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general principles of human anatomical partonomy and speculations on the growth of partonomic nomenclature¹

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Berlin and Kay's (1969) pioneering research in the area of color categorization and Berlin, Breedlove, and Raven's (1973) recent innovative work in folk biology present ethnoscience with an alternative to its patent relativistic perspective on naming behavior.² Rather than focusing upon different ways in which speakers of various languages classify and name similar phenomena, these two studies demonstrate universal principles in categorization processes, thereby giving new impetus to the anthropological determination of parameters of human psychic unity.³

These studies treat somewhat different kinds of universals. Berlin and Kay's (1969) approach fundamentally involves description of the pervasive manner in which a perceptual space, i.e., the color spectrum, is partitioned.⁴ They determine that certain lexemes of every language—basic color terms—are related referentially to the same focal areas of the perceptual grid. On the other hand, Berlin, et al. (1973), rather than treating the relationship of categorization to structured perception, isolate universal principles of nomenclature (labeling) connected with classificatory systems, i.e., biological folk taxonomies. The kinds of principles discovered by Berlin, et al. can be conveniently referred to as *classification-nomenclature* universals to distinguish them from *classification-perception* universals described by Berlin and Kay.⁵

Brown, Kolar, Torrey, Truong-Quang, and Volkman (1976) suggest that specific classification-nomenclature universals discovered for both biological (cf. Berlin, et al. 1973) and nonbiological (cf. Brown, et al. 1976) folk taxonomy pertain as well to certain nontaxonomic category systems. Because of their resemblance in several respects to folk taxonomies, these systems have been named "partonomies" (cf. Brown, et al. 1976).

There are a number of differences as well as similarities between partonomies and taxonomies—see especially McClure (1975) for differences; definitionally the most significant difference is that partonomies are based on "part of" relationships, while taxonomies are based on "kind of" relationships. This paper is concerned with describing both classification-perception and classification-nomenclature principles in human anatomical partonomy. Some speculative comments concerning the growth of partonomic nomenclature are also offered.

This paper describes twelve general principles of classification and nomenclature in human anatomical partonomy (body parts systematics). These principles are derived through comparison of "naming-behavior" data from forty-one globally distributed languages. In addition, four growth stages in the development of nomenclature for parts of the human extremities are proposed.

preliminary definitions

To promote rigor and consistency in the discussion of partonomy, the following seven definitions are proposed:

- (1) A *parton* (plural: *parta*) is part of an entity and is described as “possessed by” that entity.
- (2) A parton is itself an entity which can possess a parton or parta.
- (3) A parton may or may not be labeled in any given language.⁶ A labeled parton is always stated by informants, in their native language, to be “part of” an entity or their language’s equivalent of “part of” an entity.⁷
- (4) A parton is *immediately* possessed by an entity if there is no intervening labeled parton also possessed by that entity which itself possesses the former parton. If such an intervening parton exists, the former parton is *nonimmediately* possessed by the entity.
- (5) A *partonomy* is an hierarchical system of one or more labeled parta, each of which is either immediately or nonimmediately possessed by an entity which is not a parton of that partonomy, i.e., *The Whole*.
- (6) The Whole is found on the first hierarchical level (Level 0) of a partonomy. (This level is referred to as “Level 0” instead of “Level 1” because The Whole is *not* a parton.)
- (7) Parta immediately possessed by The Whole are found on the second hierarchical level (Level 1) of a partonomy; parta immediately possessed by the latter parta are found on the third level (Level 2), and so on.

While partonomy includes any type of part-whole system involving labeled parta, ethnoscience has mainly studied human anatomical systematics; some notable exceptions are Basso’s (1967) Western Apache “automobile” partonomy and Spradley’s (1970) Seattle tramp “city jail” or “bucket” partonomy. As mentioned earlier, Brown, et al. (1976) suggest certain classification-nomenclature universals for partonomy in general which were originally isolated for folk biological and nonbiological taxonomies. For example, Brown, et al. propose that, like folk taxonomies, partonomies will rarely exceed five hierarchical levels in depth. For the most part, however, classification-nomenclature universals from folk taxonomy do not seem to fit partonomy in any definitive manner. The present study was undertaken with the idea that partonomies in general will demonstrate their own unique principles of classification and nomenclature. However, with perhaps a few exceptions—for example, partonomies in general do not exceed a certain depth—the principles described in this paper pertain only to human anatomical partonomy.

The principles to be outlined here were derived through comparison of anatomical partonomic data from forty-one globally distributed languages. These include twelve American Indian languages (Aleut, Bella Coola, Eskimo, Hopi, Huastec, Inupik, Jacaltec, Navajo, Quechua, Tarascan, Tzeltal, and Zuni), ten European languages (Czech, English, Finnish, French, German, Romanian, Russian, Saxon, Serbo-Croatian, and Spanish), five Sub-Saharan African languages (Ashanti, Chirah-mbaw, Gourma, Ibo-Nigerian, and Swahili), five Southeast Asian languages (Kayan, Malay, Maranao, Thai, and Vietnamese), four Middle Eastern and West Asian languages (Arabic, Dari-Farsi, Pashto, and Urdu), two Chinese languages (Chinese [Shanghai dialect] and Mandarin Chinese), two Micronesian languages (Ponapean and Trukese), and Kewa, spoken in the Papua highlands.⁸

partonomic reference language

In studies of biological folk taxonomy a reference language commonly is used to identify natively labeled “plant” or “animal” taxa. For example, the Huastec *ik'te'* is identified in English as ‘cedar,’ or in standard scientific Latin terminology as *Cedrela mexicana* (Brown 1972:76). Berlin and Kay (1969) use a reference language for identifying natively labeled colors. This consists of the Berlin and Kay Munsell color array of coded color chips. Native color terms are identified with reference to the color chips and the appropriate codes.

The difference between classification-perception and classification-nomenclature universals is revealed through examination of the manner in which reference languages figure (or do not figure) into their description. For example, Berlin and Kay discover that specific color chips of their array have universal significance as the most representative forms of named colors. The specific universal principles connected with this discovery cannot be stated or described without referring to the specific coded color chips of the array, i.e., the reference language. Statements of classification-perception principles always require the use of some kind of reference language.

On the other hand, statements of classification-nomenclature universals do not necessarily involve use of a reference language. Berlin, et al. (1973), for example, identify two basic types of lexemes as characteristically labeling taxa of certain hierarchical levels of biological folk taxonomies. These are primary lexemes and secondary lexemes. Primary lexemes universally label taxa occurring on second and third levels of taxonomies, while secondary lexemes label taxa occurring on third, fourth, and fifth levels. The statement of such principles can be made without identifying through use of a reference language—e.g., scientific Latin or English—the actual taxa involved.

Since classification-perception, as well as classification-nomenclature, universals pertain to human anatomical partonomy, it is necessary to introduce a reference language. English words for body parts will be used to identify parta. For example, the English expression ‘lower leg and foot’ given between slashes (i.e., /lower leg and foot/) is used to identify the Huastec parton *akan*. In this paper, slash-enclosed words are referred to directly as parta; hence, /lower leg and foot/ is a parton labeled in Huastec by *akan*.⁹

This partonomic reference language is not, of course, a perfect descriptive instrument. For example, the proximal end (the end closest to the point of attachment) of the English ‘lower leg and foot’ may not be precisely the same as the proximal end of the Huastec *akan*. On the other hand, it is probably not clear even to Huastec speakers exactly what point on the limb constitutes the proximal end of *akan*, just as it is not clear to English speakers *exactly* at what point the lower leg becomes the upper leg.¹⁰ Thus the reference language may be no more imprecise than the target language. It is, of course, the responsibility of the user of any descriptive instrument to be as accurate in that use as possible.

partonomic nomenclature

While a parton, by definition, may or may not be labeled, all parta of a partonomy, by definition, are. In some respects native labels for human body parta resemble labels for taxa of folk biological taxonomies. For this reason, the terminology used by Berlin, et al. (1973) for describing folk taxa labels is borrowed, in part, for describing human body parta labels, specifically their terms “primary lexeme” and “secondary lexeme.”

“Secondary lexeme” is not employed in this paper precisely as Berlin, et al. (1973) use

it. They describe a secondary lexeme as a polylexemic label for a folk taxon consisting of a lexeme and another constituent indicating the form superordinate to that taxon, e.g., *jack oak* (a kind of *oak*) (cf. Berlin, et al. 1973:217). An expression labeling a taxon in this way is not a secondary lexeme *unless* all other taxa in the contrast set of which it is a part are also so labeled (Berlin, et al. 1973:217). A contrast set is the set of taxa immediately included in a certain superordinate taxon. Commonly, a human body parton will be labeled by a polylexemic expression consisting in a lexeme and another constituent which marks a parton immediately possessing it, e.g., *forearm* (a part of *arm*). When a parton is so labeled, the label is referred to in this paper as a “secondary lexeme,” although some parta also immediately possessed by the same parton immediately possessing the former may not be, *and empirically usually are not*, so labeled.

Berlin, et al. (1973:217) describe three kinds of primary lexemes. These are productive and unproductive primary lexemes (both described as analyzable forms) and unanalyzable primary lexemes. Productive primary lexemes are polylexemic and like the secondary lexemes of Berlin, et al. have constituents which mark categories superordinate to the taxa they label. An expression which labels a taxon in this way is a productive primary lexeme *only if* at least one taxon of the contrast set of which it is part is *not* so labeled. In this respect, productive primary lexemes are more like secondary lexemes labeling body parta since labels for parta of the same “partonomic” contrast set rarely, if ever, *all* have constituent expressions referring to the superordinate parton by which all are possessed. Use of the term “secondary lexeme,” then, precludes use of the term “productive primary lexeme” in this study.

Unproductive primary lexemes, which are also polylexemic, frequently are found as labels for body parta as well as for taxa. Unproductive primary lexemes are distinguishable “in that no constituent marks a category superordinate to the forms in question. Thus *begger-tick* is not a kind of *tick*, *jack-in-the-pulpit* has little to do with either *jack* or *pulpit*” (Berlin, et al 1973:217). An example of an unproductive primary lexeme in body partonomy is the Huastec *pulek te' ehattalab* /spinal cord/. The constituents of this expression translate literally, ‘the great tree of life.’

