INVESTIGATING LINGUISTIC UNIVERSALS

Ian Maddieson

Department of Linguistics, UCLA, Los Angeles, U.S.A.

ABSTRACT

A property that is widely distributed across the world's languages is often taken to be a necessary or desirable feature of language design. This paper reviews ways that biological limits or physical laws may constrain language, and proposes that avoidance of extremes is a desirable trait. The problem of distinguish-ing between 'universals' (shared features deriving from response to such pressures) and inherited similarities is discussed in the light of growing evidence of wider language relationships and new models of human prehistory.

1. INTRODUCTION

For centuries linguists have tried to understand what is essential to the nature of Language, as opposed to something that is particular to a given language or group of languages, by studying language universals. The reasoning is essentially as follows: if a feature is distributed widely enough in the world's languages to be labeled universal then it is either a necessary property of human language, or it is in some sense a desirable one. A similar arg-ument applies when clusters of co-occurr-ing linguistic properties are described under the heading of linguistic typology. If certain sets of properties repeatedly occur together in languages, then it can be argued that their co-occurrence is a necessary or a desirable property. That is, typology includes the study of contingent universals.

It is usually because of this line of thinking that people are interested in uni-versals of language. The study of preva-lent patterns in languages, of universals, is a window to examine the question of why language is the way it is. By this hypothesis, universals arise because of biological limits and environmental pres-sures that are at work on all languages simply by virtue of the fact that they are in use by members of the same species of mammal. Despite the great geographic dispersion of our species and a good deal of individual and group variability between its members, all humans make use of basically the same equipment of brain, vocal tract and auditory system. Studying universals is therefore not so much a goal in its own right as a challenge to the linguist to come up with explanatory accounts of what these pressures are and how they affect human language in general. The goal is to produce models of these pressures that predict the universals that have been observed.

However, if we are interested in universals we have two great problems to face. One is the problem of obtaining knowledge about them. How do we de-cide what is universal? That is, how do we go about finding what is prevalent enough in the languages of the world to count as a possible universal? The second problem is how to distinguish those properties that we wish to consider 'universal' (in the particular sense that they arise from design considerations that apply to human language in general) from prevalent patterns that arise from other sources of uniformity? It is a hypothesis that important properties of human languages are common because they are based on inherent characteristics of the human species and of the environment in which we as a species employ our linguistic abilities. This hyp-othesis must be compared with alternative hypotheses that might explain the data in better or equally satisfactory ways.

Since the concern of this conference

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is with the phonetic sciences, the discussion of these issues which follows will be directed to and illustrated with examples from the domains of phonological and phonetic universals, based in part on my own work with the UCLA Phonological Segment Inventory Database or UPSID [25, 28], but there is nothing in the general principles concerned that would be any different if the field of enquiry was in some other area of linguistics.

2. HOW TO FIND MEANINGFUL PREVALENT PATTERNS?

As has been pointed out before, but is worth stressing again, some kind of structured systematic sampling of the universe of known languages is essential if we want to know what linguistic patterns are prevalent [2, 12, 18, 25]. Prevalence is an essentially statistical concept. We need to be able to say with some confidence that the set of languages within which some property is said to be prevalent (or more common than some other pattern) represents the larger universe that we are really interested in studying, ultimately that of all possible human languages. Above all, if we are looking at patterns of co-occurrence of properties, at typological patterns, we must be able to evaluate the independent distribution of these properties, in order to be able to say if they are significantly associated with each other.

An obvious way to know how widely distributed a particular feature is would be to count the frequency of that feature in *all* human languages. Even if we limit ourselves to languages still spoken at this time, there are two straightforward practical problems which prevent us from attempting this. First, linguists have not yet got around to examining all of the world's living languages, and, second, even if they had, surveying descriptions of all languages would be impossibly time-consuming.

There are also theoretical objections to making this the goal; these concern the need to survey the data in a way that gives appropriate weight to each language. First, there is no unambiguous principle to define the borderline between the degree of difference between two speech varieties that warrants assigning them to different languages and the degree of difference which can be accomodated within the construct of a single language. Different linguists will give various classifications of the same speech varieties. Without an answer to this problem we might include only one dialect of one language but many varieties of another, giving it undue weight in the survey. This makes it impossible to be certain that we have assigned equal weight to each language.

