Folk Zoological Life-Forms: Their Universality and Growth

CECIL H. BROWN
Northern Illinois University

Folk zoological life-form terms, like folk botanical life-form terms (Brown 1977a), are added to languages in a highly regular manner. Life-forms of the triad FISH, BIRD, and SNAKE are lexically encoded first, although in no particular order, followed by WUG (e.g., American English bug*) and then MAMMAL. Four general principles of naming-behavior underlie these regularities: (1) criteria clustering; (2) conjunctivity (including binary opposition); (3) dimension salience; and (4) marking. In addition, size of folk zoological life-form vocabularies is positively correlated with societal complexity. This is caused by the decay of folk biological taxonomies as societies become more complex.* [cognitive anthropology, ethnobiology, folk classification, language universals, language change]

THIS IS THE SECOND of two papers treating the universality and growth of folk biological life-forms. The first paper showed that five botanical life-forms, "tree," "grerb" (small herbaceous plant), "vine," "bush," and "grass," are added to languages in a highly regular manner (Brown 1977a). These uniformities were explained through reference to general principles of naming-behavior. The present study similarly shows that five folk zoological life-forms are lexically encoded in a highly regular order. General principles of naming-behavior also underlie zoological life-form encoding.

The order in which biological life-forms are added to languages is inferred from synchronic implicational universals. For example, if a language has a label for "grerb," it will also have a label for "tree," although not necessarily vice versa. Thus the occurrence of a "grerb" term universally implies the occurrence of a "tree" term (Brown 1977a). Similarly, if a language has a word for "mammal," it will also have a word for "wug" (e.g., American English *bug*) although not necessarily vice versa. Thus "mammal" universally implies "wug." For such relationships to have been realized in fact, life-form

CECIL H. BROWN's research interests lie primarily in cognitive anthropology and linguistics. His published works in these fields include articles on kinship semantics, ethnobiology, ethnoanatomy, color classification, language universals, language change, and the historical/comparative linguistics of Mesoamerican languages. He has also written a book, *Wittgensteinian Linguistics* (1974), dealing with overlapping issues in contemporary linguistics and philosophy. Following fieldwork among Huastec Mayan speakers of northern Veracruz, Mexico, in 1971 he earned a Ph.D. in anthropology from Tulane University. Brown is currently an associate professor of anthropology at Northern Illinois University where he has been since 1970. His principal nonacademic interest is warm weather.

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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 zoological life-forms to vocabularies inferred from synchronic implicational universals.

	[FISH BIRD SNAKE]	→	[WUG]	→ [MAMMAL]
Stages:	1-3		4	5

Fig. 1. Lexical encoding sequence for folk zoological life-forms.

There are five stages in the growth of folk zoological life-forms, with one life-form term being added at each stage (see Figure 1). From Stage 1 to Stage 3 three life-forms are encoded, FISH, BIRD, and SNAKE, although in no particular order. Ranges of the categories FISH and BIRD are usually comparable to those of taxa labeled by *fish* and *bird* in English. SNAKE, on the other hand, may encompass elongated animals such as worms and lizards in addition to snakes. A fourth life-form, WUG, is encoded at Stage 4. WUG includes creatures denoted by *bug* in American English (i.e., insects and other very small animals such as spiders) and is commonly extended to worms. Sometimes WUG life-forms also encompass other small creatures such as snails, frogs, tortoises, crabs, and lizards. Finally, MAMMAL is added at Stage 5. MAMMAL includes most large creatures, occasionally encompassing even large nonsnake reptiles and large amphibians.

The plant life-form study reported a positive correlation between size of folk botanical life-form lexicons and societal complexity. A similar association holds between the number of named zoological life-forms in languages and the societal complexity of peoples who speak them. Both correlations are a consequence of the decay of folk biological taxonomies "from the bottom up" (from more specific classes to less specific classes) among peoples whose relationship with the world of plants and animals becomes attenuated as societies become more complex (Brown 1977a:332; Berlin 1972:83). When taxonomies devolve from the bottom up, labeled life-form taxa become more useful and, consequently, tend to increase in number.

IDENTIFICATION OF FOLK ZOOLOGICAL LIFE-FORMS

All human groups respond to the diversity of plants and animals in their environments by grouping them into labeled categories of greater and lesser inclusiveness. The expression *life-form* has been used to refer to the largest and most heterogeneous of these groupings regularly discovered in folk biological taxonomies (apart from "unique beginner" categories such as *plant* and *animal*).

Formal nomenclatural criteria for determining affiliation of folk biological taxa with ethnobiological ranks such as *life-form, generic,* and *specific* have been proposed by Brent Berlin and his colleagues (Berlin 1972, 1976; Berlin, Breedlove, and Raven 1973, 1974). In Berlin's scheme a taxon having a certain kind of label is defined as belonging to a certain rank. For example, life-form classes are always labeled by primary lexemes (e.g., *tree, fish*) and immediately precede generic taxa, which are always labeled by primary lexemes (e.g., *oak, trout*). Generics, if polytypic, always precede specific classes labeled by secondary (compound) lexemes (e.g., *post oak, live oak, rainbow trout, cutthroat trout*). Hunn (1977) recently has questioned whether nomenclatural criteria for ranking taxa necessarily correspond with certain psychological criteria for doing the same, pointing to instances in Tzeltal Mayan folk zoological classification in which these criteria do not seem to be in accord (for example, see Hunn 1977:54-55).

"Life-form" categories identified in this paper do not always meet Berlin's strict criteria for affiliation with that rank nor are they always particularly large and heterogeneous. These criteria, however, served as an important guide in an initial phase of research involving a survey of published and unpublished reports of firsthand investigation of native zoological taxonomies (see discussion of Type A language cases below). The principal finding of the survey is that among those zoological classes in languages that are unambiguously identified as life-forms by Berlin's nomenclatural criteria, five categories consistently occur: FISH, BIRD, SNAKE, WUG, and MAMMAL. No other zoological life-forms are as pervasive as these five. The critical features associated with these regularly occurring folk zoological life-form taxa are as follows:

FISH — Creature possessing fins, gills, and a streamlined body, adapted to an aquatic environment. (This life-form is occasionally extended to other aquatic animals lacking some or all of these features, e.g., whales, aquatic crustaceans. In such cases true fish usually constitute the focal members of the class [cf. Hunn 1977:250].)

BIRD — Creature possessing feathers, wings, and a bill or beak, adapted to flying. (This life-form is occasionally extended to bats.)

SNAKE — Featherless, furless, elongated creature adapted to crawling, usually lacking appendages. (This life-form in its greatest extension includes worms, snakes, lizards, and, occasionally, other elongated creatures such as reptilelike insects.)

WUG — Small creature usually other than those included in FISH, BIRD, and SNAKE. (This life-form always encompasses bugs, i.e., insects and other very small creatures such as spiders, and frequently is extended to worms. Occasionally, the category also includes other small creatures such as snails and crabs and, in addition, creatures such as lizards, tortoises, and frogs if these are small.)

MAMMAL — Large creature other than those included in FISH, BIRD, and SNAKE. (Typically this life-form is restricted to mammals. Occasionally, however, it is extended to other large animals such as iguanas and crocodiles and, in addition, to such creatures as tortoises and frogs if these are large.) (Note: *Animal* is used more commonly than *mammal* as a name for this life-form by speakers of American English. Since *animal* is used also as a unique beginner to refer to creatures in general, to avoid ambiguity of reference, it is not employed as a life-form gloss here.