Unanalyzable primary lexemes are monolexemic labels for both taxa and parta; examples in English of the former are *tree*, *oak*, and *pine*, and of the latter, *head*, *arm*, and *eye*.

Secondary lexemes labeling either taxa or parta can be described as consisting of a head and an addendum. The head in this study is defined as the constituent lexeme of a taxon’s or a parton’s label which also labels respectively the immediately superordinate taxon or parton. The addendum is a constituent element serving to modify in some manner the head expression. Thus, for example, in taxonomy the addendum *jack* of *jack oak* specifies the “kind of” oak implicated, and in partonomy the addendum *fore* of *forearm* indicates the “part of” arm involved. In their modifying functions the addenda of secondary lexemes of taxonomy always suggest “kind of” relationships, and the addenda of secondary lexemes of partonomy always suggest “part of” relationships.

Frequently a secondary lexeme may label a taxon and a parton simultaneously. For example, the English *finger nail* labels a taxon which is a kind of nail and a parton which is a part of finger. When considered as a taxon, *nail* is the head and *finger* the addendum, the latter specifying the “kind of” nail implicated (e.g., that kind contrasted with toenail). When considered as a parton, the roles are reversed, *finger* is the head and *nail* the addendum, the latter specifying the “part of” finger indicated (e.g., the nail as opposed to the knuckle). *Thus one must distinguish between taxonomic and partonomic heads and addenda.* It should also be noted that a polylexemic expression regarded as a

secondary lexeme in partonomy may not necessarily be properly regarded as a secondary lexeme (or productive primary lexeme) in taxonomy. For example, *forearm* does not label a taxon which is either a kind of “fore” or a kind of “arm,” i.e., neither *fore* nor *arm* is a taxonomic head. In taxonomy, *forearm* must therefore be regarded as either an unanalyzable or unproductive primary lexeme.¹¹

depth principle

Twelve principles of classification and nomenclature in human anatomical partonomy are outlined in this paper. I do not claim that the principles described below are the only ones pertaining to human anatomical partonomy, only that they are the ones I felt justifiably derivable given the limits of my data base. For instance, much of the partonomic data supplied to me⁸ involve external rather than internal body parts, and consequently no principles concerned with the latter—if they indeed exist—are described. In effect, there is no theoretical motivation, only data limitations, underlying the choices made in discussing body parts and related principles in this study.

The first of these twelve is the “depth principle,” which refers to the limit upon the number of hierarchical levels pertaining to human body partonomies:

principle 1 Human anatomical partonomies rarely exceed five hierarchical levels in depth (Level 0-Level 4) and never exceed six hierarchical levels (Level 0-Level 5). When extended beyond five levels in an individual partonomy, no more than two parta occurring at a fifth level (Level 4) possess parta occurring at a sixth level (Level 5).

The depth principle for partonomies in general was first suggested by Brown, et al. (1976), who view it as an extension of the depth principle pertaining to taxonomic classification. Partonomies, anatomical or otherwise, at a maximum are greater in depth by one level than folk taxonomies, which never exceed five levels in depth.

When a partonomy is extended to a sixth level, no more than two parta at Level 4 possess parta at Level 5. In all partonomies surveyed, parta at Level 5 are either immediately or nonimmediately possessed by the parton, /finger/, and/or the parton, /toe/. In all cases, save one, parta at Level 5 are /fingernail/ and/or /toenail/, which are immediately possessed by /finger/ and/or /toe/, respectively. The exception is Serbo-Croatian, in which *nokat* /nail/ immediately possesses *noktište* /half moon/, the latter parton occurring at Level 5.¹²

level 0 and level 1

Two principles specifically relate to parta (and The Whole) found at Level 0 and Level 1 of human body partonomies:

principle 2 The Whole, i.e., the human body, is labeled in all human anatomical partonomies.

principle 3 All parta at Level 1 are labeled by primary lexemes.

The Whole (cf. Principle 2) is labeled either by an unanalyzable primary lexeme or by an unproductive primary lexeme. Huastec offers an example of the latter, *patal in hual*, literally, ‘all in view.’ *Pali-war* in Ponapean is another example which may be translated as ‘vessel side’ (as opposed to *pali-ngen* ‘spirit side’). English also labels The Whole with an unproductive primary lexeme, “human body.” The unmodified “body” is also an appropriate unanalyzable primary lexeme for The Whole in English. Most, if not all,

unanalyzable primary lexemes for The Whole in other languages are translated directly as 'body' and are used to refer to the bodies of nonhuman animals as well (as is, of course, the case in English). Occasionally, for instance in Jacaltec, Kayan, and Quechua, an unanalyzable primary lexeme labeling The Whole will also label the parton, /trunk/, i.e., /body without the head and limbs/.

All parta immediately possessed by The Whole are labeled by primary lexemes (Principle 3). Level 1 parta are usually labeled by unanalyzable primary lexemes, but occasionally an unproductive primary lexeme occurs there. An example of the latter is the Huastec, *sukul patal* /trunk, arms, and hands/, which is translated literally as 'all the stomach.'

Parta frequently, but not always, at Level 1 are /head/, which is apparently always labeled and always by an unanalyzable primary lexeme, /trunk/, /arm (and hand)/, and /leg (and foot)/ (parenthetical items may or may not be included in parta). Less frequently occurring parta (at Level 1) are /back/, /chest/ or /front of torso/, /extremities/, /shoulder/, /neck/, /abdomen/, /pelvic region/, /groin/, /armpit/, /blood/, /skin/, /bone/, /muscle/, /nerves/, /veins/, and /hair/. Broadening of the comparative base will undoubtedly augment this list.

"arm" and "leg," "hand" and "foot"

The remaining nine principles pertain to the extremities:

principle 4 The parton, /arm (and hand)/, is labeled in all human anatomical partonomies. This parton is always labeled by a primary lexeme.

principle 5 The parton, /leg (and foot)/, *if labeled*, is always labeled by an unanalyzable primary lexeme. A labeled /leg (and foot)/ is never named by the same lexeme labeling /arm (and hand)/.^{1 3}

principle 6 The parton /hand/, *if labeled*, is always labeled by an unanalyzable primary lexeme.

principle 7 The parton /foot/, *if labeled*, is always labeled by an unanalyzable primary lexeme. If the primary lexeme labeling /foot/ is the same as that naming /leg (and foot)/, the former parton may occasionally possess an alternate label which is a secondary lexeme.

principle 8 If both /hand/ and /foot/ are labeled, they are labeled by different unanalyzable primary lexemes.^{1 3}

Principles 4 and 5 refer to parta which are equivalent to or almost equivalent to taxa immediately subordinate to the taxon labeled *limb* or *extremity* in English, i.e., arm and leg. Labeled /arm (and hand)/ and /leg (and foot)/ are characteristically found at Level 1 or Level 2. There are, however, instances where /arm (and hand)/ occurs at Level 3. For example, in Huastec *okob* /arm/ is immediately possessed by *patal in kuš* /back, arms, and hands/, which is immediately possessed by *sukul patal* /trunk, arms, and hands/, which occurs at Level 1. No equivalent hierarchical extension has been observed for /leg (and foot)/.

Most frequently /arm (and hand)/ is labeled by an unanalyzable primary lexeme (Principle 4). Of the languages surveyed, there is only one example in which /arm (and hand)/ is labeled by an unproductive primary lexeme. Finnish assigns the word *käsivarsi* to /arm/, which is translated literally as 'hand handle.' *Käsi* is the Finnish label for /hand/.

Only three languages of those surveyed, Hopi, Inupik, and Tarascan, do not label /leg

(and foot)/ (Principle 5). All three do, however have labels for the native 'upper leg' and 'lower leg.' Hopi, for example, distinguishes lexically /upper leg/, /lower leg/, and /foot/. Inupik similarly distinguishes /upper leg/ and /foot/, but lumps the latter and /lower leg/ as a single labeled parton immediately possessing /foot/, i.e., /lower leg and foot/. Tarascan does not name /foot/ but does lexically identify /lower leg and foot/ and 'upper leg.' The Tarascan 'upper leg' is precisely given as the parton, /side, outer hip, upper leg/.

The parton, /hand/, or the parton, /foot/, may or may not be labeled (Principles 6 and 7). When not labeled, /finger/ or /toe/ respectively—both of which are always named, see Principle 9—is immediately possessed by /arm and hand/ or /leg and foot/, respectively, or by /forearm and hand/ or /lower leg and foot/, respectively; the latter two parta are occasionally labeled by the same lexeme naming /arm and hand/ or /leg and foot/. Neither /hand/ nor /foot/, for example, is labeled in Chirah-mbaw (a language of The Camerouns), and the Chirah-mbaw *pošiyombo* /fingers/ and *pošiykow* /toes/ (which are secondary lexemes) are immediately possessed by *mbo* /arm and hand/ and *kow* /leg and foot/, respectively. In Huastec /foot/ is not labeled, and *tihāš in akan* /toe/ (which is a secondary lexeme) is immediately possessed by *akan* /lower leg and foot/, which bears the same label as /leg and foot/, i.e., *akan*.

Frequently, when /hand/ or /foot/ is reported as labeled, it is described as named by the same unanalyzable primary lexeme labeling /arm (and hand)/ or /leg (and foot)/ respectively. For examples, Stark (1969:4) reports the Quechuan *maki* as labeling both /arm/ and /hand/, and John L. Fischer (personal communication) describes *ne:* as referring to both the Ponapean /leg/ and /foot/. As reported in Principle 7, if the primary lexeme labeling /foot/ is the same as that naming /leg (and foot)/, /foot/ may occasionally also be named by a secondary lexeme as an alternate label. Fischer mentions such an alternative form for the Ponapean /foot/, *pate:-n ne:*. As another example, the Finnish /foot/, which is generally referred to by use of the term for /leg/, *jalka*, can alternately be called *jalkaterä*, literally, 'blade of leg.'