Secondly, we know that where we find close-knit families of languages existing today this reflects an evolution from an earlier stage at which the precursors of these now-distinct languages were dialects of a single language. Separately counting all members of such close-knit groups transparently gives undue influence to the group, just as separately counting all dialects of a language does for that language. This is because members of the group will have so many features in common that are simply inherited. Few of their shared features are likely to be due to *independent* response to the pressures shaping human language that it is our ultimate objective to investigate. We may take the North Germanic languages as an example. There are perhaps five living languages in this group, Icelandic, Faroese, Swedish, Norwegian and Danish, and we know that they go back to a common Norse parent language that was quite uniform as recently as five or six hundred years ago. The descendent languages, unlike their next nearest relatives in the West Germanic group, share some elements of a pattern relating consonant quantity to vowel quality and quantity features. We might overestimate the global prevalence of such a pattern, that is, the number of independent occurr-ences of the pattern, by counting each of these languages separately. In contrast, a language such as Albanian in the same period of time has not fragmented into a number of daughter languages. We would under-represent features that might have been shared by the daughter languages it never had. The problem is just the same as if we were to count each of a large number of modern dialects of English but only to count one variety of modern French. In that case, our survey might show an inflated number of interdental fricatives, and a correspondingly depress-ed number of front rounded vowels.

It is therefore necessary for both

practical and theoretical reasons to develop some strategy so as to make a selection of languages such that each contributes an appropriately equal weight to the sample. One needs to create a sample that can be trusted to represent in a fair way the overall frequency of the properties of interest in the world's languages. For the UPSID project the decision made was to aim for a sample that includes one and only one language from each group of languages that is separated from its closest relative by a genetic distance similar to that separating the North Gemanic languages from the West Germanic languages. In terms of time depth this might translate into about 1500 years of separation, a long enough period for substantial independent developments to occur in the phonological patterns of any two lang-uages belonging to the same larger family. Related languages will, of course, have certain elements of their phonological patterns in common, or we would hardly be able to recognize their relatedness. But at the same time they will have a degree of independence. Languages with *no* closer relatives are also included, as they too represent the outcome of certain lines of independent development. The current UPSID sample size is 451 languages, probably between 5% and 8% of the world's existing languages.

However, despite the restriction built in to constructing the UPSID sample, problems concerning whether the selected languages can be considered truly independent samples do not go away. I will return to this question when it comes to discussing the interpretation of prevalent patterns. But first I will provide a simple illustration of the use of this database to derive estimates of the frequency of phonological patterns.

It is generally agreed that there are more languages with a voicing contrast in stops than languages with a voicing contrast in fricatives [16, 25]. But let us suppose that we want to investigate the claim that voicing contrasts in fricatives *preferentially* occur in languages which have a voicing contrast in stops, that is, there is an implicational universal involved. To do this, it is not good enough simply to point to a large number of languages that do indeed share both types of voicing contrasts and then list a number of lang-

uages that have a voicing contrast in stops but not in fricatives. It has to be shown that there are *fewer than expected* cases of languages that have a fricative voicing contrasts but lack stop voicing contrasts. The frequency of fricative voicing and stop voicing independently can be estimated from our language sample, and each number can be viewed as the probability that a given language will have the property in question. We can then multiply these independent probabilities together to obtain estimates of how frequently fricative and stop voicing might be expected to co-occur if there was no contingent relationship between them. The expected value can then be compared with observed frequencies of co-occurrence and singular occurrence, and the significance of the association of the voicing contrasts with each other can be statistically evaluated.

In our UPSID database, about 72% of the languages included have voicing contrasts in stops (i.e. have voiced and voiceless plosives) and about 47% have voicing contrasts in fricatives. That is, the probability of one of the individual languages in the database having a stop voicing contrast is .72, and the probability of an individual language having a fricative voicing contrast is .47. If we multiply these two probabilities together, the result is about .34. That is, if there is no connection between the occurrence of these two things, we may expect 34% of these languages to show both stop and fricative voicing, leaving about 13% that have fricative voicing without stop voicing. The observed figures are in fact 38% and 9% respectively. A simple χ-square test can then be applied to compare the observed with the expected distributions, yielding the answer that there is about a one in five chance that these results are accidental. Since there is only one degree of freedom in this problem the level of significance should perhaps not be taken too seriously, but for what it is worth, the result suggests that the connection between the occurrence of fricative and stop voicing is not all that strong.

