custard apple), *munek'* (black sapota), *ut'ub* (mesquite), etc. The "grass" category, *tom*, however, possesses the formal characteristics of a Level 1 generic. This taxon immediately includes five specific taxa (labeled by secondary lexemes): *čatath-tom* (zacate pangola), *alha²-tom* (zacate aguático), *čak-tom* (zacate colorado), *paktha²-tom* (zacate Guinea), *put-tom* (zacate silvestre)—(original Spanish glosses given by informants).

Berlin, Breedlove, and Raven (1974) identify four botanical life-forms for Tzeltal Mayan plant taxonomy. These are *te?* (tree), *wamal* (herb), *ʔak'* (vine), and *ʔak* (grass). The first three of these clearly meet the criteria of life-form rank. The last item, *ʔak*, names a taxon which immediately includes taxa *all* of which are labeled by expressions sharing the identical superordinate constituent (i.e., specific taxa): *beel ʔak*, *k'an ʔak*, *sisin ʔak*, *yas ʔak*, etc. (Berlin, Breedlove, and Raven 1974:400-401). Consequently, the Tzeltal *ʔak* (grass), like the Huastec *tom* (grass) is formally a Level 1 generic rather than a life-form category.

According to Berlin, Breedlove, and Raven (1974:400), the Tzeltal are not ambiguous "as concerns the classificatory treatment of *ʔak* as contrasting directly with *te?*, *ʔak'*, and *wamal* as a life-form taxon." This seems reasonable given that *ʔak* (grass) immediately includes 35 taxa whereas the clearly established Tzeltal life-form *ʔak'* (vine) includes only 24. Perhaps the number of taxa immediately included in a Level 1 taxon may be of some importance as a criterion, in addition to nomenclature features, for formally identifying life-form taxa.

Huastec informants similarly tend to respond to the Level 1 generic *tom* (grass) as if it were a life-form. All Huastec botanical life-forms, however, immediately include more labeled taxa than does *tom*. There are, nevertheless, other reasons for treating "grass" classes such as *ʔak* and *tom* as if they were formally life-form categories. Level 1 "grass" taxa in Tzeltal and Huastec, and in many other languages I have surveyed, manifest certain other characteristics (outlined in 1-7 below) shared by most formally defined botanical life-form

taxa. For this reason, Level 1 "grass" classes should perhaps be regarded as "near life-forms." In this paper the latter taxa are treated as if they possessed full life-form rank.

I have isolated certain other properties of folk botanical life-forms which usually, *but not always*, characterize them. These properties have been determined through comparison of data from 29 languages studied for ethnobotanical classification (see following section). They are as follows:

(1) Life-form labels are usually used to name individual plants rather than collectivities of plants. Thus terms equivalent to the English *crop*, *foliage*, *hedges*, *brush*, and the like usually are not found as life-form terms.

(2) A small number of distinctive features pertaining to the *form* of the *whole plant* (gross morphology) are the usual criteria by which the plant is identified by use of a life-form label (cf. Berlin 1976:385). Given this, there are certain characteristics which folk botanical life-forms usually *do not* possess. These are summarized in 3-7 below.

(3) Usually no characteristic *part* of a plant constitutes the criterion by which the plant is identified by a life-form term. Thus words equivalent to the English *fruit*, *flower*, and *tuber*, for example, usually are not found as life-form terms.

(4) Usually no characteristic *function* or *use* (or total lack thereof) of a plant constitutes the criterion by which the plant is identified by a life-form term. Thus terms comparable to the English *herb* (medicinal), *vegetable* (edible), and *weed* (total lack of use), for example, usually are not found as life-form labels.

(5) *Seasonal habits* of plants usually do not constitute the criteria by which they are identified by life-form terms. Thus words equivalent to the English *perennial* and *annual*, for example, usually are not found as life-form terms.

(6) Usually the *life stage* of a plant does not constitute the criterion by which it is identified by a life-form term. Thus words equivalent to the English *seedling* and *sprout*, for example, usually are not found as life-form terms. Occasionally, however, a life-form label can be alternatively used in a manner that seems to refer to life stages of plants. In Huastec, for instance, the life-form *č'ohol* (herb) is used to refer to any young or stunted tree no more than two feet or so in height.

(7) Usually the *environment* or *location* in which a plant grows does not constitute the criterion by which it is identified by a life-form term. Thus expressions comparable to the English *desert shrubs*, *tropical plants*, and *aquatic plants*, for example, usually are not found as life-form labels.

Berlin (1975:385) views the life-form inventories of several linguistic communities studied in depth for folk plant systematics as reminiscent of classical botanical classification involving the major categories "tree," "herb," and "vine." His informal cross-linguistic survey leads him to remark that "These three major groupings . . . represent such distinct perceptual discontinuities that their recognition may constitute a substantive near-universal in prescientific man's view of the plant world" (1976:385). My investigation of a large number of botanical life-form lexicons also suggests the universality of the three general plant classes mentioned by Berlin and, in addition, that of at least two others, "bush" and "grass," but only in the implicational sense of "universal" outlined earlier.

While a worldwide survey of folk botanical vocabularies reveals considerable richness in the variety of life-form categories they exhibit, only a very few of these are of global distribution. The latter general classes include "tree," "herb," "bush," "grass," and "vine," all of which are represented in languages spoken in every major, inhabited ecological zone. The distinctive morphological features possessed by plants determining their inclusion in the latter categories are of such a general nature that botanical organisms found in all of the world's plant-bearing environments manifest them. On the other hand, membership in other botanical life-form classes of limited distribution usually involves distinctive characteristics

of plants that occur in abundance and variety only in restricted ecological contexts, e.g., cacti, palms, agaves, and so on. The critical features associated with these five globally distributed, panenvironmental, botanical life-form taxa can be summarized as follows:

- “tree” larger plant (relative to the plant inventory of a particular environment) whose parts are chiefly ligneous (woody).
- “herb” smaller plant (relative to the plant inventory of a particular environment) whose parts are chiefly herbaceous (green, leafy, nonwoody). (This definition provides for the inclusion of grasses within the class. However, unless otherwise indicated, “herb” is used to refer to a class so defined, but *excluding* grasses.)
- “bush” plant of intermediate size (relative to the plant inventory of a particular environment) whose parts are either ligneous or herbaceous.
- “grass” smaller herbaceous plant (relative to the plant inventory of a particular environment) with narrow, often bladelike or spear-shaped, leaves.
- “vine” plant exhibiting a creeping or twining or twisting stem habit, whose parts are either ligneous or herbaceous.