McClure's (1975) study suggests that reports of the use of the same term for /arm (and hand)/ and /hand/ or for /leg (and foot)/ and /foot/ may come from biased samples of informants. Of the thirty-two Romanian speakers interviewed by McClure (1975:79), she determined that only eighteen could be definitely established as having a concept /hand/. Similarly, of twenty-one Saxon informants, she found that only six had such a concept. Romanian and Saxon informants ascertained to have a concept /hand/—reported as labeled by the same term as that labeling /arm and hand/—are described by McClure (1975:79) as "well educated speakers." McClure (1975:79) writes, "it is difficult to determine the presence of the more restricted concept among less educated informants." This finding, as discussed below, may have implications for the growth of partonomic nomenclature for the extremities.

When /hand/ or /foot/ is labeled by a *monosemic* lexeme, informants are not always certain as to the nature of the relationship between that parton and the native 'arm' or 'leg' respectively. (A monosemic lexeme is defined in this paper as a word which labels only *one* parton of a given partonomy.)¹⁴ I have encountered this uncertainty on several occasions of eliciting partonomies from speakers of several languages, including English. Informants are reluctant to state categorically that a uniquely labeled /hand/ or /foot/ is part of the native 'arm' or 'leg,' respectively, but they are not prepared to say once and for all that it is not. I have suggested to them that the former are perhaps better stated as "connected to" the latter, a reasoning usually judged appropriate.

McClure (1975:79) also determines that "transitivity" is not characteristic of "part of" relationships (partonomy). A specific relationship *R* is transitive only if an entity *a*

bears the relationship R to an entity c when a bears R to entity b and when b bears R to c . Transitivity, as McClure points out, is characteristic of “kind of” relationships (taxonomy) and permits the following valid line of reasoning: oaks are kinds of trees, trees are kinds of plants; therefore, oaks are kinds of plants. The same reasoning apparently does not work in partonomy: fingernails are parts of fingers, fingers are parts of hands, hands are parts of arms, *but not* fingernails are parts of arms. Berlin, quoted in Werner and Begishe (1970:252), observes that “for most speakers of English it is not the case that a finger nail [*sic*] is part of the arm. In fact, to suggest that the finger is part of the arm is also a bit spooky.” On the basis of similar observations, McClure (1975:79) concludes that “part of” relationships are not transitive.

McClure (1975:84) notes that the expression “part of” is polysemous and postulates that this may account for one case of apparent lack of transitivity in human body partonomies. She first considered the following example to be identical to that of fingernails and arms: “teeth are parts of mouths, mouths are parts of faces, but teeth are not parts of faces.” Upon reconsideration she realized that teeth are more appropriately regarded as “in” the mouth rather than “part of” the mouth in the most characteristic sense of the latter expression. Thus the lack of transitivity apparent in this example is traced to a factor other than the alleged inherent lack of transitivity in “part of” relationships.

A similar explanation may also explain the apparent lack of transitivity in the examples of fingernails and arms and fingers and arms. This account, like McClure’s for teeth and face, involves recognition of an underlying propositional relationship which is more appropriate than “part of” in its most characteristic sense. For example, as mentioned above, when /hand/ is labeled by a monosemic lexeme, it is frequently deemed by informants to be *connected to* the native ‘arm.’ Thus fingernails are not parts of arms, because hands, of which fingernails are parts, are not actually parts of arms; rather, hands are connected to arms. Similarly, fingers are not parts of arms, because hands, of which they are parts, are not parts of arms. Equivalent explanations may account for all apparent cases of lack of transitivity in human anatomical partonomies.¹⁵

I would hesitate in venturing that the relationship “part of,” in its most characteristic sense, is always transitive, but would nonetheless argue for its eternal transitivity when used in connection with parts of entities that are contiguous, such as those of the human body (assuming, of course, no amputations). Stephen A. Tyler (personal communication) describes an estate as an example of an entity consisting of noncontiguous parts. That farm in Connecticut is “part of” my estate, but it is not contiguous with other parts of the whole such as my insurance policy. While words are a part of my insurance policy, it seems odd to say that they are also a part of my estate—hence, lack of transitivity. As Tyler suggests, transitivity is more likely to pertain to the “part of” relationship when it entails contiguous parts of *empirical* wholes, such as bodies, than when it involves the often noncontiguous parts of *conceptual* or *logical* wholes such as estates.

McClure (1975:79) notes that the eighteen of thirty-two Romanian speakers who were ascertained as having a concept, /hand/, and the six of twenty-one Saxon speakers who were discovered to have the same all denied that fingernails are parts of arms. Though McClure does not make a specific statement, she leads us to conclude that speakers established as *not* having a concept, /hand/, accepted the proposition that fingernails are parts of arms. It may be that persons inclined to reject the proposition always have a concept, /hand/, while those that accept it do not. Rejection of the proposition may also imply that /hand/ is appropriately regarded as connected to rather than part of the native

'arm.' A possible conclusion is that the presence of a concept, /hand/ or /foot/, labeled by a monosemic lexeme or otherwise implies the connective propositional relationship and also a concept, /arm/, or a concept, /leg/, respectively, rather than a concept, /arm and hand/, or a concept, /leg and foot/.¹⁶

"finger" and "toe"

principle 9 The parta, /finger/ and /toe/, are always labeled. Four nomenclatural patterns occur: (a) The parta, /finger/ and /toe/, are labeled by different unanalyzable primary lexemes. This pattern will only occur when both /hand/ and /foot/ are labeled by primary lexemes differing from primary lexemes labeling /arm (and hand)/ and /leg (and foot)/, respectively, or labeling /forearm (and hand)/ and /lower leg (and foot)/, respectively, i.e., when both /hand/ and /foot/ are labeled by monosemic lexemes. (b) The parta /finger/ and /toe/ are labeled by the same unanalyzable primary lexeme. (c) Both /finger/ and /toe/ are labeled by different secondary lexemes. When this pattern is in evidence, the two secondary lexemes share the same partonomic addendum. (d) One parton, /finger/, is labeled by an unanalyzable primary lexeme, and the other parton, /toe/, is labeled by a secondary lexeme. The primary lexeme serves as the partonomic addendum in the secondary lexeme.

An observation similar to Principle 9(a) was first made by Liston (1972:332). Liston proposes crosslinguistic investigation of the proposition that languages distinguishing "hand from arm and foot from leg also distinguish finger from toe." Many languages which do not lexically differentiate /arm/ and /hand/ or /leg/ and /foot/ do distinguish /finger/ and /toe/, but in *all* cases these languages label the latter two parta with different secondary lexemes (Principle 9[c]) or /finger/ with a primary lexeme and /toe/ with a secondary lexeme (Principle 9[d]). Liston perhaps intends his proposition to extend only to the differentiation of the latter parta by use of different *primary* lexemes. However, this survey has brought to light two languages, Inupik and Kayan, which lexically distinguish /hand/ from /arm/ and /foot/ from /leg/ but which do *not* differentiate /finger/ and /toe/ in the latter manner; thus Liston's observation is not crosslinguistically valid. Nevertheless, all languages which label the latter parta with different primary lexemes make the other distinctions mentioned by Liston (Principle 9[a]). These include, however, only four languages, Eskimo, English, French, and German, the latter three also having been cited by Liston in connection with his observation.

The patterns reported in Principles 9(b), 9(c), and 9(d) are by far more common than that of 9(a). Aleut, French, Inupik, Kayan, Kewa, Ponapean, Serbo-Croatian, and Spanish, among those surveyed, use the same unanalyzable primary lexeme to label both /finger/ and /toe/ (Principle 9[b]). Such a lexeme, which is more or less equivalent in use to the English *digit*, often is also used in these languages as a partonomic addendum in secondary lexemes labeling the latter two parta. These secondary lexemes roughly translate as 'digit of hand (or arm)' and 'digit of foot (or leg).' Ten languages always label both /finger/ and /toe/ with secondary lexemes sharing the same partonomic addendum (Principle 9[c]): Arabic, Chirah-mbaw, Hopi, Huastec, Ibo-Nigerian, Jacaltec, Mandarin Chinese, Thai, Tzeltal, and Vietnamese. An example is the Huastec *tihāš in k'ubak* /finger/ and *tihāš in akan* /toe/, sharing the addendum, *tihāš*, literally, 'long, thin object.'

When one parton of the pair, /finger/ and /toe/, is labeled by an unanalyzable primary lexeme and the other by a secondary lexeme, /finger/ is the parton labeled by the primary lexeme, and /toe/ is the parton labeled by the secondary lexeme (Principle 9[d]). In addition, the lexeme for /finger/ serves as the partonomic addendum in the secondary

lexeme for /toe/. Principle 9(d) means, in effect, that languages may have secondary lexemes equivalent to the English ‘fingers of the foot (or leg)’ but *never* have secondary lexemes comparable to ‘toes of the hand (or arm).’ This principle is attested to by languages of global distribution including Chinese (Shanghai dialect), Dari-Farsi, Malay, Pashto, Quechua, Russian, Serbo-Croatian, and Swahili. Examples are the Quechua *riru* /finger/ and *čaki riru* /toe/ and the Dari-Farsi *angusht* /finger/ and *angushte pay* /toe/.

Zuni (Carol Stout, personal communication) offers the only discovered exception to these principles, labeling /toe/ with a primary lexeme *tukni-* and individual fingers with secondary lexemes. Examples of the latter are *ʔasi-łana-kka* ‘arm and hand, big instrument’ /thumb/, *ʔasi-cʔana-kka* ‘arm and hand, little instrument’ /little finger/, and *topinte ʔasi-nne* ‘one/arm and hand, singular’ /first finger/. The Zuni case does not, however, violate the observation that languages never have secondary lexemes equivalent to the English ‘toes of the hand (or arm),’ since *tukni-* /toe/ does not serve as a partonomic addendum in any of the secondary lexemes naming kinds of /finger/.

