# V TYPES OF NEUTRALIZATION OF DISTINCTIVE OPPOSITIONS

## 1 GENERAL OBSERVATIONS

Individual languages are distinguished from each other not only by their phonemic inventories and their prosodic means but also by the way in which these distinctive elements are utilized. German has the phoneme *ŋ* ("ng"), but it is only used in final and medial position, never before the "determinate" vowels. In Evenki (Tungus) the same phoneme *ŋ* is used in all positions, that is, not only medially and finally but also initially and before all vowels. The phoneme *r*, on the other hand, which in German is used finally, medially, and initially, cannot occur in initial position in Evenki. Similar limitations on the use of certain phonemes are found in all languages. They are just as characteristic of the phonemic system of the individual languages and dialects as are differences in the phonemic inventory.

Very important in this respect are the rules for neutralization of the phonological oppositions. Neutralization takes place in certain positions. The number of phonemes that occur in these positions is hence smaller than in other positions. In addition to the total system of phonemes or of prosodic properties there accordingly also exist *partial systems*. These are valid only for specific positions, and only part of the phonological means of the total system is represented in them. The rules for neutralization differ from language to language, even from dialect to dialect. Still it is possible to uncover certain types that, in the final analysis, form the basis of all kinds of neutralization in the various languages and dialects.[1]



One must particularly distinguish between types of neutralization that are contextually conditioned and types of neutralization that are structurally conditioned. This depends on whether a phonological opposition is neutralized in the environment of specific phonemes or, regardless of phonemes, in specific positions in the word only. Furthermore, one must distinguish between *regressive* and *progressive* types of neutralization, depending on whether the neutralization takes place *after* "something" or *before* "something." But this classification is not exhaustive. In some instances the neutralization is neither regressive nor progressive alone but is both regressive and progressive.

## 2 CONTEXTUALLY CONDITIONED TYPES OF NEUTRALIZATION

The types of neutralization that are contextually conditioned fall into a *dissimilative* and an *assimilative* class. It all depends on whether the phonemes in question are dissimilated from the "contextual phoneme" with respect to a particular phonic property or are assimilated to it. Since this always involves the loss of a phonological property, it is clear that dissimilative neutralization takes place only in the vicinity of those phonemes that have the property in question, while assimilative neutralization takes place only in the environment of phonemes that do not have this property.

### A Dissimilative Neutralization

With reference to *dissimilative* neutralization, various additional subtypes must be distinguished. The "contextual phonemes," in the vicinity of which a phonological opposition is neutralized, may either have the

particular phonological property itself or only a phonologically related property. Further, the contextual phoneme may possess the particular property (or a related property) only positively, or it may possess it positively as well as negatively. In other words, neutralization may take place either in the vicinity of the marked member or in the vicinity of the marked as well as the unmarked member of the same opposition or of a related (privative) opposition. Four possible types of dissimilative neutralization result.

*a. The neutralization of a phonological opposition takes place in the vicinity of both members of the same opposition.* In very many languages the opposition between voiced and voiceless obstruents is neutralized in the vicinity of voiced as well as voiceless obstruents. (The representative of the archiphoneme in this case is "externally conditioned," that is, it is the same as the contextual phoneme with regard to type of voicing.) For example: Serbo-Croatian "srb" (Serb, masc.): "srpski" (Serbian): "srpkinja" (Serb, fem.); "naručiti" (to order): "narudžba" (the order). In French the opposition between nasalized and nonnasalized vowels is neutralized before all vowels, that is, it is neutralized before nasalized as well as nonnasalized vowels. (The nonnasalized vowels function here as representatives of the archiphoneme because they are the unmarked members of this opposition.)

*b. A phonological opposition is neutralized in the vicinity of the marked member of this opposition, but is retained in the vicinity of the unmarked member.* In Slovak, for example, the opposition between long and short vowels is neutralized after a syllable with a long syllable nucleus. (The unmarked short vowels function here as the representatives of the archiphoneme.) A rare case of this type is found in Sanskrit. The opposition between dental and "retroflex" *n* is neutralized after a retroflex *ṣ*. (Neutralization takes place not only when it follows directly but also when vowels, labials, or gutturals occur in between.) It is retained, however, not only after nonretroflex *s* but also after all other retroflex consonants (*ḍ, ḍh, ṭ, ṭh*).

*c. A phonological opposition is neutralized in the vicinity of both members of a related phonological opposition.* "Relatedness" is here based on the classification of phonological oppositions illustrated above. For example, in Lezghian (K'üri) the opposition between rounded and unrounded consonants is neutralized before and after high vowels (*u, ü, i*) because these vowels are members of the opposition of timbre "rounded"/"unrounded." The low vowels *a*, *e*, on the other hand, do not participate in this opposition.[2]

*d. A phonological opposition is neutralized in the vicinity of the marked member of a related opposition, but retains its phonological validity in the vicinity of the corresponding unmarked member.* E.g., in Japanese, Lithuanian, and Bulgarian the opposition between palatalized and nonpalatalized consonants is only phonologically valid before back vowels. It is neutralized before front vowels. (The choice of the archiphoneme in this case is conditioned internally in Bulgarian, externally in Lithuanian, and in Japanese internally before *e* and externally before *i*.) In Mordvin the opposition between palatalized and nonpalatalized apicals and liquids (*t-t', d-d', n-ń, r-ŕ, l-l'*) is neutralized after front vowels. (The choice of the archiphoneme is here conditioned externally.)[3] In the languages of the Eastern Caucasus which have a correlation of consonantal rounding (Ch'ak'ur, Rutulian, Artshi, Aghul, Darghinian, Kubachi), this correlation is neutralized before rounded vowels (the archiphoneme representative being conditioned internally).[4] In French the opposition between nasalized and nonnasalized vowels is neutralized before nasal consonants (i.e., before the marked members of the correlation of consonantal nasalization). This is true at least within a morpheme before *m* (before *n* only one exception is found: *ennui*). In the Maattivuono dialect of the Sea Lapps (as well as in the Inari dialect and in some other dialects) the opposition between long (bimoric) and short (one-mora) vowels is neutralized before long geminated consonants.[5]

Sometimes the neutralization of an opposition in the vicinity of the marked opposition member is proof of the "relatedness" of the two oppositions. For example, in the Štokavian-Evakian dialects of Serbo-Croatian the apical and the sibilant series of localization are "split," that is, they are represented each by two series, so that the entire consonantal system takes on the following shape:

| | | | | | |
|---|---|---|---|---|---|
| (*p*) | *t* | *ć* | (*k*) | *c* | *č* |
| (*b*) | *d* | *đ* | (*g*) | [*dz*] | [*dž*] |
| (*m*) | *n* | *ń* | | | |
| (*v*) | *l* | *ļ* | | | |
| | | | | *s* | *š* (*h*) |
| | | | | *z* | *ž* |

The relationship of opposition between the *t* and the *ć* series, although it is bilateral, is equipollent. The same is true for the oppositive relationship between the *c* and the *č* series. Both of these equipollent bilateral oppositions are neutralizable. Neutralization in these cases is contextually conditioned: the opposition between the *t* and the *ć* phonemes are neutralized before *t* and *ć* phonemes (type *a*): the oppositions between the *s* and *š* phonemes are neutralized before *č* (type *b*). But further, the opposition

between *s* (*z*) and *š* (*ž*) is neutralized before the *ć* phonemes. (The archiphoneme representatives in this case are either *š*, *ž*, or special intermediary sounds *ŝ* and *ẑ*.) This circumstance presents proof that, from the point of view of the phonological system of these dialects, the opposition between the *t* and the *ć* series is "related" to the opposition between the two sibilant series (but not identical with it). In the East Bavarian dialects (as, for example, in Vienna) the opposition between *i*, *e*, *äi* and *ü*, *ö*, *äü* (which originated from *il*, *el*, *eil* and *ül*, *öl*, *äül* respectively) is found in all positions except before liquids: *i*, *e*, and *äi* may occur before *r*, while *ü*, *ö*, and *äü* may occur before *l*. This neutralization of the opposition of vocalic rounding before liquids (which, historically, resulted from the fact that the phoneme combination *lr* did not exist in German) creates a type of relatedness between the opposition *i-ü* (and *e-ö*, etc.) on the one hand, and the opposition *r-l* on the other. From the point of view of the dialects mentioned, the *r* may be regarded as the clearer, and the *l* as the darker liquid. Thus one cannot always arrive at the "relatedness" of individual oppositions within particular phonological systems from general discussions alone.