The cross-linguistic identification of these five general plant classes constitutes the focus of this study.

TYPE A LANGUAGE CASES

This paper reports a survey of the botanical life-form inventories of 105 languages. Data were assembled from two major sources: (1) published and unpublished accounts of firsthand investigation of native botanical classification, and (2) dictionaries, including word lists and vocabularies. Languages are identified as Type A or Type B cases according to the kind of major source employed in the collection of data pertaining to them, respectively (1) and (2) above. Data from 29 Type A cases are presented in this section. These data were either personally collected by the author, obtained from ethnobotanical reports (monographs and articles), from dictionaries with special sections dealing with botanical classification, or were supplied to the author by individuals who gathered data in the field.⁵

Table 1 lists the 29 Type A language cases and specifies for each case the presence (+) or absence (–) of the globally occurring life-form classes. In Table 1 “grass” and “herb” (the latter referring to herbaceous plants excluding grasses) are scored in the same column. If a language has a life-form category including both grasses and herbs, a single “+” is given in the center of the column. If a language does not have the latter “composite” category and, in addition, lacks both “grass” and “herb” a single “–” is given in the center of the column.

TABLE 1. FOLK BOTANICAL LIFE-FORM INVENTORIES FOR 29 TYPE A LANGUAGE CASES.

Cases	Life-Forms			
	“tree”	“grass” (+) “herb”*	“vine”	“bush”
Huichol ¹	–	–	–	–
Quiche ⁴	+	–	–	–
Zuni ¹	+	–	–	–
Hopi ¹	+	+	–	–

TABLE 1. FOLK BOTANICAL LIFE-FORM INVENTORIES
FOR 29 TYPE A LANGUAGE CASES (cont'd)

Cases	Life-Forms				
	"tree"	"grass" (+)	"herb"*	"vine"	"bush"
Itawis ³	+	+		-	-
Karok ¹	+	+		-	-
Navaho ¹	+	+		-	-
Papago-Pima ²	+	+		-	-
Pocomchi ⁴	+	+		-	-
Samal ¹	+	+		-	-
Western Apache ²	+	+		-	-
Paiute ¹	+	+	-	-	-
Aguaruna ¹	+	+		+	-
Chuj ¹	+	+		+	-
Hanunoo ¹	+	+		+	-
Kagura ¹	+	+	-	-	+
Smith River ¹	+	+	-	-	+
Yurok ¹	+	+	-	-	+
Mandarin ¹	+	+	-	+	-
French (Canadian) ³	+	+		+	+
Quechua ¹	+	+		+	+
Spanish ³	+	+		+	+
Ndumba ¹	+	+	+	+	-
Tewa ¹	+	+	+	+	-
Tzeltal ¹	+	+	+	+	-
Tzotzil ²	+	+	+	+	-
English ³	+	+	-	+	+
Huastec ³	+	+	+	+	+
Koya ⁴	+	+	+	+	+

+ = item present
- = item absent

1 — monograph or article source
2 — dictionary (special treatment)

3 — collected by author
4 — personal communication

*"herb" refers to herbaceous plants *excluding* grasses.

A brief discussion will illustrate some of the decisions involved in scoring the occurrence or nonoccurrence of life-forms in languages treated in Table 1. Walker (1966), for example, assigns the gloss "grass" to the Zuni *pəʔta:we*. "Grass," however, is not scored present for Zuni in Table 1 because Walker (1966:225) reports personal knowledge of only one subcategory of the taxon, i.e. *pə:cikowa* (blue gramma). The ethnobotanical rank of *pəʔta:we*, as a life-form or even as a near life-form, is not clearly established in Walker's account.

Walker (1966:224) also uses "bushes" to gloss *h̄tta:we* ("bush" is not scored present for Zuni in Table 1). According to him (1966:224), *h̄tta:we* includes "all perennial plants which grow in clumps and have no foliage, hence any bush in winter." Thus the term actually refers to a category of plants having a certain seasonal habit or characteristic. Walker also uses "herb" to gloss *k^wimi:we* ("herb" is not scored present for Auni in Table 1). From other information provided (Walker 1966:224), the latter term seems to refer to medicinal herbs rather than to a general class of small herbaceous plants. For example, *k^wimi:we* is also glossed by "roots."

Description of Navajo botanical life-forms comes from an unpublished paper by Werner, Manning, and Begishe (n.d.). These authors assign the translation "woody plants" to the Navajo term *ts'in*. The latter word is glossed by "tree" in Berard Haile's (1951) exhaustive dictionary of Navajo stems. "Tree" is indicated present for Navajo in Table 1. Werner and his colleagues translate another Navajo life-form term, *ch'il*, by use of "flexible non-woody plants." The latter clearly refers to all plants which are not called *ts'in* and thus must include all herbaceous plants and grasses. This interpretation is supported by Haile (1951) who uses "grass," "herb," and "weed" as appropriate glosses for this term. Thus a composite life form, "grass"+"herb," is scored present for Navajo in Table 1.

Randall (1976) similarly translates the Samal *sagbot* by use of "non-woody vegetation." Like the Navajo *ch'il*, *sagbot* seems to refer to plants other than trees, i.e. herbaceous plants and grasses. Thus a Samal "grass"+"herb" category is judged present in Table 1. Finally the Tewa *p'e*, translated by "stiff, long object; stick, lumber, plant; shrub, bush" (Robbins, Harrington, and Freire-Marreco 1916) is scored as "tree" in Table 1.

IMPLICATIONAL RELATIONSHIPS

If "grass"+"herb" is counted as a sixth life-form in addition to "tree," "grass," "herb," "vine," and "bush," there are 64 (2⁶) logically possible combinations of these classes which could occur in languages. The 29 cases of Table 1, however, demonstrate only 11 of these patterns. There are, therefore, severe constraints upon the types of life-form classes that may occur together in the lexicons of languages.

One obvious implicational relationship apparent in Table 1 is that if a language has one or more of the life-forms considered, it will have "tree." Thus the presence in a language of any life-form other than "tree" implies that language's possession of a "tree" term. Another implicational universal is somewhat more complex. If a language has "vine" or "bush," or both of these, it will also have, in addition to "tree," either "grass" or "grass"+"herb" (the composite category).