“fingernail” and “toenail”

principle 10 The parta, /fingernail/ and /toenail/, are always labeled. Two nomenclatural patterns occur: (a) Both /fingernail/ and /toenail/ are labeled by the same unanalyzable primary lexeme. (b) Both /fingernail/ and /toenail/ are labeled by different secondary lexemes. When this pattern is in evidence, the two secondary lexemes share the same partonomic addendum.

In the sample, no language labels /fingernail/ and /toenail/ with different primary lexemes, while a number of languages label the latter parta with the same unanalyzable primary lexeme (Principle 10[a]). Examples of Principle 10(b) are the Arabic *hawafer el yed* /fingernails/ and *hawafer el rezil* /toenails/ and the Thai *lep mur* /fingernail/ and *lep tin* /toenail/. English, of course, also offers an example of Principle 10(b).

Carol Stout in a personal communication reports that Zuni assigns an unanalyzable primary lexeme to /fingernail/ *šonči* and a secondary lexeme to /toenail/ *tukni-šonči*. Thus a principle for fingernails and toenails paralleling Principle 9(d) for fingers and toes is suggested. Willard Walker, also in a personal communication, describes *šo'nčinne* as naming both /fingernail/ and /toenail/, thus indicating that Principle 10(a) pertains to Zuni. The difference is probably accounted for by variable linguistic usage in Zuni.

principle 11 If both /finger/ and /fingernail/ or both /toe/ and /toenail/ are labeled by secondary lexemes, they share the same partonomic head, which also serves as a primary lexeme naming an immediate or nonimmediate superordinate parton.

Principle 11 is illustrated in Arabic, Thai, Malay, Chirah-mbaw, Vietnamese, Ponapean, Tzeltal, Ibo-Nigerian, and Mandarin Chinese. The latter two languages can stand as examples. In Ibo-Nigerian, secondary lexemes for /fingernails/ and /fingers/ are *mbo aka* and *nkpisi aka*, respectively. The partonomic head *aka* marks the parton, /arm and hand/, which immediately possesses both *mbo aka* and *nkpisi aka*, i.e., is superordinate to them. In Mandarin Chinese, *ǎw ǎ* labels /toenails/, which is immediately possessed by *ǎw ǎ* /toes/, which is itself immediately possessed by *ǎw* /foot/. Note that the shared constituent or partonomic head of the Ibo-Nigerian *mbo aka* and *nkpisi aka* marks a parton which *immediately* possesses *both* the parta they label, while in the Mandarin Chinese example the shared constituent of *ǎw ǎ* and *ǎw ǎ* labels a parton immediately possessing *ǎw ǎ* /toes/ and *nonimmediately* possessing *ǎw ǎ* /toenails/. Thus the

partonomic head of the Mandarin label for /toenails/ does not label the parton by which it is immediately possessed ($\check{y}aw \check{y}\phi$), but rather labels the first parton nonimmediately possessing it ($\check{y}aw$). The Mandarin Chinese pattern is more pervasive than that demonstrated in Ibo-Nigerian.

Principle 11 in effect means that languages *never* have secondary lexemes equivalent to 'nails of the digits of the leg (or foot)' or 'nails of the digits of the arm (or hand).' Thus, for example, $*\check{y}aw \check{y}\phi \check{y}a$ does not occur in Mandarin Chinese. A similar phenomenon is recorded for nonbiological folk taxonomies by Brown, et al. (1976). The taxon *ripsaw* of an American English "tool" taxonomy, for example, is immediately included in the taxon, *sabre saw*, which is immediately included in *saw*. Thus the taxonomic head of *ripsaw*, i.e., *saw*, refers to a nonimmediate rather than an immediate superordinate taxon. Consequently, $*rip \textit{ sabre saw}$ does not occur in English.

principle 12 If /finger/ is labeled by a primary lexeme, /fingernail/ and /toenail/ are labeled by primary lexemes, except when /toe/ is named by a primary lexeme differing from that labeling /finger/, in which case /fingernail/ and /toenail/ may be, but are not necessarily, labeled by secondary lexemes.

This principle in effect means that *no* language manifests (1) secondary lexemes equivalent to the English 'nails of the hand' or 'nails of the foot' when /finger/ is labeled by a primary lexeme, (2) expressions comparable to 'nail of the finger' and 'nail of the finger of the foot (or leg)' used to refer respectively to /fingernail/ and /toenail/, or (3) a secondary lexeme resembling 'nail of the digit' used to refer to *both* /fingernail/ and /toenail/. English is the only example in my sample which has secondary lexemes for /fingernail/ and /toenail/, where both /finger/ and /toe/ are labeled by primary lexemes. In this case, of course, the latter parta are labeled by different primary lexemes, and, therefore, the English pattern agrees with Principle 12.

growth of partonomic nomenclature

The following comments on the growth of partonomic nomenclature are openly speculative and in some instances based upon a scarcity of confirming examples. As a minimum contribution, in a general way and in terms of a general theory of language development they do bring a certain order to a subset of principles described above which otherwise might not be apparent. At best, they precisely outline the stages through which all languages have passed or are passing in the development of some kinds of partonomic nomenclature. Realistically, these comments may achieve something more than the minimum contribution and something less than the maximum, with the hope that they may serve as a model for further research into human anatomical partonomy and as a stimulus for studies focusing upon nomenclatural growth in other domains.

The general theory of language development followed here is summarized in the proposition that the growth of a language involves the making of ever finer distinctions requiring ever larger lexicons. This theory is in the tradition of studies of color terminology by Berlin and Kay (1969) and of ethnobotanical nomenclature by Berlin (1972). Berlin and Kay demonstrate a developmental pattern connected with increasingly finer lexical discrimination of the color spectrum. Berlin (1972) argues that ethnobotanical terminological growth in part involves the differentiation of labeled generic categories or taxa into less comprehensive specific categories. These studies are consistent with Werner's (1954:203) observation, quoted in Berlin (1972:59), "that the pre-

dominant developmental trend is in the direction of differentiation rather than of synthesis.”

The possibility of finding different languages at different stages of nomenclatural growth has facilitated the proposal of developmental schemes for color and botanical terminology. The difficulty with proposing such a scheme for partonomic nomenclature is that probably all languages have developed extensive lexicons for human body parts, and all should therefore be regarded as advanced in this respect. The elaboration of body part terms, however, has not been consistent with respect to all major components of the human body, for while probably all languages distinguish the same, or most of the same, parts of the trunk and head, parts of the extremities are more finely discriminated by some than by others. Consequently, speculations on the growth of partonomic nomenclature offered in this paper are only concerned with terms labeling parts of the extremities.

Four general stages are proposed pertaining to the development of nomenclature for *both* upper and lower extremities. These are grossly characterized as follows. At Stage 1, /arm and hand/ or /leg and foot/ is labeled by an unanalyzable primary lexeme, and /hand/ or /foot/, respectively, is neither conceptually nor lexically distinguished. Stage 2 also does not distinguish /hand/ or /foot/, but /forearm and hand/ or /lower leg and foot/ is named and often with the same term labeling /arm and hand/ or /leg and foot/ respectively. At Stage 3, the word for the native ‘arm’ or ‘leg’ (or for ‘forearm’ or ‘lower leg’) is used as well to label a now conceptually, but not lexically, distinguished /hand/ or /foot/. At Stage 4, /hand/ or /foot/ becomes lexically differentiated from the native ‘arm’ or ‘leg’ (or from ‘forearm’ or ‘lower leg’ as the case may be).

Table 1 outlines in a more detailed fashion the proposed stages, showing the manner in which nomenclature for fingers, toes, fingernails, and toenails as well is implicated in the developmental scheme. Parts labeled at each stage are given with an indication of the types of lexemes labeling them. Thus at Stage 1 for upper extremities, for example, /arm and hand/ is labeled by an unanalyzable primary lexeme (P1) and /finger/ by a secondary lexeme (P1A1, P1 being the partonomic head and A1 the partonomic addendum) or by a primary lexeme (A1), which may also be used as a partonomic addendum.

While apparently all languages label /arm (and hand)/, some languages among those surveyed do not label /leg (and foot)/. (As mentioned earlier, the latter include Hopi, Inupik, and Tarascan.) Table 1 therefore presents two alternative, but related, developmental schemes for lower extremities, one in which a concept /leg (and foot)/ is pertinent and one in which it is not. With respect to the latter, it is assumed that languages now found lacking a concept /leg (and foot)/ never had one. This assumption will be discussed presently.

It is not necessarily the case that any single language’s nomenclature for upper extremities and that for lower extremities are at parallel levels of growth. Huastec, for example, is at Stage 4 for upper extremities and at Stage 2 for lower extremities. Nor is it the case that nomenclature for upper extremities will achieve a certain growth stage before nomenclature for lower extremities or vice versa. In the Huastec case, upper extremities are more advanced developmentally than lower extremities, but for Quechua, for example, the reverse is true.

Certain constraints, however, simultaneously pertain to the labeling of parts of upper and lower extremities. These are given as Principles 9(a), 9(d), 10, and 12, but it is useful to restate them here in terms of the formalism of Table 1:

- (a) Both A1 /finger/ and A2 /toe/ occur only when both P2 /hand/ and P4 /foot/ occur (Principle 9[a]).

Table 1. Stages in the growth of partonomic nomenclature for extremities.