As a final note in this section, a word should be said about the care required in drawing conclusions from any assemblage of data about a set of languages. Typically, when a large number of descriptions of languages are brought together to get a view of the variety of lang-

uage, a wide range of explicit or implicit linguistic theories are represented. Scholars of different language families and from different parts of the world are trained in different traditions, so that different facts are observed and the same facts will be reported in different ways. Also as theor-etical models in a given tradition evolve, what are considered to be the significant properties of a language change. We need to be sure that descriptions are comparable before generalizations are drawn, and to be sure that the inferences made are responsive to the particular nature of the data that is represented.

3. HOW TO INTERPRET PREVALENT PATTERNS?

As remarked above, universals in themselves are not objects of ultimate interest. It is the theory that will account for universals that is the focus. Compiling a sample such as UPSID provides a basis for stating which types of patterns might be justly interpreted as prevalent. For example, since over 98% of languages in the UPSID sample have stops at bilabial, anterior coronal (dental or alveolar) and velar places of articulation, we can say that it is a valid generalization about languages that they are overwhelmingly likely to have stops at these three places. What this means is that we would expect to find this to be true of some different but representative sample of extant languages or if we could travel 2000 years forward or backward in time and sample the lang-uages spoken at that time. In this case, as in any other, once it has been established that some pattern is prevalent or that there is a certain set of properties that tend to co-occur in the world's languages, we are challenged to look for the explanation that might be responsible for that pattern.

There are several types of explanations that may be entertained. They fall into two basic groups. The first type posits that prevalent patterns reflect necessary or desirable properties of language. The second group takes more account of the extent to which prevalent patterns might be due to inherited similarities between languages or to the spread of traits due to contact. These two types of explanations reflect on the one hand the fact that the faculty of language is a basic part of our human make-up and on the other hand the fact that the particular languages that survive and spread result from accidents of history shaped by many socio-political and environmental factors.

The first type of explanation includes the possibility that certain universals are inevitable. Some universals may be due to species-specific biological constraints; these at least set limits to the range of variation that languages may exhibit. However, the absolute biolog-ical constraints that can be stated at this time do not seem to be very interesting. This is perhaps because we know relatively little about what our language-related biological limitations actually are, and hence are restricted mostly to stating the obvious, such as that in their speech mode languages must use articulations that are possible human gestures that leave some acoustic signature of their presence. Thus, although languages make use of various gestures involving the lower lip, such as bilabial, labiodental and linguolabial articulations, labio-uvulars are universally absent. This is so for the rather uninteresting reason that the lower lip and the uvula cannot meet. This tells us why labial-uvulars are absent but does not tell us why bilabials are universal and linguolabials very rare.

Aside from articulatory impossibilities, we can also point to certain inevitabilities in speech production of the sort that have been the focus of research by John Ohala and some of his associates (e.g. Ohala [33]). These are effects that arise from the operation of physical laws applicable to the functioning of the vocal apparatus. They are not species-specific in any sense, but since the physical laws apply to all individuals, these effects are also inevitable. Ohala points out how physical laws produce assymetrical results. For example, given the higher resistance to air-flow in high vowels, there is a certain level of subglottal driving pressure at which voicing of high vowels will fail to occur but voicing of low vowels will be sustained. The consequence is that voice-less high vowels are a little more likely to occur than voiceless low vowels. This addresses the observation that there are languages in which all vowels devoice and languages in which only high vowels devoice, but no language is known that

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has devoicing of low vowels only.

The possibility that there are innate categorical classifications of certain sound types due to the way the perceptual system works remains uncertain, but further biologically-determined limits could arise from such a cause.

Other universals may reflect desirable design attributes of languages rather than inevitable properties. Let us think about one class of desirable properties. For a variety of reasons, humans do not wish to operate *near* the limits of their capabilities. In any mode of activity, errors increase when performance is pushed towards the limits. The nearer an approach is made to an operating limit the greater the difficulty of learning becomes, the more variable individual levels of success become, the greater the degradation of performance under stressful conditions, the greater the difficulties resulting from effects of age, tiredness, etc, and so on. For spoken language, the relevant limits would include limits on the range and speed of movement of the constituent parts of the vocal tract mechanism, limits on the ability of the auditory system to resolve distinctions between sounds, and limits related to the capacity for storage of linguistic knowledge in the brain.