If these synchronic implicational relationships are interpreted diachronically, then clearly "tree" is always lexically encoded first, followed immediately by a category whose range of inclusion is as broad as "grass"+"herb" and as narrow as "grass." For convenience, the second life-form characteristically encoded by languages is referred to by use of the expression GRERB.

One other regularity is also apparent in Table 1. No language possesses both "grass" and "herb" life-forms and lacks "vine." Consequently, "vine" must be lexically encoded before both "grass" and "herb" emerge as distinct life-forms.

The observations made above concerning the order in which life-form classes are added to languages are summarized by the encoding paradigm of Figure 1. Figure 1 also describes the three possible paths languages may take in adding botanical life-forms to lexicons.

TYPE B LANGUAGE CASES

Nineteen of the 29 Type A cases presented in Table 1 are North, Central, and South American Indian languages. To obtain a more globally representative sample of cases, the botanical life-form lexicons of 76 additional languages were investigated through dictionary sources. The life-form lexicons of these 76 Type B cases and the original 29 Type A cases are described in Table 2. Type B cases were all taken from sources containing an approximate minimum of 3,000 lexical entries.

TABLE 2. STAGE AFFILIATIONS OF 105 TYPE A AND B LANGUAGE CASES WITH ASSOCIATED ENVIRONMENT TYPE AND SOCIETAL COMPLEXITY INDICES

		<i>Indices</i>	
		A = environment type(s) (cf. Table 3) B = societal complexity	
STAGE AFFILIATION:		A	B
<i>Stage 1 (no items)</i>			
	1. Huichol ¹	52	—
<i>Stage 2 (one item)</i>			
	["tree"]:		
	2. Pintupi ²	52	—
	3. Quiche ¹	46	—
	4. Zuni ¹	52	1
	["vine"]:		
	5. Nukuoro ²	78	—
<i>Stage 3 (two items)</i>			
	["tree"—"grass" + "herb"*(GRERB)]:		
	6. Cayapa ²	88	1
	7. Chamorro ²	78	—
	8. Hausa ²	54	7
	9. Hopi ¹	52	1
	10. Itawis ¹	88	—
	11. Karok ¹	55	—
	12. Mazahua ²	46	—
	13. Navaho ¹	52	1
	14. Pangasinan ²	88	—
	15. Papago-Pima ¹	51/52	1
	16. Pocomchi ¹	46	—
	17. Samal ¹	84	—
	18. Swahili ²	84	—
	19. Tarascan ²	52	6
	20. Wappo ²	55	1
	21. Western Apache ¹	52	1
	["tree"—"grass"(GRERB)]:		
	22. Crow ²	54	2
	23. Kusaiean ²	78	4
	24. Lake Miwok ²	46	—
	25. Paiute ¹	52	1

TABLE 2. STAGE AFFILIATIONS OF 105 TYPE A AND B LANGUAGE CASES
WITH ASSOCIATED ENVIRONMENT TYPE AND SOCIETAL COMPLEXITY INDICES (cont'd)

		<i>Indices</i>	
		A = environment type(s) (cf. Table 3)	
		B = societal complexity	
STAGE AFFILIATION:		A	B
<i>Stage 4 (three items)</i>			
	[“tree”—“grass”+“herb”*(GRERB)—“vine”]:		
	26. Aguaruna ¹	44/78	—
	27. Chuj ¹	46	—
	28. Dyola ²	54	—
	29. Galla ²	54	2
	30. Hanunoo ¹	88	0
	31. Manobo ²	88	1
	32. Mixe ²	46	—
	33. Muyuw ²	88	—
	34. Nahuatl ²	46	7
	35. Tibetan ²	44	7
	36. Totonac ²	88	7
	[“tree”—“grass”(GRERB)—“vine”]:		
	37. Atakapa ²	54/56	—
	38. Biloxi ²	54/56	—
	39. Mandarin ¹	54	13.0
	40. Tiruray ²	88	—
	[“tree”—“grass”(GRERB)—“bush”]:		
	41. Congo ²	84/88	6
	42. Eskimo ²	51	0
	43. Kagura ¹	84	—
	44. Kiowa ²	54	—
	45. Smith River ¹	55	—
	46. Yurok ¹	46	1
	[“tree”—“grass”+“herb”*(GRERB)—“bush”]:		
	47. Nez Perce ²	36/52	—
<i>Stage 5 (four items)</i>			
	[“tree”—“grass”+“herb”*(GRERB)—“vine”—“bush”]:		
	48. Albanian ²	55	—
	49. Arabic ²	65	7
	50. Armenian ²	54/56	—
	51. Dakota ²	54	—
	52. French (Canadian) ¹	36/54	89.9
	53. Hungarian ²	56	36.8
	54. Igbo ²	88	—
	55. Japanese ²	56/78	41.5
	56. Jarai ²	88	—
	57. Maranao ²	88	—
	58. Miskito ²	88	4
	59. Mongolian ²	54/56	5
	60. Natick ²	56	—
	61. Onondaga ²	56	3
	62. Otchipwe ²	36	1
	63. Quechua ¹	44	—
	64. Rumanian ²	56	21.8
	65. Serbo-Croatian ²	56	—
	66. Spanish ¹	55	31.4
	67. Tagalog ²	88	7

TABLE 2. STAGE AFFILIATIONS OF 105 TYPE A AND B LANGUAGE CASES
WITH ASSOCIATED ENVIRONMENT TYPE AND SOCIETAL COMPLEXITY INDICES (cont'd)