<i>Upper Extremities</i>					
Stage 1.	P1/arm and hand/			$\left\{ \begin{matrix} P1A1 \\ A1 \end{matrix} \right\}$ /finger/	$\left\{ \begin{matrix} P1A3 \\ A3 \end{matrix} \right\}$ /fingernail/
Stage 2.	P1/arm and hand/	P1/forearm and hand/		$\left\{ \begin{matrix} P1A1 \\ A1 \end{matrix} \right\}$ /finger/	$\left\{ \begin{matrix} P1A3 \\ A3 \end{matrix} \right\}$ /fingernail/
Stage 3.	P1/arm/	(P1/forearm/)	P1/hand/	$\left\{ \begin{matrix} P1A1 \\ A1 \end{matrix} \right\}$ /finger/	$\left\{ \begin{matrix} P1A3 \\ A3 \end{matrix} \right\}$ /fingernail/
Stage 4.	P1/arm/	(P1/forearm/)	P2/hand/	$\left\{ \begin{matrix} P2A1 \\ A1 \end{matrix} \right\}$ /finger/	$\left\{ \begin{matrix} P2A3 \\ A1A3 \\ A3 \end{matrix} \right\}$ /fingernail/
<i>Lower Extremities: Concept /leg (and foot)/ Pertinent</i>					
Stage 1.	P3/leg and foot/			$\left\{ \begin{matrix} P3A1 \\ A1 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P3A3 \\ A3 \end{matrix} \right\}$ /toenail/
Stage 2.	P3/leg and foot/	P3/lower leg and foot/		$\left\{ \begin{matrix} P3A1 \\ A1 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P3A3 \\ A3 \end{matrix} \right\}$ /toenail/
Stage 3.	P3/leg/	(P3/lower leg/)	P3/foot/	$\left\{ \begin{matrix} P3A1 \\ A1 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P3A3 \\ A3 \end{matrix} \right\}$ /toenail/
Stage 4.	P3/leg/	(P3/lower leg/)	P4/foot/	$\left\{ \begin{matrix} P4A1 \\ A1 \\ A2 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P4A3 \\ A2A3 \\ A3 \end{matrix} \right\}$ /toenail/
<i>Lower Extremities: Concept /leg (and foot)/ Not Pertinent</i>					
Stage 1.	(not applicable)				
Stage 2.	P3/lower leg and foot/			$\left\{ \begin{matrix} P3A1 \\ A1 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P3A3 \\ A3 \end{matrix} \right\}$ /toenail/
Stage 3.	P3/lower leg/	P3/foot/		$\left\{ \begin{matrix} P3A1 \\ A1 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P3A3 \\ A3 \end{matrix} \right\}$ /toenail/
Stage 4.	P3/lower leg/	P4/foot/		$\left\{ \begin{matrix} P4A1 \\ A1 \\ A2 \end{matrix} \right\}$ /toe/	$\left\{ \begin{matrix} P4A3 \\ A2A3 \\ A3 \end{matrix} \right\}$ /toenail/

P = Unanalyzable primary lexeme

A = Unanalyzable primary lexeme also used as a partonomic addendum in a secondary lexeme

Numerals identify lexemes.

Parenthetical items may or may not be present.

Braced items represent "either/or" possibilities

See pages 411-412 for pertinent constraints (a-g)

- (b) When $\left\{ \begin{matrix} P1A1 \\ P2A1 \end{matrix} \right\}$ /finger/ occurs, then $\left\{ \begin{matrix} P3A1 \\ P4A1 \end{matrix} \right\}$ /toe/ must also occur (Principle 9[d]).
- (c) When $\left\{ \begin{matrix} A1 \\ A2 \end{matrix} \right\}$ /toe/ occurs, then A1 /finger/ must also occur (Principle 9[d]).
- (d) When A3 /fingernail/ occurs, then A3 /toenail/ must also occur (Principle 10).
- (e) When A3 /toenail/ occurs, then A3 /fingernail/ must also occur (Principle 10).
- (f) When A1 /finger/ occurs and A2 /toe/ does not occur, then A3 /fingernail/ and A3 /toenail/ must also occur (Principle 12).
- (g) When A2 /toe/ occurs, then $\left\{ \begin{matrix} A3 \\ A2A3 \end{matrix} \right\}$ /toenail/ and $\left\{ \begin{matrix} A3 \\ A1A3 \end{matrix} \right\}$ /fingernail/ must also occur (Principle 12).

Several other nomenclatural constraints pertain to extremities including those given as Principles 4, 5, 6, 7, 8, 9(b), 9(c), and 11. All of the latter are implicit in and thus formally accounted for by the scheme of Table 1.

stage 1 Five of the languages surveyed, Chirah-mbaw, Ibo-Nigerian, Kewa, Swahili, and Tzeltal, are at Stage 1 for both upper and lower extremities. Hopi and Zuni demonstrate this stage only for upper limbs. Gourma seems to be at Stage 1 for lower limbs. In addition, McClure's (1975:79) discussion indicates that Romanian and Saxon are at this level for upper extremities for some speakers of these languages, but provides no information on lower extremities.

No Stage 1 for lower limbs is postulated as a growth interval for languages lacking a concept /leg (and foot)/. Such languages are assumed to have initially developed a nomenclatural pattern pertaining to lower extremities resembling that of Stage 2 languages.

stage 2 Only four languages, Aleut, Huastec, Jacaltec, and Tarascan, demonstrate the Stage 2 paradigm. Two of these, Huastec and Jacaltec, are Mayan Languages, the latter demonstrating the Stage 2 pattern for both upper and lower extremities and the former only for lower extremities. Huastec assigns the label *akan* to both /leg and foot/ and /lower leg and foot/. Jacaltec labels both /arm and hand/ and /wrist and hand/ with *q'ab'e* and both /leg and foot/ and /ankle and foot/ with *?oxe*. The Jacaltec nomenclature for lower extremities is, as Day (personal communication) notes, similar to, but tantalizingly different from Huastec. Stage 2 also pertains to both upper and lower limbs in Aleut. Tarascan, which lacks a concept /leg (and foot)/, demonstrates a Stage 2 pattern for lower extremities alone.

Aleut presents an example of a subvariety of the Stage 2 pattern for upper and lower extremities. Like all languages at Stage 2 (for both upper and lower limbs), Aleut lacks the concepts, /hand/ and /foot/, and labels /forearm and hand/ and /lower leg and foot/ with primary lexemes. Unlike other Stage 2 languages (see Table 1), it does not extend reference of the latter two labels to /arm and hand/ and /leg and foot/ respectively; rather, it labels these parts with monosemic lexemes—by definition, of course, differing from those lexemes naming /forearm and hand/ and /lower leg and foot/. The Aleut Stage 2 subvariety can be postulated as developing from the Stage 2 pattern for upper and lower extremities described in Table 1. This development is illustrated in Table 2.

Table 2 describes two logically possible ways in which the Aleut Stage 2 subvariety may have developed. This entails growth from a Stage 2 pattern (as given for upper and lower extremities in Table 1) to a Stage 2a or 2b pattern (each of which is given in Table 2 for upper and lower extremities). Alternative Stages 2a and 2b both involve the lexical differentiation of /arm and hand/ and /forearm and hand/ and of /leg and foot/ and /lower leg and foot/. Table 2 also indicates how Stage 3 and 4 patterns may develop from either Stage 2a or Stage 2b.

Tarascan, which lacks a labeled concept, /leg and (and foot)/, is established as a Stage 2 language because it lexically identifies the parton, /lower leg and foot/, and does not distinguish /foot/. In addition, as a major distinction with reference to the lower limbs, Tarascan labels /side, outer hip, and upper leg/ with a monosemic element.¹⁷ This basic partitioning seems to indicate that the Tarascan nomenclature for lower extremities, if it has evolved at all, has not entailed a labeled concept, /leg (and foot)/, in its growth, and hence, has not passed through Stage 1. Intuitively, it seems improbable that a labeled concept, /leg (and foot)/, could have been antecedent to the conceptual and lexical

Table 2. Stages in the growth of partonomic nomenclature for extremities involving Aleut Stage 2 sub-varieties (Stage 2a or 2b for upper and lower extremities).

<i>Upper Extremities</i>			
Stage 2.	P1/arm and hand/	P1/forearm and hand/	.....
Stage 2a.	P1/arm (and hand)/	P2/forearm and hand/	.....
OR			
Stage 2b.	P2/arm (and hand)/	P1/forearm and hand/	.....
Stage 3.	X/arm/	Y/forearm/	Y/hand/
Stage 4.	X/arm/	Y/forearm/	Z/hand/
WHERE X = P1 or P2, Y = P1 or P2, X ≠ Y, Z = a new lexeme			
<i>Lower Extremities</i>			
Stage 2.	P3/leg and foot/	P3/lower leg and foot/	.....
Stage 2a.	P3/leg (and foot)/	P4/lower leg and foot/	.....
OR			
Stage 2b.	P4/leg (and foot)/	P3/lower leg and foot/	.....
Stage 3.	X' /leg/	Y' /lower leg/	Y' /foot/
Stage 4.	X' /leg/	Y' /lower leg/	Z' /foot/
WHERE X' = P3 or P4, Y' = P3 or P4, X' ≠ Y', Z' = a new lexeme			

partitioning into two major parts of a more comprehensive unit consisting in the foot, lower leg, upper leg, outer hip, and side extending to immediately below the armpit. It seems equally improbable that the labeled concept, /leg (and foot)/, if it ever pertained to a language, would have been deleted from its lexicon. These observations have brought me to the conclusion, explicitly formulated in Table 1, that languages now lacking a concept /leg (and foot)/ never had one.

The postulation of a general level of nomenclatural growth represented by Stage 2 in its various manifestations is not, of course, supported by an abundance of empirically observed cases. However, other evidence from languages with Stage 3 patterns suggest that their parta labels for upper and/or lower extremities passed through Stage 2. Quechua and Russian, both of which label /arm/ and /hand/ with the same primary lexeme, use the latter as well to label /forearm/. Quechua, to be discussed below, also has a Stage 3 pattern for lower extremities which logically could have developed from Stage 2a or Stage 2b. In addition, Huastec, which is at Stage 4 for upper extremities, uses the same primary lexeme, *okob*, to label both /arm/ and /forearm/. Nevertheless, Stage 2 is probably not a necessary growth interval in the development of all languages. The majority of languages in the survey which are at Stage 3 and Stage 4 for upper and/or lower extremities do not label /forearm/ and/or /lower leg/ with the same term naming /arm/ and/or /leg/, respectively. I would nonetheless argue that the evidence is clear, if not extensive, enough to claim that *if* a language goes through a stage intermediate to Stages 1 and 3, it will resemble the proposed Stage 2.