The five classes defined above stand apart from most other categories meeting Berlin's life-form criteria in that inclusion within them is based solely on *the form of the whole animal* or, in other words, on gross morphology. Membership in nonpervasive or nonuniversal life-form categories is frequently found to be based on criteria other than gross morphology. These include animal habitat (e.g., house vs. forest), edibility (e.g., poisonous vs. nonpoisonous, tabooed vs. nontabooed), feeding habits (e.g., meat-eating vs. plant-eating vs. insect-eating), relationship to human beings (e.g., dangerous vs. harmless, domesticated vs. wild), locomotion (e.g., flying vs. crawling vs. trotting vs. burrowing), occurrence in environment (e.g., common vs. rare), and so on. The finding that universal zoological life-forms are based on gross morphology is identical to the finding for universal folk botanical life-forms, which are based solely on the form of the whole plant (Brown 1977a:320).

Labeled zoological categories that meet the definitional criteria of universal life-forms (involving gross morphology) occasionally do not meet the nomenclatural criteria for life-forms as outlined by Berlin. In addition, in some instances these classes are not especially large or heterogeneous. In this study definitional criteria take precedence over other criteria (nomenclature, heterogeneity), and such categories are formally treated as life-forms.[1]

LIFE-FORMS AS BINARY OPPOSITIONS

Although universal life-forms are typically encoded through use of a single label, such categories can be lexically recognized in other ways. For example, the life-form BIRD is frequently encoded through binary opposition. Languages doing so will lack a label for "birds in general" but will name one or both of the contrasting classes "large bird"/"small bird." I have encountered examples of the use of binary opposition in encoding FISH, SNAKE, and MAMMAL in addition to BIRD (see Table I).

Encoding by binary contrast is a common feature of language. Indeed, dimensions are apparently always encoded through binary opposition before they are assigned single labels. For example, the dimensions denoted by the contrasts sharp/dull and hard/soft differ from dimensions denoted by deep/shallow and wide/narrow in that they lack non-productive labels. Productive labels for the former two dimensions are, of course, derived from words encoding the contrasts they designate: sharpness or dullness and hardness or softness. The developmental priority of binary opposition is also reflected by the fact that nonproductive names for dimensional concepts are frequently derived as well from words encoding contrasts: depth (from deep) and width (from wide).

For botanical life-forms, "tree" and "grerb" emerge when the binary opposition "large plant"/"small plant" is lexically encoded (Brown 1977a, 1977b). Languages having "tree" and "grerb" will often lack a term for plants in general. However, the contrast itself signals recognition of plants as a unified grouping of living things set off from animals. A common procedure for deriving labels for the botanical unique beginner lends support to this argument. Frequently, words for "plant," like labels for dimensional concepts (e.g., sharpness, depth), are derived from terms encoding associated contrasts. Berlin (1972:78–80), for example, cites languages in which labels for "tree" and "grerb" are used as well in reference to "plant," and argues that the nonunique beginner usage is developmentally prior.

Shoshoni offers an example in which a term for a zoological life-form is derived from one of the labels for an associated contrast. Hage and Miller (1976) report that the Shoshoni lexically distinguish "large bird"/"small bird." The "large bird" term, *kwinaa,* is three-way polysemous since it refers also more specifically to "eagle" and more generally to BIRD. The latter usage is clearly the more recent of the term's three referential applications. The original meaning of *kwinaa* almost certainly was "eagle." This term, for example, is found in Northern Paiute, in which it is restricted to "eagle" (Fowler and Leland 1967). In Shoshoni, *kwinaa* expanded in reference from eagle to large birds in general. This type of lexical change is discussed in detail in Berlin (1972) and in Brown (1979). With the lexical encoding of the "large bird"/"small bird" distinction, BIRD emerged as a life-form category. A single label for this life-form was subsequently acquired by promoting to life-form status one of the two words encoding the contrast.

Ethnobiological oppositions of the types discussed above occasionally involve overt marking (see Brown 1977a:334–335). This results when a label for one oppositional pole is derived from its counterpart. Encoding of adjectival oppositions sometimes entails overt marking. In Spanish, for example, the opposition "deep"/"shallow" is encoded through use of *profundo* and *poco profundo,* respectively. The latter label is an example of overt marking whereby the term for the unmarked pole ("deep") is used as part of a compound label for the marked pole ("shallow"). *Poco profundo* translates literally into "little deep."

Several possible examples of overtly marked "grerb" were listed in the botanical life-form paper (Brown 1977a:335) and several additional cases in Mayan languages have been reported (Brown 1979). These polynomial "grerb" terms consist of a label for "tree" and a modifier (e.g., Kanjobal Mayan *† eʔ* "tree"/*mok'an † eʔ* "grerb," literally "short tree"). I have encountered five possible examples of overt marking pertaining to zoological life-forms: Gimi *umi* "large mammal"/*atumi* "small mammal," Ndumba *fai* "large mammal"/*faahi* "small mammal," Cayapa *piñi* "snake"/*tupiñi* "worm," Tarahumara *si-nó-w-i* "snake"/*no-w-í* "worm," and Natick *askook* "snake"/*oohk* "worm" (literal translations of overtly marked items could not be determined from original sources).

The Cayapa, Tarahumara, and Natick examples are direct evidence that "snake" and "worm" terms arise through lexical encoding of a "large elongated animal"/"small elongated animal" opposition. In this study the life-form SNAKE or "elongated animal" is judged present when a language demonstrates a label for "snake" or "worm" or labels for both. These two categories are then treated as a binary contrast. It is frequently the case that when only one pole of this opposition, i.e., "snake" or "large elongated animal," is lexically encoded, worms or small elongated animals are included in the small-creature class WUG. SNAKE, of course, is also lexically encoded through use of a single term that designates both snakes and worms and, on occasion, other elongated creatures as well.

LANGUAGE CASES

This article surveys the zoological life-form inventories of 112 languages. Data were assembled from two major sources: (a) published and unpublished accounts of firsthand investigation of native zoological classification and (b) dictionaries. Languages are referred to as Type A or Type B cases according to the kind of source used in collecting data pertaining to them, respectively (*a*) and (*b*) above. Type A cases were investigated by the author, were obtained from ethnozoological reports (monographs and articles) and from dictionaries with special sections dealing with zoological classification, or were supplied to the author by individuals who gathered data firsthand. Type B cases were collected from dictionaries. Dictionaries with less than 3,000 entries were used only if they proved especially thorough with respect to animal glosses. In some instances Type A cases were supplemented by dictionary materials.

Table I indicates the approximate ranges of zoological life-forms possessed by languages. For example, "[SNAKE(snake); WUG(worm + bug)]" preceding cases 102 and 103 (respectively Delaware and Mongolian) indicates that the SNAKE life-forms in these languages encompass snakes alone, and that their WUG life-forms include both worms and bugs. As another example, "[SNAKE(snake/worm); WUG(bug)]" preceding a number of cases (55–67) indicates that SNAKE is encoded through binary opposition ("large elongated animal"/"small elongated animal") and that WUG is restricted to bugs. Details of FISH, BIRD, and MAMMAL are indicated only when these differ in some important respect from equivalent classes in English: e.g., "BIRD(large bird/small bird)," which notes that this life-form is recognized through a large/small contrast. In addition, superordinate and subordinate distinctions are indicated: e.g., "FISH(fish/small fish)" means that a language has a general term for "fish" and a separate term for "small fish," the former taxonomically preceding the latter.