<i>Indices</i>		
	A = environment type(s) (cf. Table 3)	
	B = societal complexity	
STAGE AFFILIATION:	A	B
68. Turkish ²	54/56	23.9
69. Vietnamese ²	88	16.8
[“tree”—“grass”(GRERB)—“vine”—“bush”]:		
70. Delaware ²	54	1
71. English ¹	56	84.6
72. Kalispel ²	54	—
73. Micmac ²	56	2
74. Yareba ²	88	—
[“tree”—“herb”*(GRERB)—“vine”—“grass”]:		
75. Mopan ²	88	—
76. Ndumba ¹	84/88	—
77. Osage ²	54	—
78. Otomi ²	46	—
79. Pahlavi ²	54	—
80. Tewa ¹	52	1
81. Tzeltal ¹	46	—
82. Tzotzil ¹	46	—
<i>Stage 6 (five items)</i>		
[“tree”—“herb”*(GRERB)—“vine”—“bush”—“grass”]:		
83. Bicol ²	88	—
84. Cheyenne ²	54	2
85. Choctaw ²	56	3
86. Cornish ²	56	—
87. Cree ²	36	1
88. Czech ²	56	65.5
89. Efik ²	88	—
90. Finnish ²	36	47.5
91. German ²	56	68.4
92. Hawaiian ²	88	5
93. Huastec ¹	88	5
94. Indonesian ²	88	20.5
95. Irish ²	54	42.7
96. Korean ²	56	14.7
97. Koya ¹	74	—
98. Maori ²	54/46	4
99. Pali ²	74	—
100. Polish ²	56	45.8
101. Sanskrit ²	74	—
102. Thai ²	88	13.7
103. Welsh ²	56	—
104. Yiddish ²	56	—
105. Zulu ²	74	7

1 — Type A (nondictionary) language cases

2 — Type B (dictionary language cases)

*“herb” refers to herbaceous plants *excluding* grasses.

TABLE 3. ENVIRONMENT TYPE KEY (cf. BARRY n.d.: 20)

Environment Type:	Index:
Tundra (Northern areas)	23
Northern coniferous forest	36
High plateau steppe	44
Temperate forest (mostly mountainous)	46
Desert (including arctic)	51
Desert grasses and shrubs	52
Temperate grassland	54
Mediterranean (dry, deciduous, and evergreen forests)	55
Temperate woodland	56
Oases and certain restricted river valleys	65
Sub-tropical bush	74
Sub-tropical rain forest	78
Tropical grassland	84
Monsoon forest	87
Tropical rain forest	88

Note: In the numerical scale, the first of each pair of numbers is scaled according to temperature and the second of the pair is scaled according to vegetation, with a scale score of 51 including both extremes of desert and arctic (Barry n.d.: 20).

Table 2 lists cases by growth stage affiliation (Stages 1-6) and presents the specific combination of life-form categories possessed by each. Languages are assigned to stages solely on the basis of the number of life-forms determined for them. Thus, for example, while the first category lexically encoded for a language at Stage 2 is usually "tree" (cf. Figure 1), one language assigned to that stage in Table 2, Nukuoro, has encoded a non-"tree" life-form, i.e. "vine." Table 2 also gives certain indices (environment type and societal complexity scores) for languages to which I will refer presently.

In the 76 Type B language cases only two additional patterns of life-form categories appear beyond the eleven of Table 1. These patterns pertain only to Nukuoro (5.), which has the single life-form "vine," and to Nez Perce (47.), which has "tree," "grass"+"herb" (GRERB), and "bush." With the exception of Nukuoro, these additional 76 cases confirm the implicational relationships apparent in Table 1 and are, of course, in conformity with the encoding sequence described in Figure 1.

BOTANICAL LIFE-FORM ENCODING SEQUENCE

The encoding sequence of Figure 1 is interpreted as a series of stages in the growth of folk botanical life-form lexicons. Languages at Stage 1 have no botanical life-forms. Only one language of the sample, Huichol (1.), is affiliated with Stage 1. At Stage 2 "tree" is lexically encoded. The life-form "tree" of early stage languages is often considerably broader in actual plant membership than "tree" of later stage languages. It frequently includes bushes and shrubs, and sometimes even ligneous vines in addition to trees.

At Stage 3 a second life-form, GRERB, is added. GRERB is never encoded simply as "herb," i.e. herbaceous plants excluding grasses, but is always initially realized either as "grass"+"herb" or as "grass." Twice as many (28) early stage languages (cf. Stages 3 and 4) have GRERB as a composite category "grass"+"herb" compared to those having it simply as

"grass." GRERB, then, is most often encoded at Stage 3 as a composite category. When GRERB is glossed as "grass" for Stage 3 and 4 languages, it may in fact include a few non-grassy herbaceous plants in addition to grasses. Such languages tend to be spoken in areas in which smaller herbaceous plants are predominantly grasses (cf. index A of Table 2 and its interpretation in Table 3). As a consequence, GRERB is reported for these cases as "grass," rather than as a composite class. In any case, GRERB life-forms of early stage languages characteristically include all, or very nearly all, plants not included in the "tree" life-form and in Level 1 generics.

From Stage 4 to Stage 6 three additional life-forms are lexically encoded. These taxa encompass plants previously included in GRERB and/or "tree" at earlier developmental stages. Thus the lexical encoding of "bush," for example, is achieved by pulling bushes and shrubs from the range of GRERB or "tree" or from the ranges of both as the case may be. Thus as life-forms are added from Stage 4 to Stage 6, the ranges of GRERB and "tree" tend to shrink.

While either "bush" or "vine" may be lexically encoded immediately after GRERB at Stage 4, "grass" is never the third botanical life-form to be added. "Grass" is created by pulling grasses from the range of GRERB, i.e., from the composite category "grass"+"herb." Thus when "grass" is encoded, "herb" (herbaceous plants excluding grasses) becomes the residue of a previously more comprehensive GRERB life-form.

"Grass" is identified as a *non-GRERB* category and "herb" as a *GRERB* category when both "grass" and "herb" occur in a language's life-form lexicon. This is in line with the observation that the lexical encoding of "grass" involves recognition of a set of distinctive features used to distinguish grasses and segregate them as a class from other herbaceous plants included in an earlier GRERB class. Thus "herb" develops as a consequence of the devolution of GRERB (involving the removal of grasses from its range) and not as the result of some *innovative* process requiring identification of a set of critical features associated with "herb" membership. Consequently, "herb," rather than "grass," is regarded as descended from a more inclusive GRERB class originally encoded at Stage 3.

GALTON'S PROBLEM AND GROWTH STAGES

Galton's Problem could be raised in critical response to the findings reported here. The argument is as follows. Geographically and genetically related languages may tend to be affiliated with the same stage of life-form development. Thus, many of the logically possible combinations of terms do not occur for languages because of borrowing and because only a few combinations were originally represented in the lexicons of parent languages. Thus, the uniformities discovered, one would conclude, are artifacts of diffusion and/or genetic relationship and, consequently, should not be interpreted as indicating a universal order in which life-form classes are lexically encoded.