Without knowing exactly where any of these limits lie, we can understand what represents movement *towards* these limits. It seems safe to assert that it is a desirable property of language that it should avoid any approach to the performance limits. This is at once a more inclusive and more cautious formulation of old observations that are usually phrased in terms of lang-uages maximizing ease of articulation and auditory distinctiveness. These two principles have been appealed to in selective ways to account for particular synchronic or diachronic patterns in lang-uages, but the implications of proposing these principles as ones that affect lang-uages across the board have rarely been taken seriously.

An exception is the ambitious phonetic model of phonological origins being developed by Björn Lindblom. The aims of this theory, the Theory of Adaptive Dispersion (summarized in [24]), include being able to account for the ontogeny of segments and the structure of segment inventories.

Lindblom's presentations of his theory include a model of the way we might envisage a language developing phonological patterns through selecting an optimal set of syllables. The optimal set is the one that minimizes the value of aggregate articulatory effort, expressed as the sum of deviations from a neutral vocal tract position plus the magnitude of articulatory trajectories in transitions between onset and offset of syllables, and, at the same time maximizes the value of overall auditory contrastiveness, expressed as the sum of differences over time in the auditory spectrum across the set of syllables. This model has at present been developed more as a demonstration that it is possible to predict the optimal set of syllables from any set of input candidates using the very general principles described, and it is not intended that the particular set of selected syllables has any special standing. So it is not appropriate to analyze the set of selected syllables to see if they reflect the preference patterns seen in actual languages. However, we can see in principle how such a model might explain the relative frequencies of bilabials and linguo-labials. Linguo-labial contact requires a tongue gesture of much greater magnitude than the lip-rasing gesture used for a bilabial.

But it is possible that this part of Lindblom's theory is too deterministic. The articulatory and auditory components produce a single optimal solution for a given input.[1] Our impression is that lang-uages are more variable than this. Considering just segment inventories, the evidence from surveys such as UPSID provides no clear evidence that languages are tending towards unique solutions. Consonantal and vocalic systems show certain similarities in their common core but the ways that they are elaborated beyond this common core are quite variable, and reduced systems with less than the common core are not unusual. A cross-linguistic study of syllable patterns currently under way at UCLA [29] shows that most of the languages studied do not have the strong dependencies between adjacent consonants and vowels that might be expected if ease of articulation and auditory distinctiveness, evaluated at the syllable level, play dominant roles in selecting preferred sound patterns. And, after all, languages with linguo-labials do

occur [26].

Rather than leaving this variability to be accounted for by social factors, as Lindblom provides, two directions for developing the more strictly phonetic elements of the model seem to merit consideration. One is to add further parameters, reflecting costs and benefits of other aspects of sound patterning, such as rules of word formation and phonological alternations. The 'cost' of the higher degree of articulatory difficulty of, say, consonant clusters may be mitigated when these result from morphological processes such as affixation (as English *move, moved*). Typically, affixes form a closed set and articulatory precision can be relaxed. Similarly, the cost of reduced auditory distinctiveness associated with an increased number of vowel contrasts might be mitigated by the presence of a rule of vowel harmony that limits the free distribution of these vowels at the word level. Recognition of whatever phonetic parameter forms the basis of the vowel harmony distinction is only required once per word, rather than for each syllable. The possibility of an association between larger vowel inventories and vowel harmony is suggested by the fact that for languages in Africa the modal size of the vowel inventory is 7, whereas on the other continents it is 5. Vowel harmony systems are more prevalent in the language families of Africa than in most other areas [27].

The second direction for taking the development of such a model is to relax the constraint that it seeks a single, optimal, solution, so that it produces a variety of possible solutions that cluster around the optimum. That is, accepting our restatement of the desirable design requirements and modelling avoidance of extremes rather than maximization of ease of articulation and auditory distinct-iveness. Of course, here the problem would be to determine how close an approach to the limits should be modeled as acceptable.