There is reason to believe that biased sampling of informants has resulted in the recognition of fewer languages with Stage 1 or 2 patterns than there may actually be

among those surveyed. Recall McClure's (1975:79) report that well educated speakers of Romanian and Saxon were usually ascertained to have a concept, /hand/ while it was more difficult to elicit the concept among less educated informants. No monosemic primary lexeme labels /hand/ in either language. Presumably the more educated speakers of these languages have had a greater opportunity to encounter such a concept, most likely in other languages, than less educated speakers. For those having learned the concept it is probably convenient to use the familiar native name for /arm and hand/ to refer specifically to /hand/, thus demonstrating a Stage 3 pattern. As it happens, a large part of the data upon which this paper is based, specifically that which has not been published, was obtained from bilingual informants (in English and in a native tongue) living in the United States who have, of course, encountered the concepts, /hand/ and /foot/. Thus there remains the possibility that for some (less educated) speakers of languages in the survey with Stage 3 patterns, there is no native concept /hand/ and/or /foot/.

stage 3 Stage 3 is characterized by the labeling of /hand/ or /foot/ with the same primary lexeme labeling /arm/ or /leg/, respectively (or /forearm/ or /lower leg/, as the case may be). Among those language cases presenting more or less complete partonomic data on limbs, Dari Farsi, Malay, Maranao, Ponapean, Quechua, Russian, and Vietnamese are at Stage 3 for both kinds of extremities, and Arabic, Chinese (Shanghai dialect), Finnish, and Pashto demonstrate this developmental plateau for lower limbs alone.

Only one language, Quechua, has a Stage 3 nomenclatural pattern which agrees with development from a Stage 2a or 2b. Any language having evolved in this way must by definition label the native 'arm' or 'leg' with a monosemic lexeme and the native 'forearm' and /hand/ or the native 'lower leg' and /foot/, respectively, with the same term (see Table 2). Quechua uses *čaki* to refer to both the native 'lower leg' and /foot/ and assigns a different term *čaka* to the native 'leg.' The Quechua Stage 3 pattern for upper extremities is as described for that level in Table 1.

No languages in the survey lack a concept for /leg (and foot)/ and also have the Stage 3 pattern outlined for such cases (Table 1). This is not, however, particularly suggestive of the gratuity of the proposed Stage 3, for which /leg (and foot)/ is *not* pertinent because the number of languages of the sample (three), regardless of developmental level, not distinguishing the latter concept is comparatively small. In other words, this apparent anomaly may result from sampling error.

Earlier I proposed that the existence of a concept, /hand/ or /foot/, labeled by a monosemic lexeme or otherwise, implies a more appropriate proposition linking the latter as "connected to" rather than "part of" the native 'arm' or 'leg,' respectively. When the former proposition is pertinent, the native 'arm' or 'leg' is actually represented by /arm/ or /leg/, rather than by /arm and hand/ or /leg and foot/. If the existence of the concept, /hand/, or the concept, /foot/, does in fact imply the connective proposition, then /arm/, rather than /arm and hand/, and /leg/, rather than /leg and foot/, are labeled *parta* pertinent to the proposed Stages 3 and 4 (as explicitly formulated in Tables 1 and 2). Similarly, /forearm/, rather than /forearm and hand/, and /lower leg/, rather than /lower leg and foot/, are pertinent to these levels (as explicitly formulated in Tables 1 and 2).

To advance from Stage 1 or 2 to Stage 3, a concept, /hand/, or a concept, /foot/, must be developed. Conceivably this could occur as a natural consequence of the general growth process whereby languages become more discriminating. McClure's (1975:79) study, as suggested earlier, points to a specific explanation of the way in which such a concept may often be learned, that is, (well educated) native speakers may encounter it in

another or other languages. With the development of such a concept by whatever means, data suggest four possible ways through which it becomes nomenclaturally incorporated into a language: (1) The concept may be given an already existing word which labels, and continues to label, the native 'arm' or 'leg' or, as the case may be, the native 'forearm' or 'lower leg.' (2) If the concept is learned from another language, the word for the concept in the latter language may be borrowed by the native language. (3) The concept may be given an already existing word which does *not* label the native 'arm' or 'leg,' or, similarly, the native 'forearm' or 'lower leg.' (4) The concept may be given an already existing word which previously labeled /arm and hand/ or /leg and foot/ or, similarly, /forearm and hand/ or /lower leg and foot/ and the native 'arm' or 'leg,' or, as the case may be, the native 'forearm' or 'lower leg' is assigned a new label.

Process (1) pertains to advancement from Stage 1 or 2 to Stage 3 and appears to be a common occurrence. Processes (2), (3), and (4), on the other hand, account for the development of Stage 4 patterns.

stage 4 Stage 4 is distinguished from other growth intervals by labeling /hand/ or /foot/ with a monosemic lexeme. Of those surveyed, Arabic, Chinese (Shanghai dialect), Finnish, Huastec, Malay, Pashto, and Tarascan have a unique label for /hand/ but not for /foot/; Czech, Hopi, and Zuni have a unique label for /foot/ but not for /hand/; and English, Eskimo, French, German, Inupik, Kayan, Mandarin Chinese, Navajo, Serbo-Croatian, Spanish, Thai, and Urdu have monosemic lexemes for both /hand/ and /foot/.

Two languages, Hopi and Inupik, which lack a concept, /leg/, demonstrate the Stage 4 pattern illustrated for such cases in Table 1. Stage 4 patterns for upper and/or lower extremities pertaining to other languages could have developed from Stage 3 either in the manner described in Table 1 or as given in Table 2. There is no way of determining which of the latter two growth sequences pertains to most languages at Stage 4, with the exception of those languages assigning the same term to /arm/ and /forearm/ or to /leg/ and /lower leg/. For the latter, Stage 4 patterns are determined to have developed from Stage 3 as given in Table 1 rather than as given in Table 2.

Data suggestive of processes (listed above) whereby the concepts /hand/ and /foot/ become nomenclaturally incorporated at Stage 4 come from five languages, Swahili, Serbo-Croatian, Malay, German, and English. Process (2), for example, is suggested by Swahili. Most speakers of Swahili are apparently at Stage 1 for both upper and lower extremities: *mkono* /arm and hand/ and *mguu* /leg and foot/. Some speakers, however, have a concept, /foot/, labeled by *futi*. The latter label, and perhaps the concept, /foot/, itself, was apparently borrowed from English.¹⁸

In Serbo-Croatian, nomenclature for both upper and lower extremities is apparently in the process of changing from either Stage 1 or Stage 3 to Stage 4. Liston (1972) describes the Serbo-Croatian *šaka* and *stopalo* as sometimes used as labels for /hand/ and /foot/, respectively. According to Liston, *šaka*'s original sense is 'fist' (1972:331), and the original sense of *stopalo*, one gathers, is 'sole' (1972:326). Other aspects of linguistic reference to extremities described by Liston indicate that these words were not originally assigned to /hand/ and /foot/ but are only now becoming so. This development agrees with process (3) described above.

Liston (1972:331) mentions that *stopalo* is employed only if special emphasis is being placed on the area of the foot as opposed to the leg. However, when one speaks of parts of the foot (as opposed to the leg), the word *stopalo* is not used; thus, for example, one refers to toes by using *prst no nozi* 'digit on the foot,' where *nozi* apparently is one form of the general term for the native 'leg,' *noga*. Similarly, when one refers to activities of

the hand, such as writing or waving, the term *šaka* is not employed: *pisati rukom* 'to write with the hand (arm)' or *maxnuti rukom* 'to wave one's arm (hand)' (Liston 1972:332). Thus *šaka* and *stopalo* do not appear to have fully achieved the status of lexemes for /hand/ and /foot/, but rather may be in the process of doing so.

The Swahili and Serbo-Croatian examples seem to suggest that languages can develop Stage 4 nomenclature without having first passed through Stage 3. For some speakers of Swahili, for instance, *futi* /foot/ may have been added without the word for the native 'leg,' *mguu*, first being used to refer to /foot/. Similarly, Serbo-Croatian may have never used its labels for the native 'arm' and 'leg' to refer specifically to /hand/ and /foot/ before *šaka* and *stopalo* were so applied. Unfortunately, data bearing on these issues are not available, and only speculative arguments can be offered addressing the necessity of Stage 3 in the growth of partonomic nomenclature for extremities.

It is my hypothesis that all languages pass through Stage 3 before developing a Stage 4 nomenclature. This is to propose that development of concepts, /hand/ and /foot/, among individual speakers of a language never involves simultaneous development of monosemic lexemes for these parts. The ubiquitousness of languages with Stage 3 patterns suggests that newly formed concepts, /hand/ and /foot/, are always initially labeled by words for the native 'arm' and 'leg,' a labeling procedure which seems quite natural given that /hand/ and /foot/ are significant segments of the continuous contiguities /arm and hand/ and /leg and foot/. Monosemic lexemes for /hand/ and /foot/ may arise only after these concepts have become fairly widespread among speakers of a language. At this point the ambiguity inherent in the use of the same word for /arm/ and /hand/ or for /leg/ and /foot/ may prove sufficiently disfunctional for many speakers to result in the incorporation of unique labels for /hand/ and /foot/ into the lexicon of a language.

Implicit in several of the speculative comments presented thus far, including the immediately preceding one, is the notion that different speakers of the same language may be at different stages in the growth of partonomic nomenclature. Such intralanguage variability has been noted for Swahili and is, of course, what McClure (1975:79) discovered when ascertaining that well educated speakers of Romanian and Saxon generally have a concept for /hand/ while there is more difficulty in determining the concept for less educated speakers. Similarly, a language could have speakers who uniquely label /hand/ or /foot/ and other speakers who label the latter and the native 'arm' or 'leg' respectively by use of the same word. (Serbo-Croatian, I believe, shows signs of being such a language.) The discovery that different speakers of the same language demonstrate different stages of partonomic growth parallels Berlin and Berlin's (1975) and Kay's (1975) recognition that different informants from the same linguistic group are frequently at different, but contiguous, stages in the evolution of basic color terms.