Table 4 organizes the 105 languages surveyed according to genetic relationship (and roughly by geography) and indicates the botanical life-form stage affiliation for each. Clearly genetically and geographically related languages are not always associated with the same life-form stage. In fact, some language families demonstrate member affiliation with as many as five of the total six growth intervals, e.g., Mayan and Austronesian (cf. Table 4). Genetic relationship and diffusion then do not appear to figure significantly among factors accounting for the observed distribution of botanical life-form classes. Thus the regularities uncovered for botanical terminology are not artifacts of Galton's Problem.

SOCIETAL COMPLEXITY, SPECIES DIVERSITY, AND GROWTH STAGES

Berlin and Kay (1969:16) note a positive correlation between general societal complexity and size of color vocabulary. A similar correlation is found for size of botanical life-form

TABLE 4. CLASSIFICATION OF LANGUAGES WITH INDICATION OF STAGE AFFILIATIONS.

Eskimo-Aleut:

Eskimo (Stage 4).

Athabaskan:

Navaho, Western Apache (Stage 3), Smith River (Stage 4).

*Macro-Algonkian:**Algonkian:* Delaware, Micmac, Natick, Otchipwe (Stage 5), Cheyenne, Cree (Stage 6).*Others:* Atakapa, Yurok (Stage 4), Choctaw (Stage 6).*Macro-Siouan:**Siouan:* Crow (Stage 3), Biloxi (Stage 4), Dakota, Osage (Stage 5).*Other:* Onondaga (Stage 5).*Hokan:*

Karok (Stage 3).

Penutian:

Zuni (Stage 2), Lake Miwok (Stage 3), Nez Perce (Stage 4).

Unclassified North American Indian Languages:

Wappo (Stage 3), Kalispel (Stage 5)

*Aztec-Tanoan:**Kiowa-Tanoan:* Kiowa (Stage 4), Tewa (Stage 5).*Uto-Aztecan:* Huichol (Stage 1), Hopi, Paiute, Papago-Pima (Stage 3), Nahuatl (Stage 4).*Mesoamerican*:**Mayan:* Quiche (Stage 2), Pocomchi (Stage 3), Chuj (Stage 4), Mopan, Tzeltal, Tzotzil (Stage 5), Huastec (Stage 6).*Otomanguean:* Mazahua (Stage 3), Otomi (Stage 5).*Others:* Mixe, Totonac (Stage 4).*Unclassified Middle American Indian Language:*

Tarascan (Stage 3).

Macro-Chibchan:

Cayapa (Stage 3), Miskito (Stage 5).

South American Indian Languages (relationships undetermined):

Aguaruna (Stage 4), Quechua (Stage 5).

*Austro-Thai:**Austronesian (Philippines):* Itawis, Pangasinan, Samal (Stage 3), Hanunoo, Manobo, Tiruray (Stage 4), Maranao, Tagalog (Stage 5), Bikol (Stage 6).*Austronesian (Micronesia):* Nukuoro (Stage 2), Chamorro, Kusaiean (Stage 3).*Austronesian (Polynesia):* Hawaiian, Maori (Stage 6).*Austronesian (other):* Jarai (Vietnam) (Stage 5), Indonesian (Stage 6).*Other:* Thai (Stage 6).*New Guinea Languages (relationships undetermined):*

Muyuw (Austronesian?) (Stage 4), Ndumba, Yareba (Stage 5).

Australian Language:

Pintupi (Stage 2).

Sino-Tibetan:

Mandarin, Tibetan (Stage 4).

Austroasiatic:

Vietnamese (Stage 5).

Japanese-Korean:

Japanese (Stage 5), Korean (Stage 6).

Dravidian:

Koya (Stage 6).

Afroasiatic:

Hausa (Stage 3), Galla (Stage 4), Arabic (Stage 5).

Niger-Kordofanian:

Swahili (Stage 3), Congo, Dyola, Kagura (Stage 4), Igbo (Stage 5), Efik, Zulu (Stage 6).

Indo-European:

Eastern Indo-European: Albanian, Armenian, Pahlavi, Serbo-Croatian (Stage 5), Czech, Pali, Polish, Sanskrit (Stage 6).

Western Indo-European: English, French (Canadian), Rumanian, Spanish (Stage 5), Cornish, German, Irish, Welsh, Yiddish (Stage 6).

Ural-Altai:

Hungarian, Mongolian, Turkish (Stage 5), Finnish (Stage 6).

*cf. Brown and Witkowski (1976).

lexicon and societal complexity. Languages having few life-form terms are usually spoken by peoples living in small-scale societies who show little of the political integration, social stratification, and technological complexity of speakers of languages possessing many life-form terms. There is also an association between botanical species diversity and number of life-form terms. Languages of desert and arctic peoples usually have few life-form terms, while languages of peoples living in areas favoring botanical variety, such as temperate woodlands or tropical rain forests, have a greater number.

Several measures of societal complexity employing a wide range of index variables are described in the literature. The measure used here was developed by Marsh (1967). Schaefer (1969) has demonstrated that several of these measures, including Marsh's, correlate strongly with each other. Marsh's index rates societal complexity in terms of size and integration of political units and the degree of social stratification pertaining to them. A primary scale ranging from 0 to 7 indexes social units other than those described as contemporary national societies, with 0 indicating the least societal complexity and 7 the most. Contemporary national societies or states assume scores greater than 7. In Marsh's (1967:338-347) index the latter range from 8.6 for Portuguese Guinea to 109.4 for the United States.

Table 2 lists the societal complexity scores for the 54 languages (societies) of the set of 105 found in Marsh's index. The association between societal complexity and size of life-form lexicons (given as life-form stage) is presented in Table 5. The correlation coefficient, gamma, is .59 ($p < .05$, $N = 54$).

Environment type scores are given for all 105 languages in Table 2 and are used to determine the association between botanical species diversity and size of life-form lexicons. These scores, interpreted in Table 3, were originally assigned to 400 societies of Murdock's *Ethnographic Atlas* (1967) by Frank Moore (cf. Barry n.d.:20). An estimation procedure was utilized for determining environment scores for societies (languages) not rated by Moore. These unrated societies were assigned the same scores as those rated societies found closest to them in geographic space.

TABLE 5. ASSOCIATION BETWEEN SOCIETAL COMPLEXITY AND SIZE OF LIFE-FORM LEXICONS (GIVEN AS LIFE-FORM STAGE).