Most decisions concerning the presence or absence of zoological life-forms in languages involved unequivocal information. A brief discussion will illustrate the nature of some of the less straightforward cases. Fowler and Leland (1967) describe a category for Northern

TABLE 1. STAGE AFFILIATIONS OF 112 TYPE A AND B LANGUAGE CASES WITH ASSOCIATED SOCIETAL COMPLEXITY SCORES.

STAGE AFFILIATION	COMPLEXITY SCORE
Stage 1 (one item)	
BIRD	
1. Pintupi[b]	—
Stage 2 (two items)	
FISH/BIRD	
2. Chrau[a1]	—
3. Yana[b]	2
FISH/SNAKE	
[SNAKE (snake/worm)]:	
4. Muyuw[b]	—
5. Tausug[b]	—
[FISH (large fish/small fish); SNAKE (large snake/worm)]:	
6. Bontok Ignorot[b]	—
BIRD/SNAKE	
[SNAKE (snake[/worm?])]:	
7. Smith River[a1]	—
8. Karok[a1]	—
[SNAKE (snake/worm)]:	
9. Crow[b]	2
[SNAKE (worm)]:	
10. Northern Paiute[a1]	1
11. Diegueño[b]	1
Stage 3 (three items)	
FISH/BIRD/SNAKE	
[SNAKE (snake + eel[/worm?])]:	
12. Nunggubuyu[a1]	—
[SNAKE (snake + worm + eel)]:	
13. Nukuoro[b]	—
[SNAKE (snake + worm/worm)]:	
14. Mixtec[b]	—
[SNAKE (snake + worm + other reptile/snake)]:	
15. Anglo-Saxon[b]	—
[SNAKE (snake + lizard/snake/worm)]:	
16. Hawaiian[b]	5
[SNAKE (snake/worm)]:	
17. Cayapa[b]	1
18. Classical Nahuatl[b]	—
19. Huastec[a3]	5
20. Igbo[b]	—
21. Jacaltec[b]	—
22. Kekchi[b]	—
23. Maidu[b]	3
24. Marshallese[b]	—
25. Palauan[b]	4
26. Pangasinan[b]	—
27. Tarahumara[b]	2
28. Tewa[a1]	1
29. Tifal[b]	—
30. Yareba[b]	—

Table I continued

STAGE AFFILIATION	COMPLEXITY SCORE
[SNAKE (snake + worm)]:	
31. Totonac[b]	7
[SNAKE (snake)]:	
32. Luiseño[b]	1
[SNAKE (worm)]:	
33. Kusaiean[b]	4
34. Mokilese[a1]	—
[BIRD (bird/large bird/small bird); SNAKE (snake/worm)]:	
35. Shoshoni[a1,b]	1
[BIRD (bird/large bird); SNAKE (snake/worm)]:	
36. Achumawi[b]	—
37. Quichua[b]	—
[BIRD (bird/small bird); SNAKE (snake/worm)]:	
38. Huitoto Muinane[b]	—
39. Natick[b]	—
[FISH (fish/small fish); BIRD (large bird/small bird); SNAKE (snake/worm)]:	
40. Aguaruna[a1,b]	—
FISH/SNAKE/WUG	
[SNAKE (snake/worm); WUG (bug + bird)]:	
41. Tequistlatec[b]	—
42. Zapotec[b]	—
Stage 4 (four items)	
FISH/BIRD/SNAKE/WUG	
[SNAKE (snake + worm/snake); WUG (bug)]:	
43. Maranao[b]	—
[SNAKE (snake + worm/worm); WUG (bug)]:	
44. Zoque[b]	—
[SNAKE (snake + worm/snake/worm); WUG (bug)]:	
45. Indonesian[a3]	20.5
[SNAKE (snake + worm/worm); WUG (bug + bird)]:	
46. Huave[b]	—
[SNAKE (snake + other reptile); WUG (worm + bug)]:	
47. Osage[b]	—
[SNAKE (snake + lizard/worm); WUG (worm + bug)]:	
48. Pashto[a3,b]	—
[SNAKE (snake/worm); WUG (worm + bug)]:	
49. Choctaw[b]	3
50. Congo[b]	6
51. Kiowa[b]	—
52. Tibetan[b]	7
53. Yoruba[b]	7
[SNAKE (snake/worm); WUG (worm + bug + small reptile)]:	
54. Cornish[b]	—
[SNAKE (snake/worm); WUG (bug)]:	
55. Bikol[b]	—
56. Biloxi[b]	—
57. Efik[b]	—
58. Fijian[b]	4
59. Finnish[b]	47.5
60. Iroquois[b]	3
61. Kayan[a4]	—

Table I continued

STAGE AFFILIATION	COMPLEXITY SCORE
62. Lake Miwok[b]	—
63. Mexicano[b]	7
64. Tagalog[b]	7
65. Tzotzil[b]	—
66. Wappo[b]	1
67. Yapese[b]	5
[SNAKE (snake [/worm?]); WUG (bug + crab)]:	
68. Thai[a1]	13.7
[SNAKE (snake/large snake/worm); WUG (worm + bug)]:	
69. Japanese[b]	41.5
[SNAKE (snake); WUG (worm + bug)]:	
70. Amharic[b]	7
71. Atakapa[b]	—
[SNAKE (snake); WUG (worm + bug + snake)]:	
72. Western Apache[a2]	1
[BIRD (bird/small bird); SNAKE (snake + worm/snake); WUG (bug)]:	
73. Pahlavi[b]	—
[BIRD (bird/small bird); SNAKE (snake + other reptile/worm); WUG (bug)]:	
74. Ocaina[b]	—
[BIRD (bird/small bird); SNAKE (snake + other reptile/snake/worm); WUG (bug)]:	
75. Chamorro[b]	—
[BIRD (bird/small bird); SNAKE (snake/worm); WUG (bug)]:	
76. Arabic[b]	7
[BIRD (bird/small bird); SNAKE (snake); WUG (worm + bug)]:	
77. Navaho[a1,b]	1
[BIRD (bird/large bird); SNAKE (snake/large snake/worm); WUG (bug)]:	
78. Galla[b]	2
[BIRD (large bird/small bird); SNAKE (snake/worm); WUG (bug)]:	
79. Dyola[b]	—
[BIRD (large bird/small bird); SNAKE (snake); WUG (*literally*, "small creature")]:	
80. Kikuyu[b]	2
[FISH (fish + worm); SNAKE (snake); WUG (bug)]:	
81. Papago-Pima[a1,2]	1
FISH/BIRD/SNAKE/MAMMAL	
[SNAKE (snake/worm)]:	
82. Tzeltal[a1,4]	—
[BIRD (bird/small bird); SNAKE (snake [/worm?])]:	
83. Yurok[a1]	1
[SNAKE (snake + worm + lizard + reptilelike insect + fish); MAMMAL (large mammal/small mammal)]:	
84. Kyaka Enga[a4]	—
BIRD/SNAKE/WUG/MAMMAL	
[SNAKE (snake + worm + lizard); WUG (bug);	