Process (4), the last of the three suggested ways by which a concept, /hand/ or /foot/, becomes nomenclaturally incorporated at Stage 4, has yet to be discussed. This process involves labeling the concept with an already existing word which previously labeled /arm and hand/ or /leg and foot/, or, as the case may be, /forearm and hand/ or /lower leg and foot/ and assigning a new label to the native 'arm' or 'leg' or, similarly, to the native 'forearm' or 'lower leg.' Recognition of process (4), as discussed below, requires postulation of Stage 4 nomenclature patterns alternative to those presented in Tables 1 and 2.

In Malay, there are two alternative nomenclatural systems for referring to upper extremities, one resembling Stage 3 and the other Stage 4. This contemporaneous occurrence may imply an ongoing change in that language from the former stage to the latter. In current usage, however, the Stage 3 pattern pertains to informal communication

events, while the Stage 4 pattern is essentially restricted to linguistic encounters of a more or less formal nature.¹⁹

The word, *tangan*, marks both /hand/ and /arm/ in the Malay Stage 3 pattern. In the alternative Stage 4 system, *tangan* labels /hand/, but a different term, *lengan*, the standard label for /upper arm/, is extended in its use to refer to /arm/ as well. If change is indeed implied in the Malay example, then process (4) is clearly in evidence.

Process (4) is also suggested by German, which manifests alternative nomenclature patterns for upper limbs strikingly similar to those of Malay. For some speakers of German, the word *Hand* can be used to refer to both /arm/ and /hand/ (McClure 1975:82). However, the German *Arm*, used for /upper arm/, is used by other speakers to refer to /arm/, in which case *Hand* is restricted in reference to /hand/.

Malay and German definitely manifest Stage 4 patterns, since they have labels for /hand/ which differ from labels for the native 'arm.' However, they deviate developmentally from other Stage 4 languages in that they use the same lexeme for /hand/ at Stage 4 as discovered for that parton at their alternative Stage 3. Tables 1 and 2, on the other hand, describe Stage 4 languages as labeling /hand/ with lexemes differing from those used for it at Stage 3. The Malay and German cases suggest the necessity of postulating an alternative Stage 4 accommodating use of the same word for /hand/ at both growth stages. Tables 3 and 4 present such an alternative stage for upper extremities and, by analogy, a parallel Stage 4 for lower extremities. Table 3, corresponding to Table 1, illustrates /arm/ and /leg/ relabeled at Stage 4. In Table 4, corresponding to Table 2, /forearm/ and /lower leg/ are also shown renamed at the latter stage.

The evidence described thus far, on the basis of which stages in the growth of nomenclature for parts of the human extremities have been inferred, is strictly synchronic in nature. However, since first proposing the described developmental schema (Tables 1-4), I have been made aware of some diachronic data which directly, rather than through inference, support certain speculations made here.²⁰ *The Shorter Oxford Dictionary on Historical Principles*, published in 1962, states that as late as 1661 the English word, *foot*,

Table 3. Alternative Stage 4 patterns developed from Stage 3 patterns of Table 1.

<i>Upper Extremities</i>				
Stage 3.	(as in Table 1):			
	P1/arm/	(P1/forearm/)	P1/hand/	.....
Stage 4.	(alternative to that of Table 1):			
	P2/arm/	(P2/forearm/?)	P1/hand/	.....
<i>Lower Extremities: Concept /leg (and foot)/ Pertinent</i>				
Stage 3.	(as in Table 1):			
	P3/leg/	(P3/lower leg/)	P3/foot/	.....
Stage 4.	(alternative to that of Table 1):			
	P4/leg/	(P4/lower leg/?)	P3/foot/	.....
<i>Lower Extremities: Concept /leg (and foot)/ Not Pertinent</i>				
Stage 3.	(as in Table 1):			
	P3/lower leg/	P3/foot/		.....
Stage 4.	(alternative to that of Table 1):			
	P4/lower leg/	P3/foot/		.....

was used to refer to the whole limb, /leg and foot/. Similarly the English *hand* is recorded as last being used to refer to /arm and hand/ in 1751. Thus historical evidence points to an English development of Stage 4 nomenclature for both upper and lower extremities conforming with Process (4) and formalized in Table 3.

A final speculative comment may be added before concluding this section. If, upon achieving Stage 4 for both upper and lower extremities, a language comes to distinguish /finger/ and /toe/ through use of different primary lexemes, then the label for /finger/ will be retained from earlier growth stages, and /toe/ will be labeled by a primary lexeme unassociated with previous developmental intervals. This, for instance, is suggested in French, where the word *doigt* is used to refer to both /finger/ and /toe/ or alternatively only to /finger/, /toe/ being distinguished as *orteil*. Apparently, when /finger/ and /toe/ are labeled by the same primary lexeme, the principal referent of the label is /finger/ rather than /toe/. The primacy of /finger/ in the growth of partonomic nomenclature for digits is also suggested by the fact that languages can have secondary lexemes equivalent to the English 'fingers of the foot' but will never have expressions comparable to 'toes of the hand' (Principle 9[d]).

nomenclature growth and cultural development

Readers familiar with Berlin and Kay's (1969) study of color terminology will notice that, unlike their evolutionary scheme for basic color terms, no correlation between the growth sequence proposed here and general cultural development is immediately suggested. This becomes especially apparent when noted that at any one point in time a single language can be at Stage 1 for upper extremities and at Stage 4 for lower extremities or vice versa. Indeed, I find no compelling reason for presuming that languages spoken by technologically advanced groups, for example, should demonstrate finer lexical discrimination of the limbs than languages used by technologically less developed people. The converse, moreover, seems probable: as Paul Friedrich (personal communication) puts it, primitives and peasants are, after all, more familiar with body parts, since "every man is his own butcher."

One explanation for the lack of correlation with cultural development may be that the proposed scheme is in fact something less than an evolutionary sequence in the classic

Table 4. Alternative Stage 4 patterns developed from Stage 3 patterns of Table 2.

<i>Upper Extremities</i>				
Stage 3.	(as in Table 2):			
	X/arm/	Y/forearm/	Y/hand/	.....
Stage 4.	(alternative to that of Table 2):			
	X/arm/	Z/forearm/	Y/hand/	.....
<i>Lower Extremities</i>				
Stage 3.	(as in Table 2):			
	X'/leg/	Y'/lower leg/	Y'/foot/	.....
Stage 4.	(alternative to that of Table 2):			
	X'/leg/	Z'/lower leg/	Y'/foot/	.....

sense, but, I would insist, something more than a simple typology. Evolution implies increasing differentiation and complexity. This involves, furthermore, the notion of irreversible progress, the achievement of levels of advancement usually with no possibility of turning back. The stages described in this paper, on the other hand, might best be regarded as simply contiguous, with no suggestion of irreversible development, but with implication of a general trend toward finer discrimination. This trend need not necessarily be connected with anything else in either language or culture, although it could be and, perhaps, sometimes actually is. So conceived, languages advance to levels of greater anatomical discrimination while occasionally slipping back to previous levels of lesser differentiation, for example, through creolization or pidginization.²¹ Both forward and backward movement always entails immediately juxtaposed stages, no language moving directly, for example, from Stage 1 to Stage 4, or vice versa, without passing through Stage 3 (and possibly Stage 2). This is, of course, one more speculative observation among several offered here hopefully to be submitted to future empirical validation.

conclusions

In this paper I have gathered data bearing on human anatomical partonomy. I have isolated twelve principles pertaining to partonomic organization and nomenclature and have abstracted, through speculation and with reference to a subset of these principles, stages in the growth of nomenclature for human extremities. Some of my conclusions are:

(1) Human anatomical partonomies rarely exceed five hierarchical levels in depth and never exceed six hierarchical levels.

(2) The Whole is labeled in all human anatomical partonomies.

(3) All *parta* occurring at the second level (formally, Level 1) of human anatomical partonomies are labeled by primary lexemes.

(4) The *parton*, /*arm* (and *hand*)/, is always labeled and always by a primary lexeme. The *parta*, /*leg* (and *foot*)/, /*hand*/, and /*foot*/, are not always named, but if they are, they are always labeled by unanalyzable primary lexemes. If a concept, /*hand*/ or /*foot*/, labeled or not, exists, it is most appropriately regarded as "connected to" rather than as "part of" the native 'arm' or 'leg' respectively.

(5) The relationship 'part of,' in its most characteristic sense, like the relationship 'kind of' is always transitive in human anatomical partonomy.

(6) The *parta*, /*finger*/ and /*toe*/, are always labeled. They are either (a) both labeled by unanalyzable primary lexemes, (b) both labeled by different secondary lexemes sharing the same partonomic addendum, or (c) one *parton*, /*finger*/, is labeled by a primary lexeme, and the other *parton*, /*toe*/, is labeled by a secondary lexeme. Derivable from (c), languages have secondary lexemes equivalent to the English 'fingers of the foot (or leg),' but never have secondary lexemes comparable to 'toes of the hand (or arm).'

(7) The *parta*, /*finger*nail/ and /*toe*nail/, are always labeled. They are either both named by the same unanalyzable primary lexeme or both by different secondary lexemes sharing the same partonomic addendum. If both /*finger*/ and /*finger*nail/, or both /*toe*/ and /*toe*nail/, are labeled by secondary lexemes, they always share the same partonomic head. Consequently, languages never have secondary lexemes equivalent to the English 'nails of the digits of the arm (or hand)' or 'nails of the digits of the leg (or foot.)' If /*finger*/ is labeled by a primary lexeme, /*finger*nail/ and /*toe*nail/ are always labeled by primary lexemes. However, if, and only if, /*toe*/ is named by a primary lexeme differing linguistically from that labeling /*finger*/, /*finger*nail/ and /*toe*nail/ may be labeled by secondary lexemes.