## B Assimilative Neutralization

In the case of contextually conditioned *assimilative* neutralization the opposition members lose their opposition mark in the vicinity of those phonemes that do not have the particular opposition mark. In Eastern Cheremis, for example, the opposition between the voiceless occlusives (*p*, *t*, *k*, *c*, *ć*, *č*) and the voiced spirants (*β*, *δ*, *γ*, *z*, *ź*, *ž*) is neutralized after nasals. (Special voiced occlusives, that is, *b*, *d*, *g*, *ʒ*, *ʒ́*, *ǯ*, which occur only in this position, function here as archiphoneme representatives.)[6] The nasals are neither voiceless, nor are they spirants, that is, they do not have the marks that are characteristic for the opposition of Cheremis obstruents. But, on the other hand, they are voiced consonants with a complete oral closure. The opposition between *p-β*, *t-δ*, etc., after nasals is neutralized in such a way that the archiphoneme loses the discriminative marks of an obstruent (because, from the point of view of Cheremis, obstruents are either voiceless occlusives or fricatives). But it still remains distinct from a nasal because it does not acquire the characteristic of nasals, namely, nasality.

This example shows that the contextual phoneme must share certain features with the members of the neutralized opposition in the case of assimilative neutralization. It must in some way be closer to them than to the other phonemes of the same system. The mark, however, that distinguishes the members of the neutralized opposition from each other must be completely alien to the contextual phoneme.



We already mentioned that the degree of aperture is a specifically vocalic mark. Assimilative neutralization of the oppositions based on degree of aperture can therefore only take place before those consonants that in some way show more relatedness to vowels than do all other consonants, but nevertheless remain consonants. In standard German the phoneme *ŋ* (*ng*) belongs to this category. Before it the oppositions *ü-ö* and *u-o* are in fact neutralized. (The "external" members of these gradual oppositions, that is, *ü* and *u*, function as the representatives of the archiphoneme.) As a sonorant and as a sound produced with the dorsum of the tongue, *ŋ* is closer to the vowels than all other consonantal phonemes of German. In many languages and dialects certain differences in degree of aperture are neutralized before nasals or before liquids (or, in particular, before tautosyllabic nasals or liquids). This is explained by the fact that nasals and liquids are closer to vowels than the remaining consonants, yet still are not vowels. In other words, they do not have a distinctive degree of aperture. In order to produce an assimilative neutralization of the differences of degree of aperture, the contextual phoneme must *in some respect* be closer to vowels than the other consonants. Liquids and nasals are closer to vowels because they represent the weakest type of obstacle (i.e., the "lowest degree of obstruction"). In other words, they least possess the properties that are specifically consonantal. But one can also approach vowels from another direction, namely, from the point of view of localization coordinate. For example, in Polabian the opposition between *ü* and *ö* was neutralized before gutturals, labials, and palatalized consonants. (The archiphoneme was, of course, always represented by *ü*.) If one considers that the gutturals were characterized by dorsal articulation, the labials by lip participation, and the palatalized consonants by a shift of the entire bulk of the tongue toward the front, it becomes comprehensible that these series of localization in particular were closest to the front rounded vowels. When we discussed the English vowel system, we saw that, for the unchecked vowel phonemes of standard English, the phonological opposition between direction of articulatory movement away from the center and direction of articulatory movement toward the center was characteristic. This specifically vocalic opposition is neutralizable only before *r*. (The vowel phonemes with an articulatory movement toward the center, i.e., *u*°, *ɔ*°, *ɑ*°, *a*°, *ɛ*°, *i*°, represent the archiphonemes.) Of all English consonants, *r* is the one that is closest to the vowels. But it lacks the specifically vocalic marks of type of contact and direction of articulatory movement.

### C Combined Contextually Conditioned Neutralization

By *combined* contextually conditioned type of neutralization we mean any combination of an assimilative neutralization with a dissimilative neutralization. For example, when in Bulgarian, Lithuanian, and Polabian the opposition between palatalized and nonpalatalized consonants is neutralized before all consonants, this is a case of combined contextually conditioned neutralization: the neutralization is obviously dissimilative in nature before the consonants that are themselves members of the palatalization correlation. It is assimilative, however, before the consonants that do not participate in the correlation of palatalization. Lezghian (K'üri) presents a complicated, yet very instructive, example of a combined contextually conditioned neutralization.[7] The correlation of consonantal intensity is here present only with voiceless (nonrecursive) occlusives, that is, heavy and light tenues are distinguished before accented vowels. But this opposition is neutralized:

(*a*) After a syllable consisting of a "voiceless, nonrecursive occlusive + a high vowel" (archiphoneme representative: the heavy tenuis). For example: "kit·àb" (book).

(*b*) After a syllable consisting of a "voiceless spirant + a high vowel" (the archiphoneme is represented by the heavy tenuis). For example: "fit·è" (veil).

(*c*) After a syllable formed by a "voiceless recursive occlusive + vowel" (the archiphoneme is represented by the light tenuis). For example: "č'utàr" (fleas).

(*d*) After a syllable consisting of a "voiced occlusive + an open vowel" (the archiphoneme is represented by the light tenuis). For example: "gatùn" (to beat, knock).

It is clear that neutralization in position (*a*) is dissimilative, but assimilative in the remaining positions (*b*), (*c*), and (*d*). In cases (*b*), (*c*), and (*d*) the initial consonants of the preceding syllable always have something in common with the nonrecursive voiceless occlusives: voicelessness in the case of (*b*); voicelessness and occlusion in the case of (*c*); and occlusion in the case of (*d*). On the other hand, these consonants do not participate in the correlation of intensity. Neutralization of this correlation in its vicinity can therefore be regarded as assimilative. But in those syllables that begin with sonorants (*r*, *l*, *m*, *n*, *w*, *j*) or with voiced fricatives (*v*, *g*, *z*, *ž*, *γ*), or end in a vowel, the opposition between heavy and light voiceless occlusives is retained. The reason for this is that neither the sonorants nor the voiced fricatives nor the vowels have properties in common with the voiceless occlusives (with the exception of infraglottal expiration, which, however, is too general a property). For example: "rüq·èdin" (ash, gen.): "rug·ùn" (to send); "mekü" (other): "mak·al" (sickle); "jatùr" (calf of the leg): "jat·àr" (waters); "akà" (ovenhole): "ak·ùn" (to see); "γucàr" (God): "γelc·ìn" (sled, gen.). In the same language the opposition between recursive and nonrecursive occlusives is neutralized before a pretonic close vowel followed by any obstruent. (The archiphoneme is here represented by a nonrecursive occlusive.) Before open pretonic vowels, however, this opposition is retained. For example: "kašàr" (heavy breathings): "k'ašàr" (sledgehammers). There is no doubt that the unaccented close vowels having the specifically vocalic properties in the least degree are the ones that are closest to the consonants.



## 3 STRUCTURALLY CONDITIONED TYPES OF NEUTRALIZATION

*Structurally conditioned* types of neutralization in turn are divided into *centrifugal* and *reductive* classes.

### A Centrifugal Neutralization

In the *centrifugal* type a phonological opposition is neutralized at the word or morpheme boundaries respectively. In other words, it is neutralized either in initial or final position only, or in both initial and final position. For example, the opposition between voiced and voiceless consonants is neutralized only initially in Erza-Mordvin, only in final position in Russian, Polish, Czech, etc., and initially as well as finally in Kirghiz (previously Karakirghiz).[8] In standard German the opposition between fortes and lenes is neutralized in final position, but the opposition between the two types of *s* (the "soft" lenis *s* and the "sharp" fortis *s*) is also neutralized in initial position. In the Bavarian-Austrian dialects the opposition between lenes and fortes is not neutralized finally, but only initially. In standard German, Dutch, English, Norwegian, and Swedish the opposition between long (unchecked) and short (checked) vowels is neutralized in final position. (The archiphoneme here is represented by the unchecked vowels.) In the Czech spoken language (Middle Bohemian) the opposition between long (heavy) and short (light) vowels is neutralized in initial position. (The archiphonemes here are represented by the short vowels.) In Lithuanian the opposition between vowels with a rising accent and vowels with a falling accent is neutralized in final position. (Vowels with a rising accent function here as archiphoneme representatives.) In most languages where the correlation of consonantal gemination is present, the latter is neutralized in initial as well as in final position.

## B Reductive Neutralization

By *reductive* neutralization we mean the neutralization of a phonological opposition in all syllables of the word except in the syllable that forms the phonological peak. This culminative syllable is generally marked by "accent" (i.e., by an expiratory increase in force or by a musical rise in pitch). Two types can be distinguished.