Table I continued

STAGE AFFILIATION	COMPLEXITY SCORE
MAMMAL (large mammal/small mammal)]:	
85. Gimi[a1]	—
[SNAKE (snake + worm + lizard);	
WUG (bug + snail + frog + snake + worm + lizard);	
MAMMAL (large mammal/small mammal)]:	
86. Ndumba[a4]	—
Stage 5 (five items)	
FISH/BIRD/SNAKE/WUG/MAMMAL	
[SNAKE (small snake + large worm/snake + large worm/small worm); WUG (bug)]:	
87. Chorti[a1]	—
[SNAKE (snake/worm); WUG (worm + bug + reptile)]:	
88. Tiruray[b]	—
[SNAKE (snake/worm); WUG (worm + bug)]:	
89. Czech[a4,b]	65.5
90. Hungarian[b]	36.8
91. Pali[b]	—
92. Welsh[b]	—
[SNAKE (snake);	
WUG (bug + small nonsnake reptile + toad + tortoise [+ worm?]);	
MAMMAL (mammal + large nonsnake reptile)]:	
93. Azande[a1]	5
[SNAKE (snake); WUG (bug + small nonsnake reptile + small amphibian + crustacean [+ worm?]);	
MAMMAL (mammal + large nonsnake reptile)]:	
94. Hill Pandaram[a1]	—
[SNAKE (snake/worm); WUG (bug)]:	
95. Albanian[b]	—
96. Armenian[b]	—
97. American English[a3]	109.4
98. Irish[b]	—
99. Italian[b]	41.3
100. Serbo-Croatian[b]	—
[SNAKE (snake/worm); WUG (bug + crayfish)]:	
101. Turkish[b]	23.9
[SNAKE (snake); WUG (worm + bug)]:	
102. Delaware[a1,b]	1
103. Mongolian[b]	5
[SNAKE (snake); WUG (worm + bug + small nonsnake reptile)]:	
104. Chinese[a3,b]	13.0
[SNAKE (snake); WUG (*literally,* "small creature")]:	
105. Zulu[b]	7
[BIRD (bird/small bird); SNAKE (snake + worm);	
WUG (bug)]:	
106. Mixe[b]	—
[BIRD (bird/small bird); SNAKE (snake/worm);	
WUG (worm + bug)]:	
107. Mende[a2]	5
[SNAKE (snake + lizard); WUG (worm + bug);	
MAMMAL (large mammal/small mammal)]:	
108. Fore[a1]	—
[SNAKE (snake + lizard/snake/large snake/small snake/worm);	

Table I continued

STAGE AFFILIATION	COMPLEXITY SCORE
WUG (bug); MAMMAL (large mammal/small mammal + frog)]:	
109. Kalam[a1]	—
[SNAKE (snake + worm + lizard + fish); WUG (bug + frog); MAMMAL (large mammal + cassowary + eel/small mammal)]:	
110. Rofaifo[a1,4]	—
[BIRD (large bird/"tree" bird/"water" bird); SNAKE (snake); WUG (worm + bug); MAMMAL (large mammal/small mammal + small residual bird)]:	
111. Puget Salish[b]	—
[BIRD (large bird/small bird); SNAKE (snake); WUG (worm + bug + snake + toad); MAMMAL (large mammal/small mammal)]:	
112. Ojibwa[a1,b]	1

Type A cases: a1, monograph or article source
a2, dictionary (special treatment)
a3, collected by author
a4, personal communication
Type B cases: b, dictionary source

Paiute (10) which includes ants, spiders, ticks, beetles, lizards, and snakes. Flying insects are excluded. In addition, the category's label, *nuyúadɨ*, translates literally as "crawlers." Thus, *nuyúadɨ* actually refers to small creatures having a particular means of locomotion and consequently does not meet the definitional criteria of a WUG life-form (involving gross morphology). Similarly, the word *kij*, glossed by "louse; bacteria; bug; flea; germ; parasite" in Abo et al.'s (1976) dictionary of Marshallese (24), appears to refer to small creatures that infest the bodies of people and animals, rather than to small creatures in general, i.e., WUG.

Other examples involve positive rather than negative decisions. Chrau (2) is judged as having a BIRD life-form. The term involved is used in reference to all birds (large and small) with the exception of birds of prey. Similarly, Puget Salish (111) is judged as possessing a FISH life-form even though the category is not extended to all fish. The label involved is a general term for all sea-going fish (salmon, trout, etc.) that spawn in fresh water.

Other decisions involved codification of a category as one or another of the five universal life-forms. Tequistlatec (41) and Zapotec (42), for example, both lump together birds and bugs (including both flying and nonflying insects) in labeled classes. I have identified those categories as WUG rather than as BIRD, for reasons to be set forth presently.

ZOOLOGICAL LIFE-FORM ENCODING SEQUENCE

There are 32 (2^5) logically possible combinations of the 5 universal zoological life-forms that can occur in languages.[2] The 112 cases of Table I, however, demonstrate only 10 of these patterns. There are, therefore, severe constraints upon the types of animal life-form classes that may occur together in the lexicons of language. These constraints are realized as implicational universals.

With only four exceptions (cases 41, 42, 85, and 86), if a language has a WUG life-form, it will also possess FISH, BIRD, and SNAKE classes. However, languages having one, two, or all of the latter three life-forms do not necessarily have WUG. Thus, the presence of WUG implies the presence of FISH, BIRD, and SNAKE. (The occurrence of WUG *always* implies at least two of the three life-forms FISH, BIRD, and SNAKE.) Similarly, with only three exceptions (cases 82, 83, and 84), if a language has MAMMAL, it will have WUG, although not necessarily vice versa. Thus, MAMMAL implies WUG.

If these synchronic implicational relationships are interpreted diachronically, then FISH, BIRD, and SNAKE are added to lexicons before WUG, and WUG before MAMMAL. This encoding sequence is summarized in Figure 1, which shows that languages at Stage 1 in zoological life-form growth encode one of the triad FISH, BIRD, and SNAKE, but in no particular order; those at Stage 2 encode two; and those at Stage 3 encode three. Stage 4 languages add WUG and Stage 5 languages add MAMMAL.

Thirty-four of the 112 languages are Type A cases (identified by use of a superscript *a* in Table I). Type A languages are affiliated with four of the five growth stages. The numbers of Type A cases per stage are as follows: Stage 2 (4), Stage 3 (6), Stage 4 (12), and Stage 5 (12).

Of the language cases surveyed 105 (93.75%) conform to the encoding sequence while only seven (6.25%) do not. Four of these exceptions, Tequistlatec (41), Zapotec (42), Gimi (85), and Ndumba (86) have not encoded all three of the FISH, BIRD, and SNAKE triad before adding WUG. The remaining exceptions, Tzeltal (82), Yurok (83), and Kyaka Enga (84), have the initial triad and MAMMAL but lack WUG.

Tequistlatec and Zapotec have added WUG after encoding only FISH and SNAKE (BIRD is lacking). Though these languages are exceptions to the encoding sequence, they do not constitute serious anomalies with respect to principles of naming-behavior underlying regularities in zoological life-form categorization to be discussed presently.

Gimi and Ndumba have added WUG after encoding only BIRD and SNAKE (FISH is missing). Speakers of these two languages live in the Eastern Highlands of New Guinea. Glick, who describes Gimi ethnozoological classification, reports that his informants were only familiar with eels and tinned fish (1964:280). Terence E. Hays (personal communication) similarly notes that eels are the only native fish known to Ndumba speakers. Lack of fish in areas in which Gimi and Ndumba are spoken undoubtedly is related to the absence of FISH life-forms in these languages. This ecological factor may also account for the manner in which fish are classified in two other New Guinea Highlands languages. Both Kyaka Enga (84) and Rofaifo (110) have labeled FISH classes, but these are respectively included in highly heterogeneous SNAKE life-forms (see Table I). Apparently, native exemplars of fish are so few in number that speakers of these languages do not feel justified in maintaining their FISH categories as unaffiliated groupings.[3] The inclusion of fish in SNAKE is understandable since these animals share the feature "elongation" with other creatures such as snakes, worms, lizards, and so on. In this connection, it is interesting that the desert dwelling Papago-Pima (81) lump together fish and worms in a single labeled class.