Societal Complexity	Life-Form Stages		
	1-3	4-5	6
High (above 7)	0	9	8
Medium (4-7)	3	8	4
Low (0-3)	9	10	3
gamma = .59	p < .05	N = 54	

Table 6 presents the correlation of botanical species diversity and size of life-form lexicon (gamma = .34, $p < .001$, $N = 105$). Botanical species diversity is determined from a vegetation score or index which is the second or right-hand digit of the environment type score (see Table 3). A vegetation index of 1 indicates the smallest amount of species diversity (grasses and shrubs) and an index of 8 the largest amount (rain forest). Where a language case demonstrates two environment types (see Table 2), an average of the two scores figures into the correlation of Table 6.

TABLE 6. ASSOCIATION BETWEEN BOTANICAL SPECIES DIVERSITY AND SIZE OF LIFE-FORM LEXICONS (GIVEN AS LIFE-FORM STAGE).

Species Diversity	Life-Form Stages		
	1-3	4-5	6
High (7 and 8)	6	14	6
Medium (4, 5, and 6)	9	41	17
Low (1, 2, and 3)	10	2	0
gamma = .34	p < .001	N = 105	

Species diversity and societal complexity are themselves positively correlated (gamma = .45, $p < .02$, $N = 54$). This might suggest that either species diversity or societal complexity, but not both, is the crucial variable in the correlations described in Tables 5 and 6. In other words, one of these two associations may simply be an artifact of the other.

The association between species diversity and life-form stages is, of course, considerably weaker than that between societal complexity and stages. However, by collapsing the variables "high" and "medium" species diversity (cf. Table 6) into one variable contrasting with "low" species diversity, the correlation coefficient is increased from .34 to .93. Thus a strong association between species diversity and number of botanical life-forms is evidenced when botanical variety is primarily realized as a contrast between severe lack of plant differentiation (low vegetation scores 1, 2, and 3) associated with desert and arctic environments and the greater variation found in all other environments. Apparently, then, the amount of species diversity in an environment is important only at low levels in influencing life-form development.

Most of the strength of the correlation of Table 6 (gamma = .34) derives from the fact that severe lack of botanical species diversity apparently tends to *constrain* the growth of life-form lexicons. There is no evidence that extreme botanical variety encourages this

development. For example, if a strong positive correlation between the size of life-form vocabularies and species diversity were in fact the case, one would expect Stage 5 and 6 languages to be most commonly spoken by groups living in monsoon forests or in tropical rain forests. This is not, however, the case. Only 25.7% of the 58 Stage 5 and 6 languages have an associated vegetation index (an average of two scores in some cases) of 7 or 8.

An increase in societal complexity, on the other hand, clearly seems to promote the addition of botanical life-form terms. My colleague, Stanley R. Witkowski, has suggested a possible explanation of this association. He refers to Berlin's discussion of "decay" in some areas of vocabulary. According to Berlin (1972:83), "Wholesale vocabulary loss in some specific area must be due in part, at least, to the lessening of cultural importance associated with the particular area of human concern." Peoples living in complex societies tend to participate in daily activities which are rarely involved with the natural world, with the world of plants and animals. Hence their knowledge of ethnobiology is seldom highly developed or particularly detailed. Thus a decay in that part of the lexicon containing words for plants and animals is to be anticipated as societies move toward the extreme complexity associated with national states. Berlin (1972:83) notes:

As concerns ethnobotanical nomenclature particularly, it now seems likely that the direction of vocabulary loss will be from the particular to the general. To use the terminology of my colleagues Kay and Geoghegan, loss will occur "from the bottom up." With little introspection, speakers of English who have been reared in an urban setting will recognize at once that they know virtually no specific names for kinds of plants, that many generic names are recognizable linguistically only as "names" of plants, the organisms referred to being totally unfamiliar. Nonetheless, abstract life-form names, such as "tree" or "grass" apparently remain as useful terms for referring to an ever-shrinking (both literally and figuratively) portion of one's natural environment.

Not only do life-form names remain as useful botanical terms, they may in fact become the *most* useful. Indeed, as fewer specific and generic names and their referents are learned, it may be of considerable value not only to retain life-form categories, but also, to add new ones. For these reasons, suggests Witkowski, the extreme societal complexity characterizing national states may tend to expand life-form lexicons.

Of the 17 languages assigned high complexity scores (above 7), 13 demonstrate medium vegetation scores (4, 5, and 6). State societies are primarily associated with temperate woodlands and grasslands rather than with lush tropical rain forests. As a consequence, larger life-form inventories are by and large characteristic of languages spoken in areas of only moderate species diversity. This helps to explain why the association between species diversity and life-form stages is considerably weaker than the correlation between stages and societal complexity.

It appears then that neither of the two positive correlations is entirely an artifact of the other. Very low species diversity constrains the expansion of life-form lexicons while increasing societal complexity encourages life-form growth.

EXPLANATION OF THE LIFE-FORM ENCODING SEQUENCE

While societal complexity and species diversity may bear upon the size of life-form lexicons, they do not figure into an explanation of the characteristic order in which botanical life-form terms are added to languages (cf. Figure 1). The latter explanation entails certain general principles of naming-behavior recently discussed by Witkowski and Brown (1977).

The special encoding priority of "tree" and GRERB can be attributed to the general human tendency to classify by means of binary oppositions. This tendency is particularly apparent in the adjectival component of vocabularies. The oppositional characteristics of dimensional concepts, such as height, width, depth, etc., are usually encoded by two terms,

and only rarely are finer dimensional distinctions lexically carved out. This results in such familiar adjectival oppositions as wide/narrow, deep/shallow, hard/soft, rough/smooth, sharp/blunt, and so on.

Stage 3 languages illustrate this tendency. These systems have encoded two major botanical categories, "tree" and GRERB, in which most, if not all, plants are included. Presumably this is accomplished through recognition of opposing dimensional characteristics of plants. This may involve (1) the dimension "size" or (2) the dimension "ligneousness vs. herbaceousness," or, conceivably, both (1) and (2) simultaneously. The life-form "tree" then includes all larger, ligneous plants, and its opposite, GRERB, all smaller, herbaceous plants.

Observation of the role of binary opposition in plant classification is more important than determination of which of the two dimensions mentioned above pertains to it. Clearly large plants are usually ligneous (woody) and small plants are usually herbaceous (nonwoody) so that attention to either dimension would result in essentially the same contrast, i.e. "tree" versus GRERB. However, the bulk of evidence bearing upon the nature of this opposition suggests "size" as the universally critical, underlying distinction.