*a.* The position of the culminative syllable is free and can have a distinctive function. In such a case it is always "accented," that is, we have a culminative differentiation of the prosodemes. In cases of this type certain phonological oppositions occur only in accented syllables. They are neutralized in all unaccented syllables. For example, in South Great Russian the oppositions *o-a* and *e-i* are neutralized in unaccented syllables, in the dialects of Bulgarian and Modern Greek the oppositions *o-u* and *e-i*, and in Slovenian the opposition between long (bimoric) vowels and short (one-mora) vowels. In the Jauntal dialect of Carinthian-Slovenian the opposition of vocalic nasalization is neutralized in unaccented syllables, and so on. In all these cases neutralization takes place in both directions, that is, before as well as after the accented syllable. But examples are not lacking of neutralizations that are only progressive (pretonic) or only regressive (posttonic). In standard Serbo-Croatian the oppositions of vocalic quantity are neutralized *before* the syllable with primary stress. In Lezghian (K'üri), as we have already mentioned, the opposition between recursive and nonrecursive occlusives is neutralized before high vowels in pretonic syllables, while it is maintained in posttonic syllables. But in the same language the oppositions between rounded and unrounded consonants and between heavy and light tenues are neutralized before *posttonic* vowels.

*b.* The position of the culminative syllable is not free but bound by a word boundary. In other words, the peak in all words is formed either by the initial syllable or by the final syllable. Certain phonological oppositions then occur only in the particular culminative syllable. They are neutralized in all other syllables of the word. In the Scottish spoken on Barra Island,[9] the opposition between *e* and *æ*, on the one hand, and the correlation of consonantal aspiration, on the other, are neutralized in all syllables except the initial syllable. In Chechen the opposition between recursive and infraglottal consonants (except the pair *q-q'*) and the "correlation of emphatic palatalization" are likewise phonologically relevant only in initial position.[10] In Eastern Bengali the correlation of recursion and the correlation of aspiration are found only initially.[11] In the Maattivuono dialect of the Sea Lapps, which has already been mentioned, the correlation of vocalic gemination is neutralized in all noninitial syllables of a word. Further,



the correlation of consonantal gemination and intensity is found only after the vowel (or diphthong) of the word-initial syllable. In the Turkic, Finno-Ugric, Mongolian, and Manchurian languages, which have what is known as "vowel harmony," certain oppositions of vocalic timbre (usually the opposition based on tongue position, but sometimes also the opposition based on lip position) are fully relevant only in word-initial syllables. In the remaining syllables these oppositions are neutralized. The choice of the representative of the archiphoneme is here conditioned externally. In other words, with respect to tongue position, the vowels of the noninitial syllable always belong to the same class as the vowels of the preceding syllable. In all these cases—and the number can easily be multiplied—it is the first syllable that is culminative. In much rarer cases this role falls to the final syllable. In French, for example, the opposition between *é* (phonet. *e*) and *è* (phonet. *ɛ*) is distinctive only in open final position.[12]

If one takes a closer look at the languages in which the position of the peak is not free, one discovers that in most cases the phonologically culminative syllable stands out with respect to expiration as well. This, of course, only involves a delimitative accent without any distinctive meaning. The phonological culminative syllable that is bound to a particular word boundary thus represents only the most appropriate place for such an accent. It is not at all necessary to associate this syllable with the delimitative accent. There are many languages in which the position of the bound delimitative accent does not coincide with the bound phonological word peak. Most Turkic languages in particular are of this type. Vowel harmony indicates that the phonological word peak here occurs on the initial syllable. Still, most Turkic languages do not have the delimitative expiratory accent on the word-initial, but on the word-final, syllable.[13]

It is possible that there are also languages in which the phonological peak is fixed on the penultimate syllable. The system of tone registers that has been described above for Zulu (p. 186) shows that in that language only two tones are distinguished in final syllable—a low tone (Types I, II, III, and VI) and a mid tone (Types IV and V). The antepenultimate syllable also distinguishes only two tones, namely, a high tone (Types II, III, V, and VI) and a mid tone (Types I and IV). But on the penultimate syllable all three tones are distinguished: a high tone by Type I, a mid tone by Type VI, and a low tone by Types II and V, and, further, a falling tone (Types III and IV). Accordingly oppositions of tone are found here on the penultimate syllable which are neutralized on the other syllables. The penultimate thus becomes culminative. It should be noted that the penultimate syllable in Zulu (as in most Bantu languages in general) also receives a (purely delimitative) expiratory increase in force.[14]

It is difficult to evaluate those cases where a prosodic opposition of tone movement is phonologically relevant in a boundary syllable only, as, for example, in Latvian or in Estonian. Since differences of tone movement in final analysis are based on putting the individual morae of a "long syllable nucleus into relief," the accent in such languages (in the sense of a culminative differentiation of morae) is free. On the other hand, this freedom of accent refers only to the two morae of the word-initial syllable. This syllable thereby becomes the phonological peak. But the case of Classical Greek must be distinguished from cases of this type. At first glance it seems as if in Classical Greek the opposition between "rising" and "falling" accent ("acute" and "circumflex") had distinctive force only in word-final syllable. The circumflex accent could not occur on the antepenultimate. On the penultimate the opposition of tone movement was automatically conditioned by the quantity of the final syllable. But in reality the acute accent on final syllables was not an accent in the proper sense, but merely an externally conditioned rise in pitch of the word-final mora. This rise in pitch occurred before a pause, if the word did not have any other high mora, and also before the enclitics, if the penultimate mora of the word was not high (for this reason not only *ἀγαθός ἐστι* but also *δῆμός ἐστι* = dḗemós esti and *ἄνθρωπός ἐστι*). The difference in tone movement in Classical Greek was thus not only conditioned externally with respect to the penultimate but also with respect to the final syllable.[15]

### C Combined Structurally Conditioned Neutralization

Both forms of structurally conditioned neutralization can combine with one another. In the so-called Turanian languages it often happens that certain consonantal oppositions are neutralized in initial position (the centrifugal type), while certain vocalic or prosodic oppositions are neutralized in noninitial syllables of a word (the reductive type). In Cheremis the consonantal correlation of voice is neutralized in initial position. But in addition this language has strict vowel harmony, which, as already mentioned, requires that the vocalic oppositions of timbre be neutralized in noninitial syllables. In the language of the Sea Lapps of Maattivuono the vocalic and the consonantal correlation of gemination and the correlation of consonantal intensity are neutralized in noninitial syllables, while the correlation of consonantal tension is neutralized initially.[16]

## 4 MIXED TYPES OF NEUTRALIZATION

Finally, different types of structurally conditioned neutralization can combine with different types of contextually conditioned neutralization.



In the Serbo-Croatian Čakavian dialects of Novi[17] and Castua[18] the opposition between long (bimoric) and short (one-mora) syllable nuclei is neutralized before a syllable with falling primary accent (the archiphonemes being, of course, represented by the short nuclei). Since in these dialects[19] the falling accent is the marked member of the opposition of tone movement, and since the latter is found only on accented long syllable nuclei, this involves the neutralization of an opposition in the vicinity of the marked member of a related opposition. In other words, this is a contextually conditioned dissimilative neutralization of the type (*d*). But at the same time this also involves the neutralization of an opposition in an unaccented syllable, that is, a reductive structurally conditioned neutralization of the type (*a*). In Circassian (Adyghe) the opposition between the maximally open vowel phoneme (*a*) and the vowel phoneme of a mid degree of aperture (*e*) is neutralized in certain positions. The maximally open *a* here always functions as the representative of the archiphoneme. Neutralization occurs in the first place in an accented syllable if the following syllable contains an *e*. It also takes place in initial position regardless of the vowel of the following syllable. The first case involves a dissimilative contextually conditioned type of neutralization of the type (*b*). The second case involves a structurally conditioned centrifugal type of neutralization. In Latin the opposition between *i* and *o* was neutralized before nasals in final syllables. (The archiphoneme was always represented by *u*, as, for example, in the endings *-um*, *-unt*.) This was a combination of the contextually conditioned assimilative type of neutralization with the structurally conditioned centrifugal type.