Tzeltal, one of the three deviant cases having all life-forms except WUG, may not in fact constitute an exception to the encoding sequence. The word *čanbalam*, according to Hunn (1977), is used by Tzeltal speakers as if it were a MAMMAL label. The same word also functions as a unique beginner label referring to animals in general, except human beings. Thus, it would appear that *čanbalam* is polysemous. Hunn (1977:135), however, does not claim that the word has two distinct referential applications. Rather, it seems that the most typical or representative *čanbalam* "animal" is found in the mammal grouping. Thus, the term merely appears to function as a MAMMAL label when the referential cutoff point for any Tzeltal speaker using it is something short of animals in general. As Hunn (1977:135) puts it, "The cut-off point in a given case will depend on the momentary perception of the balance between the core [i.e. the mammal focus] and the extended range of the term." If Tzeltal lacks MAMMAL, it is simply an unexceptional Stage 3 case.

GALTON'S PROBLEM AND GROWTH STAGES

Galton's problem could be raised in response to the findings reported here. In other words, the implicational relationships for folk zoological life-forms may be an artifact of the "relatedness" of the languages surveyed rather than the product of universal underlying principles of naming-behavior. Geographically and/or genetically related languages may be affiliated with the same stage of life-form growth. If so, many of the logically possible combinations of life-forms do not occur in languages because of areal diffusion of only a limited number of patterns and/or because only a few combinations were originally represented in the lexicons of parent languages.

Table II organizes the 112 languages surveyed according to genetic relationship and roughly by geography, and indicates zoological life-form stage affiliation. Genetically related languages of the sample are not regularly associated with the same life-form stage. For example, well-represented language groupings (e.g., Indo-European, Mayan, Niger-Congo, Central New Guinea, and Uto-Aztecan) are affiliated with at least three of the total five stages. Austronesian, the family represented by the most languages (18), shows association with all but one of the five stages. Geographically contiguous languages also tend not to share the same stage of life-form growth. For example, 17 Western U.S. languages (Achumawi, Crow, Diegueño, Karok, Lake Miwok, Luiseño, Maidu, Navaho, Northern Paiute, Papago-Pima, Shoshoni, Smith River, Tewa, Wappo, Western Apache, Yana, and Yurok) range from Stage 2 to Stage 4. Thus, neither diffusion nor genetic relationship appears to have figured significantly in the observed distribution of life-form inventories.

TABLE II. CLASSIFICATION OF LANGUAGES WITH STAGE AFFILIATIONS.

Salish: Puget Salish (Stage 5).
Macro-Algonkian:
  Algonkian: Natick (Stage 3), Delaware, Ojibwa (Stage 5).
  Other: Yurok (Stage 4).
Gulf:*
  Siouan: Crow (Stage 2), Biloxi, Osage (Stage 4).
  Other: Atakapa, Choctaw (Stage 4).
Iroquoian: Iroquois (Stage 4).
Athapaskan: Smith River (Stage 2), Navaho, Western Apache (Stage 4).
Penutian: Maidu (Stage 3), Lake Miwok (Stage 4).
Yukian: Wappo (Stage 4).
Hokan: Diegueño, Yana, Karok (Stage 2), Achumawi, Tequistlatec (Stage 3).
Aztec-Tanoan:
  Kiowa-Tanoan: Tewa (Stage 3), Kiowa (Stage 4).
  Uto-Aztecan:
    Aztecan: Classical Nahuatl (Stage 3), Mexicano (Stage 4).
    Sonoran: Tarahumara (Stage 3), Papago-Pima (Stage 4).
    Takic: Luiseño (Stage 3).
    Numic: Northern Paiute (Stage 2), Shoshoni (Stage 3).
*Mesoamerican**:*
  Otomanguean: Mixtec, Zapotec (Stage 3).
  Mayan: Huastec, Jacaltec, Kekchi (Stage 3), Tzeltal, Tzotzil (Stage 4), Chorti (Stage 5).
  Zoquean: Zoque (Stage 4), Mixe (Stage 5).
  Others: Totonac (Stage 3), Huave (Stage 4).

Table II continued

Macro-Chibchan: Cayapa (Stage 3).
Macro-Carib:
  Witotoan: Huitoto Muinane (Stage 3), Ocaina (Stage 4).
Andean-Equatorial: Aguaruna, Quichua (Stage 3).
Austronesian:
  Eastern Oceanic:
    Polynesian: Hawaiian, Nukuoro (Stage 3).
    Other: Fijian (Stage 4).
  Micronesian: Kusaiean, Marshallese, Mokilese (Stage 3), Yapese (Stage 4).
  Northwest Austronesian: Bontok Igorot, Tausug (Stage 2), Palauan, Pangasinan (Stage 3), Bikol, Chamorro, Maranao, Tagalog (Stage 4), Tiruray (Stage 5).
  West Indonesian: Indonesian, Kayan (Stage 4).
Kam-Tai: Thai (Stage 4).
Mon-Khmer: Chrau (Stage 2).
Central New Guinea:
  East New Guinea Highlands:
    East Central: Gimi (Stage 4), Fore, Rofaifo (Siane) (Stage 5).
    Eastern: Ndumba (Tairora) (Stage 4).
    West Central: Kyaka Enga (Stage 4).
    Karam: Kalam (Stage 5).
  Southeast New Guinea: Yareba (Stage 3).
  Central and South New Guinea: Tifal (Stage 3).
Unclassified New Guinea language (Austronesian?): Muyuw (Stage 2).
Australian Macro-Phylum: Pintupi (Stage 1), Nunggubuyu (Stage 3).
Sino-Tibetan: Tibetan (Stage 4), Chinese (Stage 5).
Japanese: Japanese (Stage 4).
Ural-Altaic:
  Altaic: Mongolian, Turkish (Stage 5).
  Uralic: Finnish (Stage 4). Hungarian (Stage 5).
Dravidian: Hill Pandaram (Stage 5).
Indo-European:
  Indo-Iranian: Pahlavi, Pashto (Stage 4), Pali (Stage 5).
  Slavic: Czech, Serbo-Croatian (Stage 5).
  Italic: Italian (Stage 5).
  Celtic: Cornish (Stage 4), Irish, Welsh (Stage 5).
  Germanic: Anglo-Saxon (Stage 3), American English (Stage 5).
  Others: Albanian, Armenian (Stage 5).
Afroasiatic:
  Semitic: Amharic, Arabic (Stage 4).
  Cushitic: Galla (Stage 4).
Niger-Congo:
  Benue-Congo:
    Bantu Proper: Congo, Kikuyu (Stage 4), Zulu (Stage 5).
    Cross River: Efik (Stage 4).
  Kwa: Igbo (Stage 3), Yoruba (Stage 4).
  West Atlantic: Dyola (Stage 4).
  Adamawa-Eastern: Azande (Stage 5).
  Mande: Mende (Stage 5).

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*Springer and Witkowski (1978)
**Witkowski and Brown (1978a)

This is not to propose that diffusion and genetic relationship never influence life-form growth. For example, while genetically related languages frequently possess more biological life-forms than their parent language, they rarely, if ever, possess fewer (cf.