(8) Four stages are recognized in the growth of partonomic nomenclature for upper and lower extremities. Stage 1 and 2 languages do not have labels for /hand/ or /foot/, while Stage 3 and 4 languages do. Stage 2, with a label for /forearm and hand/ or /lower leg and foot/, apparently does not constitute a necessary interval in the development of all languages. Before achieving Stage 4, all languages do, however, pass through Stage 3, in which /hand/ or /foot/ is labeled by the same term labeling the native 'arm' or 'leg' respectively, or, as the case may be, the native 'forearm' or 'lower leg.' Alternative Stage 4 patterns are recognized. One consists of the labeling of /hand/ or /foot/ with a primary lexeme different from that naming it at Stage 3. The other consists of labeling /hand/ or /foot/ with the same primary lexeme naming the latter at Stage 3 and assigning a label to the native 'arm' or 'leg' (or 'forearm' or 'lower leg') different from that labeling it at Stage 3.

The most general conclusion reached is that both classification-perception and classification-nomenclature principles pertain to human anatomical partonomy. Determination of the latter, moreover, is contingent upon determination of the former. In order to say that a certain labeling procedure universally pertains to body partonomy, one must first establish just what is labeled, and this necessarily means discovery of those areas of the perceptual grid, i.e., the human body, of universal recognition. As evidence for such principles in body partonomy, biological and nonbiological folk taxonomy, color classification, and in other naming-behavior systems accumulates, and the parameters of human psychic unity become more clearly defined, one of ethnoscience's important contributions will be the systematic revelation of the manner in which structured perception of the universe and universal naming procedures are interrelated.

notes

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²I do not find the usual word used by ethnoscientists, i.e., "semantics," appropriate to the kinds of linguistic phenomenon treated here. "Naming behavior" is used instead to avoid suggesting that the lexical identification of entities has anything to do with meaning as this relates to communication and understanding through actual language use. To my way of thinking—deriving from the ordinary language lineage 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 taken up by me in several places (Brown 1973, 1974a, 1974b) and will not be repeated here for lack of space.

³I do not mean to imply that Berlin and Kay's (1969) and Berlin, Breedlove, and Raven's (1973) studies represent the only attempts in an ethnoscientific tradition to outline universal principles. In this connection I should also mention Witkowski's (1972) Guttman scale treatment of "semantic" distinctions in kinship terminologies, D'Andrade and Egan's (1974) investigation of colors of emotion, Nerlove and Romney's (1967) typology of sibling terminologies, and Kronenfeld's (1974) later refinement of the latter. I have also discovered and hope to publish soon (Brown n.d.) a predictable sequence for adding folk botanical life form terms, such as "tree," "grass," "vine," etc., to lexicons. The latter is analogous in several respects to the diachronic sequence postulated for basic color terms by Berlin and Kay (1969).

⁴Berlin and Kay's (1969) study of basic color terms is well known and has been summarized many times in the literature. Therefore, it will not be outlined again here. For recent revisions in the color theory see Berlin and Berlin (1975), Kay (1975), and Kay and McDaniel (1975).

⁵The distinction drawn here can be related to contemporary linguistic theory (cf. Chomsky 1965:28): classification-nomenclature principles constituting kinds of "formal" universals and classification-perception principles kinds of "substantive" universals.

⁶In the paper in which the term was introduced (Brown, et al. 1976), *parta* was defined as

referring to “named things hierarchically juxtaposed through the propositional relationship ‘part of.’” There are analytical reasons for revising this definition so that *parta* can refer to both labeled and unlabeled parts of an entity.

⁷My data base indicates that all languages demonstrate a “part of” relationship or a relationship in some way related (logically) to “part of.” Allen Johnson (personal communication), for example, describes Machiguenga, an Arawakan language, as lacking an equivalent to the English “part of”: “In my current research . . . I have been unable to find a ‘part of’ frame. I have been forced to work with possessive forms: ‘x belongs to y’ or, simply, ‘x is y’s.’ This is true for body parts and for other things, such as the edible ‘parts’ of a tree.” Swanson and Witkowski (n.d.:10) also report a lack of an explicit “part of” relationship in Hopi and a similar use of the possessive: “Possession works from the general (whole) to the more specific (part) and is most common in actual communication whereas part-whole, as the name implies, works from the more specific (part) to the more general (whole).” Thus the relationship “possesses,” an apparent logical inverse of “part of,” substitutes for the latter in both Machiguenga and Hopi and, perhaps, in many other languages as well.

⁸Rarely have the data from languages listed here approximated complete anatomical partonomies. Well over a majority of cases have, however, been complete enough to measure the pervasiveness of almost all the principles deduced. Other less complete data cases have been useful in confirming certain subsets of these principles.

Some of the data upon which this study is based come from published accounts, but the largest part was supplied to me in various unpublished forms by individuals whom I wish to acknowledge and thank here. These are Diane Clark, Michael Sellon, and Virginia Smith (Spanish), Christopher Day (Jacalteco), J. L. Fischer (Ponapean and Trukese), Mark Flotow and Lev Soudek (Czech), Robert Ghogomu and Daniel V. Jordan, Jr. (Chirah-mbaw), Jay Happonen and Ronald Provencher (Malay), Robert Hernandez (Ibo-Nigerian), Bill Horine (Swahili), Phil Krebs (Urdu), John McCarthy (Arabic), Robert H. McDaniel (Kayan), Randy Noah (Ashanti), Patt O’Halloran (Maranao), Pertti J. Pelto (Finnish), Tipawan Trúong-Quang Reed (Thai and Vietnamese), Edwina Spodark (Russian), James Stanlaw (Chinese, Shanghai dialect), Carol Stout and Willard Walker (Zuni), Bryan C. Truman (Vietnamese), Jane Trucksis and T. Dawn Williams (Mandarin Chinese), D. S. Weber (French), and Donna Woods (Thai).

The published accounts are Brown, et al. (1976—Huastec), Franklin (1963—Kewa), Friedrich (1969—Tarascan), Landar and Casagrande (1962—Navajo), Lantis (1959—Eskimo), Liston (1972—Serbo-Croatian), Lucier, VanStone, and Keats (1971—Inupik), Marsh and Laughlin (1956—Aleut), McClure (1975—German, Romanian, and Saxon), Saunders and Davis (1974—Bella Coola), Stark (1969—Quechua), Stross (n.d.—Tzeltal), Swanson and Witkowski (n.d.—Gourma, Hopi, and Navajo), and Werner and Begishe (1970—Navajo).

⁹In this study, /*arm*/ and /*leg*/ refer to appendages excluding /*hand*/ and /*foot*/ respectively.

¹⁰Many human anatomical *parta* have indeterminate boundaries. Kay and McDaniel (1975) have recently developed a formalism for handling categories demonstrating ambiguous borders, or, in their words, “fuzzy sets.” Perhaps their fuzzy set formalism, or something akin to it, can be adapted to anatomical partonomy, thereby avoiding the imprecision inherent in the reference language used in this study.

¹¹Note that the construction of the binomial *forearm* is best understood (makes more sense) in a partonomic context as a secondary lexeme rather than in a taxonomic context as an unanalyzable or unproductive primary lexeme. This is to suggest that *forearm* ordinarily may be regarded by English speakers more as a parton than as a taxon. Similarly, *finger nail* as a secondary lexeme in both taxonomy and partonomy may be equally salient as both a taxon and a parton. A general theory might be developed proposing the contextual pertinence of secondary lexemes as a guide to the general salience of binomial constructions.

¹²In Brown, et al. (1976), the Huastec *elim* ‘incisor,’ *kormiyo* ‘canine tooth,’ and *išohol* ‘molar’ are incorrectly given as Level 5 *parta* immediately possessed by *kamab* ‘teeth.’ The former three primary lexemes actually label taxa which are “kinds of” *kamab*. Thus the Huastec body partonomy maximally extends to five rather than to six hierarchical levels.

¹³This observation is not as trivial as it perhaps may immediately seem to casual English-speaking observers of human body partonomy when noted that in many different languages other “symmetrical” parts of the upper and lower extremities, such as /*fingers*/ and /*toes*/ or /*finger nails*/ and /*toe nails*/, share the same label (see Principles 9[b] and 10[a]). In this connection it is interesting to note the seemingly universal constraint on naming right-left mirror-image human body parts by use of different unitary (primary) lexemes (cf. Swanson and Witkowski n.d.:17).

¹⁴In this paper a monosemic label for a parton is “monosemic” in the universe of a given body partonomy. Such a lexeme may in fact be polysemic otherwise. For example, the word “arm” is monosemic in English human body partonomy, i.e., it labels only *one* body parton, /*arm*/, (albeit a parton with two symmetrical or mirror-image manifestations), but otherwise it is polysemic labeling, for example, /*arm* of a chair/ as well.

¹⁵ Willard Walker, in a personal communication, has suggested another way of solving the fingernails/arms problem: "If, for example, hands are distinguished from arms, fingernails may cease to be parts of arms, not because hands are 'connected to' (rather than 'parts of') arms, but because arms have ceased to be the parent bodies from which hands extend and have become mere links between hands and trunks and, hence, in a sense, extensions of the hand."

¹⁶ That a concept /hand/ or /foot/ is generally regarded as "connected to" rather than "part of" /arm/ or /leg/ respectively may explain why /hand/ is never (Principle 6) and why /foot/ is never primarily and only alternatively (Principle 7) labeled by a secondary lexeme. A secondary lexeme for /hand/, for example, would consist in a partonomic head which also labels /arm and hand/ and a partonomic addendum indicating the part of /arm and hand/ implicated. If /hand/ is not a "part of" /arm/, but rather is "connected to" the latter, the construction of such a secondary lexeme is a logical impossibility.

¹⁷ Tarascan incorporates reference to *parta* in the form of suffixed nonroot morphemes (Friedrich 1969).

¹⁸ *Futi* is standardly used in Swahili as a term for a measure of length corresponding to the English "foot" (twelve inches).

¹⁹ I am particularly indebted to Ronald Provencher for clarifying the Malay example.

²⁰ I am grateful to Peter M. Tobias for making me aware of these data.

²¹ A possible case of such a reversal in English has been brought to my attention by Peter M. Tobias. He reports that inhabitants of Grenada use *foot* to refer to both /leg (and foot)/ and /foot/. This, on the other hand, may simply represent the persistence among Grenadians of an archaic or obsolete English usage.

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