## 5 EFFECT OF THE VARIOUS TYPES OF NEUTRALIZATION

Combinations of several types of neutralization can have an effect in two opposite directions. They may limit each other to such an extent that a neutralizable opposition is practically neutralized only in very few positions, while it retains its distinctive force in the overwhelming majority of positions. But they may also be cumulative, so that the particular neutralizable opposition functions distinctively only in a very restricted area. In Lithuanian, Polabian, and East Bulgarian the opposition between palatalized and nonpalatalized consonants is found only before back vowels (in other words, it is found only before phonemes that do not share any phonological properties with the palatalized consonants). In all other positions the correlation of palatalization is neutralized in these languages, before consonants by a combined contextually conditioned neutralization;

before front vowels by a dissimilative structurally conditioned neutralization of the type (*d*); and in final position by a structurally conditioned neutralization.

In many languages a preference for certain types of neutralization or for specific positions of neutralization can be observed. In certain positions several phonological oppositions are neutralized, while in certain others all phonological oppositions remain intact. Thus *positions of minimal* and *positions of maximal phoneme distinction* are created in the same language.[20] Incidentally, there need not exist any parallelism in the distinction of vowel phonemes and the distinction of consonantal phonemes. In Bulgarian, for example, all vowel phonemes are differentiated in accented syllables between consonants and in final position. In unaccented syllables, on the other hand, the oppositions *u-o*, *i-e*, and *ă*(*ъ*)-*a* are neutralized (at least in East Bulgarian pronunciation). Accordingly only three archiphonemes (*u*, *i*, *a*) are distinguished here. Before the unaccented vowels *u* and *a*, accented vowels only occur in loanwords, and unaccented *i* is nonsyllabic after vowels. As for the consonants, all thirty-six consonantal phonemes are distinguished before back vowels (*p*, *ṕ*, *b*, *b′*, *m*, *ḿ*, *t*, *t′*, *d*, *d′*, *n*, *ń*, *k*, *ḱ*, *g*, *ǵ*, *x*, *c*, *č*, *s*, *š*, *z*, *ž*, *ć*, *dź*, *ś*, *ź*, *f*, *f́*, *v*, *v́*, *l*, *l′*, *r*, *ŕ*, *j*). The correlation of palatalization is neutralized before sonorants (*l*, *l′*, *r*, *ŕ*, *m*, *ḿ*, *n*, *ń*, *v*, *v́*) and before the front vowels (*i*, *e*), so that in this position only twenty-one consonantal phonemes are distinguished. Before obstruents and in final position, not only the correlation of palatalization but the correlation of voice is neutralized as well. Accordingly only fourteen consonantal phonemes are distinguished in that position (*p*, *m*, *t*, *n*, *k*, *x*, *c* ,*s*, *č*, *š*, *f*, *l*, *r*, *j*). Thus there is no position in Bulgarian in which all phonemes of that language are distinguished. But four typical positions can here be determined: the position of maximal vowel distinction (accented, interconsonantally), the position of maximal consonantal distinction (before back vowels), the position of minimal vowel distinction (before unaccented vowels), and the position of minimal consonantal distinction (before obstruents, and in final position). Similarly four positional types are found in most languages of the world.

Certain languages also show a preference for a particular (progressive or regressive) direction of neutralization. It seems that very often this is a question that is related to the morphonological and grammatical structure of the particular languages.[21]

[1] Cf. N. S. Trubetzkoy, "Character und Methode der systematischen phonologischen Darstellung einer gegebenen Sprache," in *Archives néerlandaises de phonétique experimentale*, VIII–IX (1933), and "Die Aufhebung der phonologischen Gegensätze," *TCLP*, VI, 29 ff.

[2] Cf. N. S. Trubetzkoy, "Die Konsonantensysteme der ostkaukasischen Sprachen," in *Caucasica*, VIII.

[3] Cf. D. V. Bubrich, *Zvuki i formy erz'anskoj reči* (Moscow, 1930), p. 4.

[4] Cf. N. S. Trubetzkoy, "Die Konsonantensysteme der ostkaukasischen Sprachen," in *Caucasica*, VIII.

[5] Cf. Paavo Ravila, *Das Quantitätssystem des seelappischen Dialektes von Maattivuono* (Helsinki, 1931).

[6] Cf. the Cheremis texts, for example, those published by Ödön Beke, "Texte zur Religion der Osttscheremissen," in *Anthropos*, XXIX (1934).

[7] Cf. N. S. Trubetzkoy, "Die Konsonantensysteme der ostkaukasischen Sprachen," in *Caucasica*, VIII.

[8] Cf. P. M. Melioranskij, *Kratkaja grammatika kazak-kirkizskago jazyka* (St. Petersburg, 1894), I, 24.

[9] Cf. Carl H. Borgström, "The Dialect of Barra," in *Norsk Tidsskrift for Sprogvidenskap*, VIII (1935).

[10] Cf. N. S. Trubetzkoy, "Die Konsonantensysteme der ostkaukasischen Sprachen," in *Caucasica*, VIII.

[11] Cf. S. K. Chatterjee, *Recursives in New-Indo-Aryan* (Lahore, 1936).

[12] Cf. Gougenheim, *Éléments de phonologie française* (Strasbourg, 1935), pp. 20 ff.

[13] Cf. N. S. Trubetzkoy, in *TCLP*, I, 57 ff., and R. Jakobson in *Mélanges . . . van Ginneken*, p. 30.

[14] Cf. Clement M. Doke, "The Phonetics of the Zulu Language," in *Bantu Studies* (1926), Special Number.

[15] Cf. R. Jakobson, "Z zagadnień prozodji starogreckiej," in *Prace ofiarowane Kaz. Wóycickiemu* (Wilno, 1937).

[16] Cf. Paavo Ravila, *Das Quantitätssystem der seelappischen Mundart von Maattivuono*.

[17] Cf. the data by A. Belić, "Zametki po čakavskim govoram," in *Izvestija II. Otd. Akad. Nauk.*, XIV, 2, and N. S. Trubetzkoy in *TCLP*, VI, 44 n. 13.

[18] Cf. Ante Dukić, *Marija Devica, čakavska pjesma s tumačem riječi i naglasa* (Zagreb. 1935).

[19] This can be recognized particularly clearly in the dialect of Castua. The above-mentioned (p. 203) nonuniform realization of the "rising" accent in this dialect (as opposed to the completely uniform realization of the "falling" accent, which is independent of position in the sentence) seems to point to the fact that the phonological content of the "rising" accent is predominantly negative, in other words, that this accent functions as the unmarked member of the correlation of tone movement. But in this case the "falling" accent must be marked in this dialect.

[20] Cf. N. Jakovlev, *Tablicy fonetiki kabardinskogo jazyka* (Moscow, 1923), pp. 70 and 80.

[21] Cf. N. S. Trubetzkoy, "Das mordwinische phonologische System verglichen mit dem russischen," in *Charisteria Guilelmo Mathesio oblata* (Prague, 1932), pp. 21 ff.

# VI PHONEME COMBINATIONS

## 1 FUNCTIONAL CLASSIFICATION OF PHONEMES

The neutralization of phonological oppositions is certainly the most important, but by no means the only important, phenomenon in the sphere of syntagmatic phonology. For only bilateral oppositions can be neutralized, and, as is well known, these are in any system always less numerous than multilateral oppositions. In many, and possibly in most, cases the circumstance that a phoneme is not permitted in a particular phonic position does not even result in the neutralization of any opposition. Such a limitation, nevertheless, represents a very important phenomenon which can be of significance for the typology of the particular system. Any rules that restrict in any way the use of the individual phonemes and their combinations must, therefore, always be carefully stated in the description of a phonological system.

Frequently a classification of phonemes can be undertaken on the basis of such rules. This *functional* classification then complements the other classification that was obtained through a logical analysis of the phonological oppositions.

A good example of this is Classical Greek (specifically the Attic dialect). Classical Greek had only a single phoneme that occurred exclusively in initial position: the *spiritus asper*.[1] The phonemes that could occur initially after the spiritus asper as well as without it were the *vowels*. All other phonemes were *consonants*. Of these $\rho$ occurred initially only after the spiritus asper. All other consonants were never found in that position.