Brown 1979). Mayan languages of the sample (Chorti, Huastec, Jacaltec, Kekchi, Tzeltal, and Tzotzil), for instance, are associated with Stages 3-5 (having three to five zoological life-forms). Lexical reconstruction indicates that Proto-Mayan probably had both a FISH and a SNAKE life-form and, possibly a BIRD life-form, thus suggesting that the language was associated with Stage 3 in life-form growth. Mayan daughter languages have at least as many life-forms terms (three) (and sometimes four or five) as the estimation for Proto-Mayan.

There are instances in which zoological life-form classes have diffused. For example, Tequistlatec (41) and Zapotec (42), both spoken in the southeastern corner of the Mexican state of Oaxaca, share unusual zoological life-form categories that are identical in referential range (though not in lexical designation). These languages are exceptions to the encoding sequence since both lack BIRD but nonetheless encode WUG. WUG life-forms in these languages encompass bugs and birds, a category range occurring in only one other language surveyed. This sharing of an unusual category is not attributable to genetic relationship. Zapotec is a member of the Zapotecan grouping, which is one of eight families of the Otomanguean stock located entirely in Mesoamerica. On the other hand, Tequistlatec is related to Yuman languages spoken in California and Arizona and thus is probably intrusive to Mesoamerica. Consequently, that Zapotec and Tequistlatec share intimate details of zoological life-form classification is almost certainly caused by diffusion.

Huave (46), the other language in which WUG encompasses birds, is spoken in an area bordering on Tequistlatec and Zapotec territory in southeast Oaxaca. Huave has a labeled BIRD taxon, but this class is included in WUG. While Huave is distantly related to Zapotec (Witkowski and Brown 1978a), the relationship is so remote that diffusion is the more plausible explanation of identical WUG ranges in these two languages.

A number of New Guinea languages encode MAMMAL through binary opposition. The distribution of this feature is also caused by areal diffusion. All six East New Guinea Highlands languages surveyed, Kyaka Enga (84), Gimi (85), Ndumba (86), Fore (108), Kalam (109), and Rofaifo (110), lexically encode "large mammal"/"small mammal" through use of dissimilar sets of two terms. While these languages are genetically related (Voegelin and Voegelin 1977:257-259), it is unlikely that the contrast is of great antiquity and, thus, traceable to a parent language, since MAMMAL tends to emerge very late in zoological life-form growth. Independent development of the large/small contrast for MAMMAL by these languages also seems unlikely since this distinction otherwise appears only rarely and sporadically in the sample of 112 cases (see only Puget Salish [111] and Ojibwa [112]).

SOCIETAL COMPLEXITY AND GROWTH STAGES

The botanical life-form study (Brown 1977a:328-332) reported a positive association between size of life-form lexicon and societal complexity. A similar correlation exists between the number of zoological life-forms and societal complexity. Languages with three or fewer zoological life-forms (Stages 1-3) are usually spoken by peoples living in small-scale societies lacking the complex political integration, social stratification, and technological elaboration of those who speak languages having four or more zoological life-form terms (Stages 4 and 5).

Measures of societal complexity employing a wide range of index variables (e.g., Freeman 1957; Marsh 1967; Naroll 1956) all correlate strongly with each other (Schaefer 1969). Marsh's (1967:338-347) scale indexes societal complexity in terms of size and integration of political units and degree of social stratification. A primary scale ranging from 0 (low) to 7 (high) applies to societal units other than contemporary national societies.

National societies range from 8.6 (for Portuguese Guinea) to 109.4 (for the United States).

Table I lists societal complexity scores for the 49 societies (languages) of the set of 112 found in Marsh's index. The association between societal complexity and size of zoological life-form lexicons (given as life-form stages) is presented in Table III. The correlation coefficient, gamma, is .66 ($p < .02$, $N = 49$).

Positive correlations between number of botanical and zoological life-forms and societal complexity are linked to taxonomic devolution. Folk biological taxonomies tend to decay "from the bottom up" (from more specific classes to less specific classes) as people urbanize and become increasingly separated from direct reliance and dependence on the world of plants and animals (Berlin 1972; Brown 1977a; Witkowski and Brown 1978b). Taxonomic decay involves both loss of knowledge of biological referents of terms for generic and specific classes and loss of knowledge of the terms themselves. As a consequence, more general terms, such as life-form names, become increasingly useful and salient (cf. Dougherty 1978a), so much so that they tend to increase in number. Thus, the growth of ethnobiological life-forms ironically indexes an overall lack of interest in and interaction with the natural world.

For folk zoological taxonomy, an increase in societal complexity may not have always resulted in a uniform devolution of systems. Some parts of zoological taxonomies may tend to decay less extensively than others. For example, possibly those portions of animal taxonomies dealing with the classification of mammals have not devolved to the degree that other parts have. For most of humankind's existence, mammals have constituted important, if not the most important, animals in its environment. As societies shifted from hunting and gathering to food-producing economies, mammals, unlike creatures such as fish, birds, and snakes, acquired new significance as domesticated animals. The late emergence of MAMMAL in zoological life-form growth may be partly caused by high levels of interest in mammals characterizing both small-scale and large-scale societies. Since specific and generic mammal terms maintain their usefulness and salience, broad zoological categories encompassing all mammals are less useful than otherwise.

EXPLANATION OF LIFE-FORM ENCODING REGULARITIES

While MAMMAL's late encoding may be traced to relative interest and cultural importance, most of the zoological life-form encoding regularities are underlain by more general principles of naming-behavior. These include: (1) criteria clustering; (2) conjunctivity (including binary opposition); (3) dimension salience; and (4) marking (see Brown 1977a, 1977b, 1979; Brown and Witkowski 1979; Witkowski and Brown 1977, 1978b).

TABLE III. ASSOCIATION BETWEEN SOCIETAL COMPLEXITY AND SIZE OF ZOOLOGICAL LIFE-FORM LEXICON (GIVEN AS LIFE-FORM STAGE).

	Life-form stage		
Societal complexity	1-3	4	5
High (above 7)	0	4	6
Medium (4-7)	5	9	4
Low (0-3)	10	9	2
gamma = .66	p < .02		N = 49

Criteria clustering occurs when certain defining features of natural objects "bundle" so that the presence of any one feature is highly predictive of the presence of other features. This leads to the expectancy of features being present together. In this way "natural breaks" occur in the physical world that are often followed in the classification of objects (Bruner, Goodnow, and Austin 1956:47; Hunn 1977:46).

Criteria clustering figures prominently in the encoding priority of FISH, BIRD, and SNAKE. Bruner, Goodnow, and Austin (1956:47), for instance, illustrate this principle by citing the example of birds, animals possessing feathers, wings, and a bill or beak. A creature's possession of feathers is highly predictive of wings and a bill or beak, so much so that an expectancy of all these features being present together is built up. This expectancy can lead to the lexical encoding of BIRD. Similarly, FISH and SNAKE have respective sets of defining features showing high levels of mutual predictability. The occurrence of gills predicts fins and a streamlined body, and greatly elongated animals usually lack appendages as well as feathers and fur. In brief, FISH, BIRD, and SNAKE constitute salient discontinuities in nature and thus are natural candidates for lexical recognition. (See Hunn [1976, 1977] for a detailed consideration of the influence of discontinuities in nature upon folk classification.)