GRERB terms, for example, are frequently found to name small trees in addition to herbaceous plants. Laughlin (1975:29) reports that the Tzotzil GRERB *č'i?lel* identifies " 'trees' whose growth is stunted or which are collected in their early stages of growth." The Huastec *č'ohol*, which signals a class of all small herbaceous plants excluding grasses, vines, and bushes, can be used to label any young or poorly developed tree no more than two or so feet in height. Stephen A. Tyler (personal communication) reports a similar use for the Koya GRERB term, *ettu*. Conversely, "tree" terms are occasionally used to name plants normally classified as GRERB, but which have achieved exceptional size. For example, Laughlin (1975:29) describes the following use for the Tzotzil "tree" term *te?*: ". . . if a species that would normally be classed as a 'plant' [*č'i?lel*] grows with great vigor, it may be identified as a 'tree.' "

Another ethnobiological example of the use of binary opposition in suprageneric classification has been described by Hage and Miller (1976) for the Shoshoni domain of birds. As in the case of plants, "size" seems to be the critical dimension underlying the binary distinction. In Shoshoni (a Uto-Aztecan language) birds are classified as *kwinaa* (large birds) or as *huittsuu* (small birds). The latter two terms completely partition the domain considered.⁶ Hage and Miller (1976) also refer to other studies reporting a suprageneric *large bird/small bird* contrast in American Indian languages affiliated with several different genetic groupings. These include Dakota (Siouan), Washo (Hokan), Aguaruna Jívaro (South American Indian), and another Uto-Aztecan language, Hopi. The same distinction is also probably utilized by Slave (Athabaskan) speakers (Stanley R. Witkowski, personal communication).

The tendency to distinguish *large plant/small plant* is apparently so strong that the opposition is maintained despite devolution of categories originally representing it. When new life-forms are added to languages, the ranges of "tree" and GRERB tend to shrink. While languages apparently always retain a "tree" category, the range of GRERB can become so depleted that it altogether ceases to be a general small plant class. This, it seems, happened in English. Nevertheless, a *large plant/small plant* contrast still persists in English botanical classification.

English folk botanical taxonomy—at least that known to the author—does not demonstrate a labeled life-form class comparable to either "grass"+"herb" or "herb." The modern nonspecialist understanding of *herb*, for example, is limited to a class of medicinal plants and plants used for foods. The latter term, however, was once generally applied to species of a category of small herbaceous plants. *The Oxford English Dictionary* cites literary examples of this usage for a 500-year period beginning in the 13th century. The latter

source, for instance, reports the following use of the word in *The Early South-English Legendary or Lives of Saints* (ca. 1290): "Of treon and herbes, pikke . . . bi-set in eche side." Thus the modern *herb* (rather than *grass* as suggested in Table 2) is traced to an ancestral English GRERB category.

(Table 2 identifies the English *grass* as a GRERB life-form. This identification is made strictly in accordance with the convention adopted and does not, of course, conform with the diachronic facts presented above. Diachronic evidence bearing on the actual development and/or devolution of life-forms of other languages may similarly lead to reinterpretations of other "grass" life-forms designated as GRERB in Table 2.)

As botanical life-forms were added to English the range of *herb* shrank to the point that it was no longer generally used to refer to members of a class of small herbaceous plants. Presumably devolution of the English GRERB entailed loss of the *large plant/small plant* distinction. However, this opposition appears to be reasserting itself by way of an alternative usage of English's botanical unique beginner or kingdom label. The word *plant*, which encompasses all botanical organisms, is commonly and widely used in a secondary sense to refer to all non-"tree" plants (cf. Buck 1949:521). *Plant* then is assuming a role in English folk botanical taxonomy formerly pertaining to *herb*. This is testimony to the importance of the *large plant/small plant* distinction and to the strength of the human tendency to categorize by means of binary oppositions.

The primacy of binary opposition in categorization of plants accounts for the developmental priority of "tree" and GRERB vis-a-vis "bush," "vine," and "grass." The encoding priority of "tree" vis-a-vis GRERB, however, is still to be explained. This is handled by appealing to the framework of "marking" developed over the years by Greenberg (1966, 1969, 1975) and others.

The principle of marking frequently finds expression in antonyms such as wide/narrow and deep/shallow (Greenberg 1966:53). In such pairs one item will be marked and the other unmarked. An unmarked term tends to occur more frequently in language use and, hence, is more salient than its marked opposite. Queries concerned with width and depth, for example, are more often framed with the unmarked forms, "wide" and "deep," than with the marked forms, "narrow" and "shallow." Thus we customarily ask "How deep is the river?" not "How shallow is the river?" In addition, marked items tend to be phonologically more complex than unmarked items suggesting the unmarked term to be older and hence developmentally prior to the marked term.

Usually the same oppositional pole of a dimension underlying an adjectival contrast will be labeled by unmarked terms in languages recognizing the distinction. Greenberg (1966:53), for example, has assembled evidence strongly indicating that "deep" is universally unmarked while its counterpart, "shallow," is universally marked. This fascinating result apparently extends to the classification of plants and the opposition "tree"/GRERB. In terms of marking theory "tree" or *large plant* is universally unmarked and GRERB or *small plant* is universally marked.

Marked items are occasionally *overtly* marked. Overt marking involves use of a label consisting of a head and an addendum. The head is a constitute lexeme that labels the marked item's unmarked counterpart. The addendum is always some kind of modifying element. In Spanish, for example, *poco profundo* refers to "shallow." This expression consists of a head, *profundo*, which labels "deep," and an addendum, *poco*, meaning "little" (Greenberg 1966:53).