Those consonants that could occur initially before $\rho$ formed the class of stops or plosives. All others were continuants. Among the latter there was only a single phoneme, the *spirant* $\sigma$, which could occur before plosives in initial position. The remaining continuants were *sonorants*. Among these were two that could occur before $\sigma$ in medial position. These were the *liquids*. Two others could not occur before $\sigma$. These were the *nasals*. Of the liquids only $\rho$ could occur in final position. It could, therefore, be considered the unmarked member of the bilateral opposition $\rho$-$\lambda$. Of the nasals only $\nu$ could occur in final position and accordingly be regarded as the unmarked member of the bilateral opposition $\mu$-$\nu$. Besides these only $\sigma$ occurred in final position, while the plosives were not permitted in that position. Among the stops or plosives there were only three that could occur after other plosives. These were the *apicals* or the *dentals*. Among the plosives not permitted after other plosives there were three that were also not permitted before $\mu$. These were the *labials*. There were three others that were permitted before $\mu$. These were the *gutturals*. Of the plosives only $\pi$ and $\kappa$ could occur before $\tau$, only $\varphi$ and $\chi$ before $\theta$, and only $\beta$ and $\gamma$ before $\delta$. No syllable that contained $\theta$, $\varphi$, or $\chi$ could occur before a syllable containing $\theta$, $\varphi$, or $\chi$. A syllable with $\pi$, $\tau$, or $\kappa$ could occur, however. Accordingly the bilateral oppositions $\theta$-$\tau$, $\varphi$-$\pi$, and $\chi$-$\kappa$ were neutralized; $\tau$, $\pi$, and $\kappa$, as the unmarked members, represented the archiphonemes. Thus two classes of plosives were characterized by this law: the *tenues* $\pi$, $\tau$, and $\kappa$ and the *aspirates* $\varphi$, $\theta$, and $\chi$. As for the remaining plosives, they could not be geminated in native Greek words. This characterized them as a special class of *mediae*. All other consonants, that is, the continuants as well as the stops (plosives), could be geminated after vowels, the long aspirates appearing as $\tau\theta$, $\pi\varphi$, and $\kappa\chi$. Before $\sigma$ the bilateral oppositions of

"tenues"/"mediae" and "tenues"/"aspirates" were neutralized, so that in that position only a single type of plosive occurred. Its character, however, is no longer evident from the graphs *ζ*, *ψ*, and *ξ*.

The rules governing phoneme combinations thus produce a complete classification of the consonants of Classical Greek as well as a strict division between consonants and vowels. But cases of this type are comparatively rare. There are languages in which the rules of phoneme combination make only a rather rudimentary classification of phonemes possible. For example, in Burmese only two classes of phonemes can be established on the basis of combinatory rules. Vowels are phonemes that are permitted in word-final position. Consonants are phonemes that are not permitted in that position. All words in Burmese are monosyllabic and consist of a vowel (or a monophonematic diphthong) that may be preceded by a consonant. All possible combinations occur within this frame. Accordingly, on the basis of these combinations, phonemes can be classified only as vowels and consonants. However, the phonemic inventory of Burmese is extremely rich: it contains sixty-one consonants and fifty-one vowels (if prosodic differences are included).

In languages such as Burmese the functional division of phonemes is jeopardized by the great uniformity of word types and the limited scope of combinatory possibilities. But there are also languages in which, conversely, word types and combinatory possibilities are so manifold that a clear functional division of phonemes appears almost impossible. All these idiosyncrasies are of great importance for the phonological typology of the world's languages.

## 2 THE PROBLEM OF GENERAL LAWS GOVERNING PHONEME COMBINATIONS

Combinations of phonemes are subject to special rules in every language. But the question is whether some of these rules at least are valid for all languages. B. Trnka has attempted to solve this problem.[2]

Trnka's attempt could not succeed entirely because he proceeded from an old, already outdated classification of phonological oppositions into correlations and disjunctions. Nevertheless, Trnka contributed toward the solution of the problem and expressed some fruitful thoughts in his article. He believes he is able to formulate a general law according to which two members of a correlational pair cannot occur next to each other within a single morpheme (*op. cit.*, pp. 57 ff.). The law is probably untenable in this form. In languages that consistently have the correlation of constriction, the combination of a fricative with the corresponding occlusive is readily permitted. For example: Polish "ścisłość" (exactness, closeness),



"w Polsce" (in Poland), "szczeć" (bristle), "jeździec" (rider), "moždžek" (small brain); Abkhas "ačša" (female of a domestic animal); Tsimshian "txâ'xk$^{u}$det" (they ate). The vowel combinations *üi* and *uü* occur in various languages. For example, in a large part of the Burgenland (Austria) the diphthong *ui* (as in "fuis" [foot]), which originated from M. H. Ger. *uo*, is distinguished from the *uü* (for example, "guün" [guilda]) that originated from *ul*. In Finnish, though rare, the monomorphemic combination *yi* (= üi) is still quite current. For example: Finnish "lyijy" (pron. *lüijü*, lead). In Annamese *iü* and *üi* are very common. Finally, compare French "huit," "huile," "nuit," "je suis," etc. Combinations of two vowels alike in quality but different in quantity also occur within the frame of one morpheme in some languages, though very rarely. For example, in Haida (cf. "ǯāada" [woman], "sūus" [say(s)], etc.),[3] and in Prākrit,[4] where combinations of nonnasalized and nasalized vowels within the same morpheme are also permitted.[5] Thus the law formulated by Trnka is not even valid for the oppositions recognized as correlations by Trnka himself. But the most flagrant case is probably represented by the correlation of consonantal nasalization since the combinations *mb*, *nd*, *bm*, *dn*, etc., are found in most languages of the world. Trnka recognized this himself. He believed, however, that he could eliminate these exceptions by not using the term "correlation" but "parallelism" for these cases (*op. cit.*, p. 59). At the same time, however, he found that some languages do not permit the phonemes that do not form correlational pairs (in the sense of the phonological terminology currently in use) to occur next to each other (within the frame of the same morpheme). For example: *s* and *š*, or Czech *n* and *ň*. Trnka then decides to designate such phoneme pairs as correlational pairs as well, thus departing from the terminology in use previously. Above we had defined a correlational pair as a privative proportional opposition. (This is essentially in accord with the definitions of the "Projet de terminologie phonologique standardisée," *TCLP*, IV, 313 ff.). However, on the one hand, Trnka does not wish to recognize the correlation of nasals as such (*b-m*, *d-n*, *g-ŋ*, etc.), and, as was shown above, he cannot recognize the correlation of constriction, the vocalic correlations *ü-i* and *u-ü*, and the "correlation of quantity" either. On the other hand, he designates equipollent bilateral oppositions of the type *s-š* or *n-ň* as correlations. He must therefore give a new definition to the term "correlation." He actually does this on page 59 of the above-mentioned article, when he says: "It is necessary, therefore, to distinguish this kind of phonemic relationship . . . from correlation, which represents such a close affinity that it deprives the members of the same pair of the capacity of being contrasted, as individual phonemes, in one

monomorphemic combination." This, then, is the only possible definition for Trnka: the term *correlation* is used to designate a relationship between two phonemes which is so close that it makes it impossible for these phonemes to be distinguished as individual phonemes in a monomorphemic combination. But if one replaces the word "correlation" in the "law" formulated by Trnka with this definition, one notes that the entire law is no more than a tautology: Phonemes that cannot occur next to each other within the frame of a morpheme cannot occur next to each other within the frame of a morpheme! Trnka terms his law the "law of minimal phonological contrast" (*op. cit.*, p. 58). This term reaches the essence of the subject matter much better than the mistaken definition that was given.

The point really is that phonemes (or better the phonological units), which within the frame of a morpheme are in direct contact with each other, must represent a certain minimum of distinction. It is to B. Trnka's credit that he noted this fact. If we regard phoneme combinations from this point of view, we find that there actually are some phoneme combinations that are not permitted in any language of the world. We can establish two groups of such *universally inadmissible* phoneme combinations. First, there are combinations of two consonantal phonemes which are distinguished from each other only by the property of a correlation based on overcoming an obstruction of the second degree (the correlation of consonantal intensity is excepted).[6] Second, there are combinations of two consonantal phonemes which are distinguished from each other only by membership in two "related" series of localization. (In other words, they are phonemes that stand in a relationship of privative or equipollent bilateral opposition to each other.) All other combinations of phonemes that are differentiated by a single phonological mark occur in one language or another.[7]

The above two groups of "universally inadmissible" phoneme combinations were discovered by way of induction. They cannot be combined under any general formula. Each language has still other inadmissible phoneme combinations. The "universally inadmissible" phoneme combinations thus do not constitute a complete system anywhere. They always form only part of the system of the phoneme combinations that are inadmissible in a language. Insofar as admissible phoneme combinations must have a certain minimum of phonological distinctiveness between their members, this minimum is determined differently for each language. In Burmese, for example, the opposition between consonant and vowel is considered such a minimum. Within a morpheme neither combinations of two consonants nor combinations of two vowels are permitted. (The phonemes transcribed by "consonant + *y* and consonant + *w*" are in



reality palatalized or rounded consonants. *hl*, *hm*, etc., represent voiceless *l*‘ and *m*‘, and the diphthongs are to be considered monophonematic.) The only admissible monomorphemic combination is the combination "consonantal phoneme + vowel phoneme." Annamese permits within a morpheme not only combinations of the type "consonant + vowel" (and "vowel + consonant") but combinations consisting of two or three vowels as well. But a combination of two consonants is not permitted. Accordingly all consonantal oppositions (i.e., oppositions based on the manner of overcoming an obstruction, oppositions of localization, and oppositions of resonance) in this language are considered so slight that they do not as yet reach the minimum. The vocalic oppositions, on the other hand, are evaluated as being above the required minimum of contrast. The Hanakian (Moravian) dialects of Czech offer the opposite picture. They do not permit any vowel combinations within the frame of a morpheme but allow many different consonantal combinations. Accordingly the minimum of contrast must be established independently for each language and given a special definition. The "universally inadmissible" phoneme combinations are not of much help in this matter.