The late encoding of WUG and MAMMAL (see Figure 1) is in part a function of their *relative indistinctiveness* as natural discontinuities vis-à-vis the distinctiveness of FISH, BIRD, and SNAKE. Each of these two groupings is distinctly heterogeneous, demonstrating little criteria clustering. For example, while most mammals have four appendages used for locomotion and/or object manipulation, so do many other animals including such common creatures as lizards, salamanders, frogs, and turtles. Consequently, possession of four appendages is not particularly predictive of other animal characteristics. Exemplars of WUG have even less in common than creatures included in MAMMAL. WUG, for example, encompasses animals having legs and lacking them, having wings and lacking them, having segments and lacking them, and so on.

Binary opposition and *dimension salience* underlie the encoding of WUG and MAMMAL. Encoding through binary opposition is a common feature of language. Oppositional characteristics of dimensional concepts such as height, width, depth, etc., are usually encoded by two terms producing such familiar adjectival contrasts as tall/short, wide/narrow, deep/shallow, and so on. Sometimes nondimensional substantive concepts are also encoded through binary opposition. This entails lexical recognition of how related objects such as plants, elongated animals, birds, etc., contrast along some dimension or dimensions, e.g., "tree"/"grerb" (large plant/small plant), "snake"/"worm," "large bird"/"small bird," and so on.

Binary opposition is one way in which the principle of *conjunctivity* is realized in natural language categorization (Witkowski and Brown 1978b). The recognition of dimensional concepts such as height, width, and depth through binary opposition is conjunctive naming-behavior. An alternative way of encoding a dimension would be to name its midsection with a single term and its two extremes with another. This never occurs in dimensional naming, however, because it would violate conjunctivity. The category combining dimensional extremes would be disjunctive, and such categories are rare in human naming systems. Binary opposition represents the only way that does not contravene conjunctivity of partitioning a dimension through use of two terms. Thus, the principle of binary opposition in dimensional naming is the surface result of conjunctivity considerations.

Conjunctivity also underlies encoding nondimensional concepts through binary opposition, e.g., "tree"/"grerb." Languages could, for instance, categorize botanical objects through attention to size by assigning a name to all midsized plants and another name to all very large and very small plants. To treat plants in such a way would violate conjunctivity and does not occur. Combining very large and very small plants (minus midsized plants) would be disjunctive. The "tree"/"grerb" or "large plant"/"small plant" contrast is the only way that is conjunctive of categorizing plants by size using two terms. Consequently, oppositional classification of objects in terms of underlying dimensions is due also to conjunctivity constraints.

In folk biological classification suprageneric categories based on binary opposition always involve size. The importance of size in suprageneric biological classification illustrates the principle of *dimension salience*. Highly salient dimensions pertain to large and varied sets of objects. Dimensions are not particularly salient if they only apply to a small number of different objects. Since all biological organisms vary by size, there is a strong tendency to incorporate this dimension into suprageneric classificatory strategies involving plants and animals.

The addition of WUG and MAMMAL to languages constitutes use of size in distinguishing a "residual" group of animals through binary opposition.[4] Animals included in these categories are residual since they are the creatures that are left over after the highly distinctive discontinuities FISH, BIRD, and SNAKE are lexically encoded. Thus addition of WUG and MAMMAL encodes the contrast "small residual animal"/"large residual animal."

A classic example of the WUG/MAMMAL contrast is described by Evans-Pritchard (1963) for the Azande (93). He reports the following extensions for the Azande MAMMAL and WUG life-forms, respectively: "Reptiles, except the snakes, tend to be described as *anya* . . . if they are large and as *agbiro* . . . if they are small" (1963:139, emphasis in original). Thus Azande MAMMAL (*anya*) includes such creatures as iguanas in addition to mammals. Evans-Pritchard also notes that Azande WUG (*agbiro*) includes toads and tortoises in addition to bugs and small nonsnake reptiles.

MAMMAL and WUG in Hill Pandaram (94) parallel Azande life-forms. Morris (1976:349–350) describes Hill Pandaram MAMMAL as follows:

> The category *mrgam* includes not only all known species of mammals . . . but several of the large species of reptiles. It excludes however snakes . . . and smaller reptiles and amphibia which are normally referred to, if categorized at all, as *puchi* [emphasis in original].

Morris (1976:348) describes *puchi* (WUG) as "a residual category . . . which includes insects, crustaceans and several other creatures."

Inclusion of large creatures that are not mammals in MAMMAL and small creatures that are not worms or bugs in WUG offers evidence that these categories are based on residualness and size. Bulmer and Tyler (1968), for example, report that Kalam (109) speakers include frogs in their "small mammal" class (*as*). These authors (1968:352) speculate on why frogs and small mammals are lumped together. From the comparative perspective of this paper, frogs and small mammals are residual creatures sharing large size relative to Kalam WUG (*joŋ*) and small size relative to Kalam "large mammal" (*kmn*). The Rofaifo (110), who also make the "large mammal"/"small mammal" distinction, group bugs and frogs together in WUG. By so doing, Rofaifo (Siane) speakers have drawn the line separating big residual animals from little residual animals at a place along a continuum of animals ranked by size different from the point at which Kalam speakers have drawn it.

Rofaifo (Siane) speakers also include fresh water eels and cassowaries in their "large mammal" category. Since eels are not found in the Rofaifo environment and are known only through trade (Peter Dwyer, personal communication), they are treated as large residual creatures in suprageneric classification. Cassowaries, probably because they are large and flightless, are excluded from BIRD life-forms in Rofaifo (Siane) and in two related New Guinea languages, Fore (108) and Kalam (109). While Fore and Kalam have elected to treat residual cassowaries as if they belong to an unaffiliated class of cassowaries, Rofaifo (Siane) speakers have incorporated these creatures into their named grouping of the largest residual animals.

Another language that encodes MAMMAL through binary contrast includes certain birds in a residual animal class. Puget Salish (111) speakers partition the universe of birds in a complex fashion. Three suprageneric categories are encoded, "large bird" (mainly birds of prey), "tree birds," and "waterfowl" (good swimmers, not shorebirds). There exists a residue of small birds that do not fit into any one of these three classes. In Puget Salish the latter creatures are included in "small mammal."

A number of languages surveyed, in addition to those already mentioned, include small residual creatures that are neither worms nor bugs in WUG. The WUG life-form of Chinese (104) encompasses small reptiles other than snakes; that of Cornish (54), various small reptiles; that of Ndumba (86), snails, frogs, and lizards; that of Ojibwa (112), toads; that of Thai (68), crabs; and that of Turkish (101), crayfish. According to the *Oxford English Dictionary* the English WUG term, *insect*, once had similar extensions. Part of the *OED* entry for *insect* reads, ". . . formerly (and still by the uneducated) applied still more widely, e.g., to earthworms, snails, and even some small vertebrates, as frogs and tortoises."

Nomenclature is sometimes indicative of the roles of size and residualness in the derivations of WUG and MAMMAL. For example, languages having zoological unique beginners such as the English *animal* will occasionally encode WUG through use of compound labels translating literally as "little animal." Five languages of those surveyed have such labels: Zapotec (42), Zoque (44), Efik (57), Fijian (58), and Mixe (106).

Unique beginner terms are frequently polysemous, referring to WUG or MAMMAL in addition to creatures in general. This type of polysemy is indicative of the residualness of organisms included in these two life-forms. An ordinary way of identifying residual creatures *before* emergence of WUG and MAMMAL terms is by use of a zoological unique beginner term, if present in a language. For example, any bug might be referred to simply as "a creature." When WUG or MAMMAL develops, a unique beginner term may, through extension of its common use as a label for residuals, develop quite naturally as a label for such a class, and in this manner acquire a polysemous application.