If we cannot be satisfied that universals arise from inevitable causes or result from shared pressures towards desirability, our other alternative is to consider that they may result from inherited similarities (or at least transmitted similarities). That is, we may see prevalent patterns that are not the result of innate limits or pressures to

select desirable traits independently applying to many separate languages, but are the result of preservation of traits, possibly quite accidental ones, of a parent language which is ancestral to many or even all of the surviving languages (or a lang-uage which influenced surviving lang-uages at an early stage). For this reason, it is important for universalists to be very concerned with the issue of how closely related the surviving languages are. Otherwise our conclusions may be little better than the ones we would draw from a sample consisting only of modern English dialects. At one time it seemed that our understanding of the story of human evolution might have allowed for the likelihood that language evolved in parallel in several different areas and over a long period of time. Early diffusion of hominids through the Old World seemed to be followed by a long period of somewhat separate but parallel development (see, e.g. [7]). Present-day populations in East Asia, Africa and Europe were believed to reveal traces of characteristics seen in ancient fossils found in those areas. This would have allowed for the interpretation that when two language families were said to be unrelated, it meant more than that the relationship could not at present be demonstrated by traditional historical-comparative methods. They could actually be of independent origin. The picture now seems more confused.

First of all, there seems to be increasing evidence that many of the groupings of languages that linguists were once content to say were "not related" can be shown to have genetic relationships demonstrable by traditional methods [19]. Reorganizations of the familiar major language families are disruptive to the scholarly communities involved and tend to be met with resistance, or ignored. But even conservative scholars are beginning to concede that the data being assembled in favor of relating (at least) Indo-European, Dravidian, Ural-Altaic, Afro-Asiatic and Kartvelian together has merit [32]. Sagart [35] has recently provided strong evidence that Chinese may be more closely related to Austronesian than to Tibeto-Burman. Since Benedict [3] has shown Austronesian and Thai-Kadai languages to be related, and Sino-Tibetan comparisons still seem valid, a macro-

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grouping of languages in Asia seems to be emerging. Benedict has further claimed Japanese as a relative of Austronesian [4], whereas Miller [30,31] has shown strong reasons for linking it with Ural-Altaic. If both connections are valid, then a huge number of the languages of the Old World are genetically linked. Missing so far from this agglomeration are the three other major language families of Africa. While there is no shortage of fanciful speculation on their wider relationships [11,17,37], at least the data assembled by Gregerson [14] and Boyd [5] seems to indicate the serious possibility that the Niger-Kordofanian and Nilo-Saharan families are related. As for the New World, many Americanists reject Greenberg's [13] grouping of most American languages into a single Amerind family [8,21] as being, at best, premature. However, cautious scholars continue to show how parts of the picture relate together (e.g. Payne [34]) and eventual demonstration that many of these languages are related seems probable. The late twentieth century is thus a period during which we are recognizing more and more of the world's languages as related to each other, and pushing back the time depth at which relationships can be recognized.

Secondly, our picture of human origins is shifting as modeling of the past based on studies of genetic markers in present-day populations is added to the tools of paleontology. A plausible account has been offered that the surviving human population may trace back to a single African origin of a considerably more recent period than earlier models suggested [6,9,38]; but see Spuhler [36] for a more cautious view). This would suggest that all languages also have a single origin of the same time depth (not more than 200,000 years, or about 4 to 6 times as long as humans have colonized areas such as Australia and the Americas, and perhaps as little as 100,000 years). The recognition of language relatedness among larger groupings tends to support this possibility of a single parent language at a not impossibly remote time period.[2] Since this language doubt-less had its share of arbitrary and idio-syncratic features, we must be concerned that at least some of the properties that we see as prevalent in the world's languages trace back to the

idiosyncratic features of this postulated parent language. Such features would be misleading testimony concerning which properties are necessary or desirable in human languages.

Of course, we know that languages change their phonetic and phonological structures over time and much diversity would have evolved from any ancient parent language. Historical studies show that, for example, vowel systems tend to be quite changeable. But there are certain other properties that tend to remain quite stable [15]. Nasals tend to remain nasals in syllable-initial position, for example. Another diachronic pattern is that stops tend to remain stops, at least in pre-stress syllable-onset position, and to retain their place of articulation, especially in low vowel environments. As noted above, stop systems including three major places (bilabial, anterior coronal, and velar) are nearly universal in languages. This seems a candidate for a trait that might be a conservative, inherited, feature. All reconstructed languages at the greatest time-depth that linguists go back to have stops at these places and the great majority of the daughter languages have retained them. There seems to be no necessity for languages to have a stop system with these particular places in contrast. Some languages, such as Ahtna [20], get along quite well with no bilabials, and it is easy to imagine languages that would have no contrast between front and back tongue articulations, with a rule-governed distribution like that of the second articulation in the so-called labial-velar stops of Nzema and Dagbani—alveolar with front vowels and velar with back vowels.