Only the combination "consonantal phoneme + vowel phoneme" can probably be considered a *universally admissible* phoneme combination, as B. Trnka correctly recognized (*op. cit.*, p. 59). These combinations are probably the logical prerequisite for the existence of vowels and consonants. Otherwise the vowels would not be in opposition with the consonants. But a phoneme exists only by virtue of its opposition to another phoneme. Whatever the case may be, a language without combinations of the type "consonant + vowel" is unthinkable.

Combinations of occlusives with homorganic nasals, according to Trnka (*loc. cit.*), exist only in those languages that have the combination "consonant + vowel." But since combinations of this type are present in *all* languages of the world, this rule merely states that the combinations of nasals with homorganic occlusives are permitted *in some* languages of the world. The two other laws formulated by Trnka, however, are acceptable.

Trnka formulates the rule (*loc. cit.*) that combinations of two obstruents which are distinguished from each other only by membership in different localization series (e.g., *pt*, *xs*, *sf*) occur exclusively in languages which also permit the combination of other consonants with obstruents (e.g., *sp*, *tr*, *kl*, *rs*). As far as we can see from the available data, this is really so. Trnka's next rule states: Languages that permit combinations of consonants initially or finally also permit consonantal combinations medially. This law really seems to be valid for languages with polysyllabic words. But in

languages with only monosyllabic words a consonant cluster is only possible initially (as in Siamese, where obstruents + *r* and *l* are permitted initially)[8] or finally. It is impossible, however, to find such combinations in medial position.

In summary, it can be said that the general laws for phoneme combinations which are valid for all languages of the world, insofar as they can be at all discovered by induction, relate only to a rather insignificant part of possible phoneme combinations. Accordingly they cannot play a significant role in syntagmatic phonology.

## 3 THE METHODS OF SYNTAGMATIC PHONOLOGY

From what has been said it follows that the phoneme combinations in every language are governed by laws and rules that are valid only for the particular language and must be established separately for each language. The variety of combinatory types at first glance seems to preclude any uniform treatment of syntagmatic phonology. Depending on the type of language, different methods must be applied. There are languages in which there are only very few combinatory rules. Burmese, where all words are monosyllabic and consist either of a vowel phoneme or of the combination "consonantal phoneme + vowel phoneme," has already been mentioned. But even for a language such as Japanese, where the number of syllables in a word is unrestricted, syntagmatic rules are no more than eight in number: (1) no consonantal combinations are permitted in word-initial position; (2) of the consonantal combinations only the combination *N* + consonant is allowed medially; (3) only vowels, or vowels + *N* (*n*), are permitted finally; (4) palatalized consonants cannot occur before *e*; (5) nonpalatalized consonants cannot occur before *i*; (6) long (bimoric) vowels cannot occur before geminated consonants or before syllable-final *N*; (7) the semivowel *w* occurs only before *a* and *o*; (8) the semivowel *y* occurs only before *u*, *o*, and *a* (before initial *e*, *y* is only optional and cannot be considered an independent phoneme in that position). Other languages, however, have a great abundance of combinatory rules. In Trnka's study titled *A Phonological Analysis of Present-day Standard English*,[9] the enumeration of combinatory rules for English comprises no less than twenty-two pages (23–45). Even if these rules could be formulated somewhat more briefly, they are still extremely numerous.

Despite this diversity of language types as regards combinatory rules, it seems not only desirable but absolutely necessary to have as uniform a method for the study of combinations as possible since a comparison between the various language types can only be pursued under this condition. At the same time, a typology of sounds cannot be established without such a comparison. The principles underlying a uniform method for the study of combinations can be formulated in the following way.



First, combinatory rules always presuppose a higher phonological unit within the framework of which they are valid. But this higher phonological unit need not always be the word. In many languages not the word but the *morpheme*, which is a complex of phonemes present in several words and always associated with the same (material or formal) meaning, must be regarded as such a unit, This is the case, for example, in German. Word-medially an almost unlimited number of consonantal combinations is allowed. For example: *kstšt* "Axtstiel" (handle of an axe), *kssv* "Fuchsschwanz" (fox tail), *pstb* "Obsbaum" (fruit tree). Combinatory rules of any kind can be formulated only with great difficulty. The phonemic structure of morphemes that make up German words, on the other hand, is rather clear. It is governed by quite specific combinatory rules. It is therefore only expedient to study combinatory rules within the frame of morphemes and not within the frame of words. The first task in any investigation of combinations is merely to determine the phonological unit within which combinatory rules can be studied most appropriately.

The second task in any investigation of combinations is a suitable division of the "frame units" (words or morphemes) with respect to their phonological structure. In languages such as Burmese this task resolves itself since all frame units here have the same structure. But in a language such as German this task is extremely important. The division of frames must here be undertaken only from the point of view of its appropriateness for the study of phonological combinations. For example, it would be inappropriate from such a point of view to divide morphemes in German according to their grammatical function (i.e., into prefix, root, suffix or final morphemes). From the point of view of a study of German combinations, the only useful division of the morphemes is into those that are *capable of bearing stress* and those that are *incapable of bearing stress*. To the former class belong the morphemes that can have primary or secondary stress in a compounded word (e.g., *aus-*, *-tum*, *tier-*, in words such as "Auswahl" [choice], "Eigentum" [property], "tierisch" [bestial]). To the class of morphemes that are incapable of bearing stress belong the morphemes that never carry primary or secondary stress (e.g., the morphemes *ge-*, *-st*, *-ig* in words such as "Gebäude" [building], "wirfst" [you throw], "ruhig" [calm]). The morphemes that are capable of bearing stress in German are the most numerous. They are very diverse structurally. They can be further divided, according to their number of syllables, into

monosyllabic morphemes (e.g., "ab" [off], "Axt" [axe], "-tum" [-dom], "-schaft" [(-i)ty], "schwarz" [black]); bisyllabic morphemes (e.g., "Wagen" [wagon], "Abend" [evening], "Arbeit" [work], "Kamel" [camel]); trisyllabic morphemes (e.g., "Holunder" [elderberry]); quadrisyllabic morphemes (e.g., "Abenteuer" [adventure]). Morphemes that are incapable of bearing stress in German, on the other hand, either form no syllable at all (e.g., *-st* as in "gib-st" [you give], "fein-st-e" [finest]) or they form only one syllable (e.g., *-zig* as in "vierzig" [forty]). Accordingly a division on the basis of number of syllables is here impossible. More useful, however, is a division of the German morphemes that are not capable of bearing stress into proclitics and enclitics, that is, into those morphemes that can always occur directly *before* a morpheme capable of bearing stress, as, for example, *be-* in "behalten" (to keep), and those that occur only *after* another morpheme, as, for example, *-er* and *-isch* in "wählerisch" (choosy). This division is also in accord with quite distinct types of phonemic structure. The *proclitic* morphemes incapable of bearing stress always consist of a syllable that contains the vowel *e*. In other words, the syllable consists either of a "media + *e*" (*be-*, *ge-*) or of "(a consonant +) *er-*" (*er-*, *ver-*, *zer-*), or of "e + nasal + tenuis" (*ent-*, *emp-*). *Enclitic* morphemes contain either no vowel at all or they contain the vowels *u*, *i*, and *ə*. Of the consonants they contain the following: *t*, *d*, *g*, *x*, *s*, *š*, *l*, *r*, *m*, *n*, *ŋ*. Of these *š*, *x*, and *g* occur only after *i* (*-ig*, *-lich*, *-rich*, *-isch*), *d* occurs only after *n* (*-end*), *n* occurs only after *u* or *i* ("Jüngling" [young man]), *s* occurs after *i*, *ə*, and *n*, or it occurs without a vowel (*-nis*, *-es*, *-ens*, *-s*, *-st*), *n* occurs after *ə* and *i* or without a vowel (*-en*, *-in*, *-n*); the rest (*-l*, *-m*, *-r*, *-t*) occur either after *ə* or without a vowel. Of the combinations of the type "consonant + vowel" only the combinations *n*, *l*, *r* + *i* (*-nis*, *-lich*, *-ling*, *-rich*) and *t* + *ə* occur within morphemes of this type. Of the consonant combinations only *nd*, *ns*, and *st* are found.[10] For the morphemes capable of bearing stress the basic types, characterized by the number of syllables, can also be subdivided. For example, the monosyllabic morphemes capable of bearing stress are divided into nine different subtypes. The criterion is whether they begin or end with a vowel phoneme, a consonant, or with a consonantal cluster ("Ei" [egg], "Kuh" [cow], "Stroh" [straw], "Aal" [eel], "Sohn" (son), "klein" [small], "Ast" [branch], "Werk" [work], "krank" [sick]). Still more subtypes are conceivable with regard to bi-, tri-, and quadrisyllabic morphemes.