Such a development, for example, would account for the Bikol (55) use of *háyop* as a label for both "creature" (unique beginner) and WUG. Cognates of this word found in other Philippine (northwest Austronesian) languages function exclusively as zoological unique beginners. Consequently, it is likely that *háyop* was originally used by Bikol speakers only as a label for animals in general and subsequently developed WUG as an additional referent. American English *animal* is an example of a zoological unique beginner label that has taken on the additional referent MAMMAL. Among the 112 languages surveyed, Bikol (55), Tzotzil (65), Chomorro (75), and Tiruray (88) have polysemous terms referring to animals in general and, more specifically, to small residual animals (WUG); and Tzeltal (82), Chorti (87), Czech (89), American English (97), Delaware (102), and Mixe (106) have unique beginner terms used to designate large residual animals (MAMMAL) as well. In some of these cases, however, the less inclusive application (WUG or MAMMAL) may have preceded developmentally the more inclusive application (zoological unique beginner).

Though the tendency to add FISH, BIRD, and SNAKE before WUG and MAMMAL is obviously strong, it is not inconceivable that one or both of the latter two life-forms may occasionally arise before all three of the initial triad have been encoded. In such case, given principles underlying the emergence of WUG and MAMMAL, it is likely that animals that are associated with life-forms normally encoded before WUG and MAMMAL but have not been encoded in fact, would be treated as additional residual creatures categorized by size. This has apparently occurred in two languages of the sample, Tequistlatec (41) and Zapotec (42).

These languages have added WUG to their life-form inventories while encoding only FISH and SNAKE of the initial triad. In both cases, birds are lumped with bugs in WUG. This classificatory treatment accords with principles underlying the emergence of WUG. In Tequistlatec and Zapotec, birds have been treated as zoological residuals sharing the feature "relative smallness" with other residual creatures. (Zapotec employs a compound label for WUG, *mani huiini?*, which translates literally as "little animal," while Tequistlatec uses a unitary lexeme, *ɬaga,* for the life-form.)

Neighboring Tequistlatec and Zapotec share WUG life-forms encompassing birds and bugs as a result of diffusion (see earlier discussion). A third neighboring language, Huave (46), has the same extension but differs in that it has labeled BIRD. Animals included in BIRD are, in turn, included in WUG. Huave has adopted, probably through borrowing, the WUG range found in Tequistlatec and Zapotec while nonetheless recognizing BIRD as a distinct discontinuity.

The Huave example indicates that the tendency to focus on size in making suprageneric distinctions is apparently so strong that lack of residualness will sometimes be overlooked in assigning creatures to "residual" categories, especially to WUG. Seventeen other languages of those surveyed demonstrate this phenomenon. The Ndumba (86) SNAKE class, which encompasses snakes, worms, and lizards, is immediately included in WUG, as are SNAKE classes (restricted to snakes) in Western Apache (72) and Ojibwa (112). In Tiruray (88), all elongated animals included in the labeled classes "snake" and "worm" are included also in WUG. Finally, 13 languages label "worm" but nonetheless include worms in their WUG life-forms: Pashto (48), Choctaw (49), Congo (50), Kiowa (51), Tibetan (52), Yoruba (53), Cornish (54), Japanese (69), Czech (89), Hungarian (90), Pali (91), Welsh (92), and Mende (107).

The encoding priority of WUG vis-à-vis MAMMAL fits into the framework of *marking* developed over the years by Jakobson (1941), Greenberg (1966, 1969, 1975), and others. Marking frequently finds expression in antonyms such as deep/shallow and wide/narrow (Greenberg 1966:53). In such pairs one item will often be marked and the other unmarked. An unmarked item is more salient, tending to occur more frequently in ordinary language use than its marked opposite. This is especially noticeable in neutralized linguistic environments. For example, queries concerned with depth more often use the unmarked form "deep" than the marked form "shallow." Thus, people 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, indicating that the unmarked forms are older and, hence, developmentally prior to marked items. (See Greenberg [1975] and Brown and Witkowski [1979] for additional features of marking relationships.)

The same pole of a dimension underlying an adjectival contrast will often be unmarked in all languages recognizing the dimension. Greenberg (1966:53), for example, shows that "deep" is universally unmarked, while its counterpart, "shallow," is universally marked. This result extends to both botanical and zoological life-forms encoded through binary opposition. In botanical classification "tree" or "large plant" is unmarked (since it is developmentally prior), whereas its counterpart, "grerb" or "small plant," is marked (Brown 1977a:334). Similarly, in zoological classification, WUG or "small residual animal" is unmarked, and its counterpart, MAMMAL, or "large residual animal," is marked.

Fitting these life-form encoding uniformities into the framework of marking shows that they do not constitute exceptional linguistic regularities. It is therefore possible that explanations eventually brought to bear upon marking uniformities in the adjectival component of language will extend to marking in the biological life-form lexicon. On the other hand, these parallel regularities may not be due in all cases to the same underlying factors. For example, the unmarked status of WUG vis-à-vis MAMMAL is probably attributable to special considerations that are not linked to marking in other parts of the vocabulary.

I argued earlier that the growth of zoological life-form lexicons indexes an increasing indifference toward and a decreasing involvement with the animal world as societies become more complex. Peoples in all societies, both simple and complex, demonstrate relatively high levels of interest in large residual animals. MAMMAL, therefore, tends to be the last holdout against pressures for adding all five universal life-forms to vocabularies. Consequently, WUG, along with FISH, BIRD, and SNAKE, regularly precedes MAMMAL in life-form encoding and, hence, is the unmarked component of the WUG/MAMMAL opposition.

CHILD ACQUISITION OF ZOOLOGICAL LIFE-FORMS

Paul K. Chase (1978) reports that American English-speaking children acquire folk zoological life-forms in the same order in which these are added to languages (see Figure 1). Chase investigated the zoological life-form vocabularies of children ranging in age from about three to ten. This investigation involved sorting tasks (using pictures of animals pasted on cards) and traditional elicitation techniques. Chase found that children from three to five years old unambiguously recognize only two zoological life-forms of the universal set of five, FISH and SNAKE. Between the ages of five and seven, a third life-form, BIRD, is acquired, and shortly thereafter WUG. WUG for children younger than eight is occasionally extended to creatures such as crabs, lizards, and turtles in addition to bugs. After age eight, MAMMAL is learned. Principles of naming-behavior underlying zoological life-form growth almost certainly account also for parallel patterns in child acquisition of suprageneric animal classes.[5]

NOTES

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[1] Labeled classes meeting definitional criteria of universal life-forms but not meeting nomenclatural and other criteria of that rank have possibly devolved from full-fledged life-form categories, or, just as likely, are in the process of consolidating into such taxa.

[2] Only nine of these possible combinations are predicted by the zoological life-form encoding sequence (see Figure 1).

[3] Peter Dwyer (personal communication) reports that older male Rofaifo (Siane) speakers always include *laiva* (FISH) in the taxon *hoiafa* (SNAKE). In formal contexts, however, younger men accord *laiva* unaffiliated status. Only two types of fish other than eels are known to the Rofaifo. Ralph N. H. Bulmer (personal communication) recorded only five fish species in the Kyaka Enga domain.

[4] The role of "residualness" in biological classification was first recognized and discussed by Hunn (1976, 1977).

[5] Dougherty (1978b) similarly describes parallels between botanical life-form acquisition by American English-speaking children and botanical life-form growth (Brown 1977a).

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