If the opposition "tree"/GRERB in fact fits into the framework of marking theory, one might expect to uncover some evidence of overt marking. In other words, examples of an overtly marked GRERB category should occasionally be found in botanical life-form lexicons. Among the 105 languages surveyed here, six possible examples are discovered:

Language:	"tree"	GRERB
Congo (41.)	<i>nchi</i>	<i>chichi</i>
Hungarian (53.)	<i>fa</i>	<i>fü</i>
Korean (96.)	<i>na-mu</i>	<i>san na-mul</i>
Mopan (75.)	<i>che?</i>	<i>pocche?</i>
Pocomchi (16.)	<i>chee?</i>	<i>k'ichee?</i>
Tewa (80.)	<i>p'e</i>	<i>p'e'næði</i>

If recognition of the opposition *large plant/small plant* accounts for the encoding priority of "tree" and GRERB, how does one explain the existence of Stage 2 languages having a "tree" life-form but not GRERB? The possibility of overt marking in plant naming figures prominently into an answer to this question. I propose that speakers of Stage 2 languages in fact do distinguish a GRERB life-form but have yet to develop any one label for the category which has achieved currency. The lexical encoding of "tree" always entails the simultaneous encoding of GRERB. However, as the universally marked item of the pair, GRERB is never initially assigned a unitary lexeme as a name; rather, it is overtly marked. This may involve the spontaneous situational production of GRERB labels equivalent to something like "tree-opposite," "non-tree," "small-tree," and so on. Presumably there is a tendency for one or the other of these labels to gain currency, but until it does, the life-form lexicon of a language will in fact lack a GRERB term.

Just as GRERB is marked vis-a-vis "tree," "bush" is marked vis-a-vis both "tree" and GRERB. The lexical encoding of "bush" involves further attention to the dimension underlying the "tree"/GRERB distinction. "Bush" is a plant of intermediate size (relative to the plant inventory of a particular environment) whose parts are either ligneous or herbaceous. "Bush," in effect, mediates between the oppositional poles "tree" and GRERB along a "size" dimension. Only when the "tree"/GRERB opposition is recognized and both poles are labeled will "bush" be distinguished as a category of botanical organisms that are smaller than the largest plants and larger than the smallest plants in any given environment.

"Vine" and "grass," both of which, like "bush," are lexically encoded after "tree" and GRERB, do not participate in a marking sequence based on plant size. Rather, member species of these life-form classes are distinguished by entirely different criteria. A plant is identified as "vine" if it exhibits a creeping or twining or twisting stem habit. A plant is identified as "grass" if it is herbaceous and possesses bladelike or spear-shaped leaves.

Finally, only the encoding priority of "vine" vis-a-vis "grass" remains to be explained. The fact that "grass" is characteristically added after "vine" (cf. Figure 1) may relate to the differential salience of distinctive features associated with membership in these classes. A feature, distinctive or otherwise, is highly salient if it pertains to a very large and varied set of objects. The dimension "size," for example, is an exceptionally salient characteristic since all natural and man-made objects manifest it. The supersalience of "size," of course, figures importantly into the explanation of the encoding priority of "tree" and GRERB.

On the other hand, a feature, distinctive or otherwise, is not particularly salient if it only pertains to a single object or to a very small number of different objects. For example, the distinctive features associated with membership in a "grass" category characterize few, if any, things other than grasses and, therefore, are especially low in salience. Likewise, the distinctive features associated with vines are not particularly salient, but are, nonetheless, generalized to a greater array of things than those pertaining to grasses.

A number of different objects, both natural and manmade, resemble vines to a lesser or greater degree. These include such items as worms, snakes, tongues, belts, whips, cords, ropes, and strings. In fact, commonly when a language has a "vine" term, it is used to identify, in addition to vines, one or more of the nonbotanical objects just enumerated.

vice versa is unclear. In any event, "grass" terms rarely, if ever, are found to have similar nonbotanical referents. This may indicate that the distinctive features associated with "grass" are somewhat less salient than those associated with "vine" and this, conceivably, could bear upon the encoding priority of "vine" vis-a-vis "grass."

NOTES

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¹ I do not find the usual word used by ethnoscientists, i.e., "semantics," appropriate to the kinds of linguistic phenomenon dealt with here. "Naming-behavior" is used instead to avoid suggesting that the association of word and object is the principal factor in the achievement of communication and understanding through actual language use. To my way of thinking—deriving from the ordinary language philosophy of Wittgenstein—the meaning of a word is equated with its *use* and not with the object or objects it may name. This argument has been undertaken by me in several places (Brown 1973, 1974a, 1974b, 1976a, 1976b) and will not be repeated here.

² Recent cross-linguistic research has focused upon naming-behavior principles in domains in addition to color and plants. This includes Nerlove and Romney's (1967) typology of sibling terminologies and Kronenfeld's (1974) later refinement of the latter; Witkowski's (1972) treatment of implicational universals in kinship categorization; Williams' (1976) possible law of "semantic" change involving synaesthetic adjectives; Brown's (1976c) outline of regularities in human anatomical partonomy (body-part systematics) and speculations on the growth of partonomic nomenclature; and Burris' (1976) lexical encoding sequence for geometric figure classes.

³ Most folk botanical taxonomies lack a unique beginner or kingdom category equivalent to the English *plant*. Berlin, Breedlove, and Raven (1973) have argued that even though such a labeled class is missing in Tzeltal, it is nonetheless there in a "covert" sense. These authors (1968) also propose the existence of covert or unlabeled intermediate taxa. Readers are directed to pages of this journal in which Berlin and I (Berlin 1974; Brown 1974c) debate the proposal of covert categories in taxonomy.

⁴ Berlin, Breedlove, and Raven (1973) outline a number of other nomenclature principles pertaining to the definition of ethnobiological ranks. Knowledge of these details is not essential to following the argument developed here, but interested readers, of course, can refer to them. In addition, Brown et al. (1976) have recently shown that Berlin, Breedlove, and Raven's principles, and the ranks they define, pertain to nonbiological classification as well.

⁵ These individuals are Linda Kay Brown (Pocomchi), Munro S. Edmonson (Quiche), and Stephen A. Tyler (Koya). Their help is greatly appreciated.

⁶ Hage and Miller (1976) describe *kwinaa* (large bird) and *huittsuu* (small bird) as labels for intermediate taxa immediately preceded by the zoological life-form *kwinaa* (bird). They do not mention whether or not Shoshoni folk zoological taxonomy demonstrates a unique beginner or kingdom category equivalent to the English *animal*. In any case, it seems reasonable to interpret *kwinaa* (large bird) and *huittsuu* (small bird) as being life-form taxa immediately included in a "bird" kingdom class. This interpretation conforms with my

suspicion that categorization through binary opposition is commonly associated with Level 1 of both biological and nonbiological folk taxonomies (see Witkowski and Brown 1977 for an assessment of the role of binary opposition in color categorization).

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