After the division of the frames into structural types has been completed, the phoneme combinations within these structural types are then to be studied. It is clear that in such a study the positions within the particular frames (initial, medial, and final position), on the one hand, and the three basic forms of phoneme combinations (i.e., combinations of vowel phonemes with each other, consonantal phonemes with each other, and vowel phonemes with consonantal phonemes), on the other, must be treated separately.



The method to be used in studying these phoneme combinations is a logically necessary result of the questions to be answered by this study. First, it must be determined *which phonemes* combine with each other in the particular position and which phonemes are mutually exclusive. Second, the *sequence* in which these phonemes occur in the particular position must be determined. And third, the *number* of members of a phoneme combination permissible in a particular position must also be indicated. From a methodological point of view, the study of the phonological structure of English monosyllables by Kemp Malone[11] can be considered exemplary. Malone studied separately the phoneme combinations that are allowed in initial, medial, and final position. He formulated three types of delimitative rules for each of these positions: (*a*) restriction on participation in a combination (restriction in membership), (*b*) restriction in the sequence of combined phonemes (restriction in sequence of members), and (*c*) restriction in the number of members of a combination. These three types of restriction represent an exhaustive answer to three questions so important for the study of phoneme combinations.

As an example, the consonantal combinations permissible in *initial position* in German morphemes capable of bearing stress will be examined here.

*a. Restrictions in membership.* (1) *s* ("ss"), *z* ("s"), *x* ("ch"), *h* and *ŋ* ("ng") cannot participate in a combination of this type. (2) Mediae and tenues are mutually exclusive (i.e., a media and a tenuis consonant cannot simultaneously participate in one and the same combination). (3) Occlusives are mutually exclusive. (4) Fricatives (*f*, *š*) are mutually exclusive. (5) Sonorants (*r*, *l*, *m*, *n*, *v*) are mutually exclusive. (6) Fricatives cannot be combined with *b*, *d*, *g*, *p̌* ("pf"). (7) *t* and *d* cannot be combined with *l*. (8) *f* cannot be combined with occlusives. (9) *v* ("w") does not combine with labials and labiodentals. (10) *c* ("z") does not combine with *r*, *l*, *s*, *f*. (11) *n* only combines with *š* ("sch"), *k*, and *g*. (12) *m* only combines with *š*.

*b. Restrictions in sequence.* (1) Fricatives (*f*, *š*) can occur only as first members of a combination. (2) Sonorants (*r*, *l*, *m*, *n*, *v*) can occur only as final members of a combination. (3) No other consonants may occur between *š* and *v*.

*c. Restrictions in number of members.* (1) Of three-member combinations only *štr*, *špr*, and *špl* are permissible. (2) Combinations of more than three members are not permitted.

From all these restrictions on morphemes capable of bearing stress the following possible combinations of consonants in initial position result: *br, pr, dr, tr, gr, kr, ƥr, fr, šr; bl, pl, kl, ƥl, fl, šl,* gn, kn, šn; šm; dv,* (*tv*), (*gv*), *kv, cv, šv; št,* (*šk*); *štr, špr, špl.*

Similar combinatory rules can also be formulated for the final and medial position of morphemes capable of bearing stress. Further, special rules can be established for polysyllabic morphemes. The rules discovered in this way must be compared with each other. It may develop that some of them have a more general sphere of application. For example, rules (2), (4), (6), and (9) of the "restrictions in membership" enumerated above are not only valid for initial position but for all positions within the frame of a German morpheme. Some rules must receive a general formulation. For example, the second "restrictions in sequence" can be replaced by two rules, which are valid for all positions within a German morpheme: ($\alpha$) Of the liquids (*r, l*) *r* can only occur in direct contact with a vowel, while *l* can occur either in direct contact with a vowel or an *r*. ($\beta$) Of the nasals only *m* and *n* can occur in direct contact with either a vowel or a liquid, while *ŋ* can only occur after a vowel.

Only after phoneme combinations have been studied by the same method in as many languages as possible can a *typology of combinations* be developed by the comparison of various languages, and can the question of the legitimacy of combinatory rules be fruitfully discussed.

## 4 ANOMALOUS PHONEME COMBINATIONS

The combinatory rules provide each language with a special character. They characterize the language no less than the phonemic inventory. There are languages in which the combinatory rules are rigorously carried out and include all parts of the vocabulary. In such languages even the loanwords are modified in such a way that they obey the normal combinatory rules valid for the native words. In other languages, however, loanwords are changed as little as possible, even if they are in contradiction to native combinatory rules. They continue to exist as foreignisms in the vocabulary. German is among the languages of this type. Take, for example, words such as "Psalm" (psalm), "Sphäre" (sphere), "Szene" (scene), "pneumatisch" (pneumatic) which have "non-German" consonantal combinations initially. It is true of course that words of this type are generally restricted to the area of technical or "erudite" vocabulary. Many of them

* *Translator's note:* Also *gl.*



conform to the normal combinatory rules when they are introduced into everyday vocabulary.[12] Only in the case of very advanced bilingualism do such words with foreign phoneme combinations penetrate the spoken speech in such numbers that they are not felt as foreignisms any more. This means that the combinatory rules of the particular language have undergone a corresponding modification.

The degree to which loanwords do not conform to native combinatory rules seems to depend on several things, especially on the variety of phoneme combinations that are permitted in a given language. In a language such as Japanese, which only allows very few phoneme combinations, the number of admissible phoneme combinations cannot increase greatly. German, on the other hand, which already has numerous and varied phoneme combinations, can add some foreign combinations to those permissible. Yet some fundamental rules must not be violated. For example, a media cannot occur next to a tenuis, *r* cannot occur without being in direct contact with a vowel, and so on. A word such as Georgian "gvçrtvnis" (he lets us practice) could not be accepted into German without modification.

The presence of particular phoneme combinations at the *morpheme boundary* also plays an important role in the introduction of loanwords. This was emphasized by B. Trnka with good reason.[13] The combinations *sc, sf, pn* are not allowed in German within the frame of a single morpheme. They do occur, however, in polymorphemic ("compounded") words at the morpheme boundary (e.g.: "Auszug" [exodus], "misfällig" [unpleasant], "abnehmen" [reduce]). This facilitates the unaltered preservation of these combinations in such loanwords as "Szene," "Sphäre," "pneumatisch," where they are transferred to initial position, in the same way as the preservation of the initial combination in "Psalm," "Psychologie," etc., is facilitated by the presence of this combination in medial position in such native words as "Erbse" (pea). In Japanese, on the other hand, the complete absence of consonantal combinations (except for N + consonant) within the frame of a single morpheme but also at morpheme boundary has the effect that loanwords cannot be introduced in unaltered form.

What has been said about foreign phoneme combinations is also valid for dialectal and archaic phoneme combinations. The standard or written language generally admits only dialect words in correspondingly modified form. Dialect words with a phoneme combination that is foreign to the written language present a foreignism in the vocabulary of the written language and are limited to special sections of the vocabulary. Take, for example, such German words as "Kaschperl" (Punch), "Droschke"

(carriage), "Wrak" (wreck), "Robben" (seals), "Ebbe" (ebbtide). As for words taken over from the older languages and which have phoneme combinations presently out of use, they also belong to a special section of the vocabulary (the vocabulary of the poetic or of the administrative language). Proper names (i.e., the names of persons as well as places) in many languages form a special class since it is in them particularly that foreign, archaic, and dialectal elements have been retained in unaltered form in the standard language. Examples are such German names as Leipzig, Leoben, Altona, Luick, Treischke, Pschor, which contain either unusual phoneme combinations or belong to very rare morpheme types.[14]

Incidentally, proper names also behave in a very special way with regard to the phonological and morphological system in some other respects.