If the minimal three-place structure of stop systems is not necessary, can we show that it is universal because it is desirable? The answer, at least at present, is that we probably can't. This is because our most effective tools for attempting to understand the issue of desirability depend on having variability to analyze and on being able to look at the co-occurrences of particular properties. The many fruitful investigations of the structure of vowel systems in the last several decades—see [22, 10, 23, 1, 40]—illustrate this point. All of these studies analyze the covariation between the size and the content of vowel inventories, and draw their conclusions in

the main from comparing changes in the modal structure of vowel inventories as the number of contrasting vowels varies. Without such variability, our ability to create models is impaired, and there is a shortage of data points with which to test the success of the predictions of any model.

The perhaps paradoxical conclusion is that we study the effect and nature of the ambient pressures on language with the most confidence when studying those aspects in which languages display the greatest variability, rather than in studying aspects in which they show the most conformity. Where universal or near-universal conformity is found, and we cannot explain it as due to biological factors or physical laws, it is difficult to reject the hypothesis that the trait in question is inherited.

FOOTNOTES

1. Lindblom's model provides for cross-language variability in two ways; the number of distinct syllables can vary and the output of the articulatory and auditory components can be modified by a matrix of sociolinguistically determined functions. These are not specified in any detail but would presumably include such things as the role of linguistic markers in identifying group membership.

2. Thomason and Kaufman [39] argue for multiple language origins, making the point that creole languages have no single parent and hence their descendents are unrelated to other languages. They also argue that it is impossible to know how often the social circumstances that lead to formation of a creole may have occurred in the distant past. These may be valid points, although it is uncertain how often conditions for long-term survival of creole languages are likely to arise. However, in the creole languages of which we know the recent histories, the sound patterns are constructed out of material that is present in one or more of the 'input' languages. There is no reason to believe this would have been different at earlier times. Ancient creole languages would not represent independent language development in the sense we are concerned with here. They would reflect continuity of traits such as three-place stop systems.

ACKNOWLEDGMENTS

REFERENCES
[1] ABRY, C., L-J. BOE, & J-L. SCHWARTZ (1989), "Plateaus, catastrophes and the structuring of vowel systems," *Journal of Phonetics,* 17, 47-54.
[2] BELL, A. (1978), "Language samples." In J. H. Greenberg et al (eds.) *Universals of Human Language, Vol 1, Method and Theory,* Stanford: Stanford University Press, 123-156.
[3] BENEDICT, P. (1975), *Austro-Thai Language and Culture,* New Haven: HRAF Press.
[4] BENEDICT, P. (1988), *Japanese/Austro-Tai,* Ann Arbor: Karoma.
[5] BOYD, R. G. (1978), "À propos des ressemblances lexicales entre langues Niger-Congo et Nilo-Sahariennes." In *Études Comparatives (Bulletin de la SELAF,* 65), 43-94.
[6] BROWN, W. M. (1980), "Polymorphism of mitochondrial DNA of humans as revealed by restriction endonuclease analysis," *Proceedings of the National Academy of Sciences of the USA,* 77, 3605-3609.
[7] CAMPBELL, B. (1966), *Human Evolution,* Chicago: Aldine Press.
[8] CAMPBELL, L. (1988), "Review article: Language in the Americas, by Joseph H. Greeenberg," *Language,* 64, 591-615.
[9] CANN, R. L., M. STONEKING & A. C. WILSON (1987), "Mitochondrial DNA and human evolution," *Nature,* 325, 31-36.
[10] CROTHERS, J. (1978), "Typology and universals of vowel systems." In J. H. Greenberg et al (eds.) *Universals of Human Languages, Volume 2, Phonology,* Stanford: University of Stanford Press, 93-152.
[11] DIOP, C. A. [1988), *Nouvelles recherches sur l'egyptien ancien et les langues négro-africaines modernes,* Paris & Dakar: Presence Africaine.
[12] DRYER, M. (1989), "Large linguistic areas and language sampling," *Studies in Language, 13,* 257-292.
[13] GREENBERG, J. H. (1987), *Language in the Americas,* Stanford: Stanford University Press.