The most important area of anomalous phoneme combinations is represented by interjections, onomatopoetic expressions, calls or commands directed toward animals, and words with "an expressive" coloration. After what has been said on the subject by V. Mathesius and J. M. Kořínek[15] the problem should be considered as clarified once and for all and does not need any further discussion.

[1] Medially the spiritus asper occurred only in combination with a geminated *ρ*. But since it was never absent in that position, it did not have any distinctive force, i.e., it did not have a phonemic function.

[2] B. Trnka, "General Laws of Phonemic Combinations," in *TCLP*, VI, 57 ff.

[3] Cf. John R. Swanton in *Handbook of American Languages*, I (*Bureau of American Ethnology Bulletin*, XL), 211 f.

[4] From the glossary to Hermann Jacobi's *Ausgewählte Erzählungen im Mâhârâshṭrî* (Leipzig, 1886), pp. 87 ff., we draw the following evidence: "āara" (respect), "īisa" (such), "ghaṛa-čhāaṇiā" (housewife), "nāara" (townsman), "paāna" (1. give, 2. march, departure), "pāava" (tree)," pāasa" (milk), "vāasa" (crow), "saāsa" (presence), "sāara" (ocean), and the temporal adverbs "kaā" (when), "jaā" (since), "taā" (then), "saā" (always), from which a suffix aā can be abstracted. The opposition between long and short vowels in Māhārāshṭrī (as in all Prakrit dialects) is neutralizable: before geminated consonants and before the combination "nasal + consonant" all vowels are short.

[5] Cf. from the same glossary to Jacobi's Māhārāshṭrī texts such words as "saā" (even), "saaā" (always), "vaāsa" (companion, friend). Before nasals and before occlusives the correlation of vocalic nasalization is neutralized in Prakrit.

[6] In languages such as Estonian, Lapp, and Gweabo, where light and heavy geminates or geminates with increasing and decreasing intensity are phonologically distinguished, it is the monomorphemic combination of the two members of a correlational pair of the correlation of intensity that is involved.



[7] In particular it must here be stressed that combinations of two prosodemes that are only distinguished by one prosodic property are permissible without question. Combinations of this type can actually occur only in mora-counting languages. They result in bimoric or trimoric syllable nuclei with falling, rising, etc., tone movement. "Long vowels with stød" are actually also only combinations of two morae, the former of which is the marked, the latter the unmarked, member of the correlation of stød.

[8] Cf. Walter Trittel, "Einführung in das Siamesische," in *Lehrbücher des Seminars für orientalische Sprachen zu Berlin*, XXXIV (1930).

[9] *Studies in English by Members of the English Seminar of the Charles University, Prague*, V (*Práce z vědeckých ústavů*, XXXVII [1935]).

[10] R. Jakobson calls our attention to the fact that the phonemic structure of the German enclitic morphemes is related to their grammatical function. *Suffix morphemes* either contain no vowel at all or they contain the vowel *ə* that occurs only in combination with *n*, *r*, or *l* in *derivative morphemes*. Of the consonants, the suffix morphemes contain only *s*, *t*, *n*, *m*, and *r*, and the three combinations *ns*, *nd*, and *st*. Enclitic accentuable morphemes that contain other phonemes or phoneme combinations are derivative morphemes.

[11] Kemp Malone, "The Phonemic Structure of English Monosyllables," in *American Speech* (1936), pp. 205 ff.

[12] The word "Sport" is already pronounced with an initial *š* by many Germans. In this form it no longer bears the mark of a loanword. In Vienna "Sport" as the name of a particular brand of cigarettes is always pronounced with an *š*.

[13] Cf. B. Trnka in *TCLP*, VI, 60 ff.

[14] It is to be noted that here also those combinations are found which ordinarily occur only at morpheme boundary. For example: "Leipzig"-"Abzug" (departure), "Leoben"-"beobachten" (observer), "Luick"-"ruhig" (quiet), "Treitschke"-"Deutschkunde" (Germanology), "Pschorr"-"Abschied" (departure).

[15] V. Mathesius, "O výrazové platnosti některých českých skupin bláskových," in *Naše řeč*, XV, 38 ff., as well as J. M. Kořínek, "Studie z oblasti onomatopoje," in *Práce z vědeckých ústavů*, XXXVI (Prague, 1934). Cf. now also V. Skalička, "O mad'arských výrazech onomatopoických," in *Sborník filologický*, XI (1937).

# VII PHONOLOGICAL STATISTICS

## 1 THE TWO WAYS OF COUNTING

The problems of statistics and of the functional load of phonological elements are very closely related to the study of combinations. Phonostatistics has already been studied and used for various practical and scientific purposes. For phonological purposes it must, of course, be modified correspondingly: not letters or sounds, but phonemes and phoneme combinations must be counted. In specifically phonological literature the importance of statistics in phonology was first stressed by V. Mathesius.[1] B. Trnka made a contribution to the statistics of English phonology in his book that we mentioned earlier.[2] W. F. Twaddell attempted a statistical study of the German system of consonants and their combinations.[3] George Kingsley Zipf studies phonological statistics in general.[4] Thus there is now no further lack in phonological statistical investigations. Still, there are by far not enough investigations, and in each one a different method is applied. No uniform method for phonological statistics has so far been developed. We must therefore content ourselves here with a few remarks on the subject.

Statistics is of twofold significance in phonology. First, it must show how often a specific phonological element of a given language (phoneme, phoneme combination, word type, or morpheme type) recurs in speech. Second, it must show the importance of the functional load of such an element or of a specific phonological opposition. For purposes of the



former, continuous texts must be examined statistically; for purposes of the latter, dictionaries. In either case it is possible to study the absolute figures for actual occurrences alone or the ratio of these figures to the figures of occurrences theoretically expected on the basis of combinatory rules.

## 2 STYLISTICALLY CONDITIONED FIGURES AND FIGURES CONDITIONED BY LANGUAGE

Each type of phonological statistical investigation has its own difficulties. In studying the frequency of a particular phonological element in continuous texts, it is the *choice of the text* which is of primary importance.

I open K. Bühler's *Sprachtheorie*[5] randomly at page 23 and take any section of 200 words (starting from "soll es also . . ." to "im Schosse der Sprachwissenschaften längst," in other words, from lines 3 to 28, starting from the top of the page). This section contains 218 accentuable morphemes. Of these 204 are monosyllables, 37 are bisyllabic, and seven trisyllabic. I then select another text, again 200 words in length, namely, the beginning of the first fairy tale in A. Dirr's *Kaukasische Märchen*.[6] I find that this section contains only a total of 220 morphemes capable of bearing stress; 210 are monosyllables, 10 bisyllabic, and not a single one is trisyllabic. The same difference between the two selected texts is also found with regard to word length. In Bühler, words of varying length from 1 to 9 syllables are found. In Dirr only monosyllabic, bisyllabic, and trisyllabic words occur, with an overwhelming preponderance of monosyllables.

| Words consisting of | *K. Bühler* | | *A. Dirr* | |
|---|---|---|---|---|
| | Number of words | | Number of words | |
| | Absolute | Percent | Absolute | Percent |
| one syllable | 95 | 47.5 | 134 | 67 |
| two syllables | 57 | 28.5 | 56 | 28 |
| three syllables | 27 | 13.5 | 10 | 5 |
| four syllables | 7 | 3.5 | — | — |
| five syllables | 6 | 3 | — | — |
| six syllables | 6 | 3 | — | — |
| seven syllables | 1 | 0.5 | — | — |
| eight syllables | — | 0 | — | — |
| nine syllables | 1 | 0.5 | — | — |
| | 200 | 100 | 200 | 100 |

The total number of syllables in the section studied in Bühler is 400, and in Dirr 276. This indicates that the average word length for Bühler is two syllables, and 1.4 syllables for Dirr. Since in German only vowels function as syllable nuclei (syllabic *n, r, l** in unstressed syllables phonologically are to be regarded as *ən, ər, əl*), the number of syllables also indicates the number of vowel phonemes (400 for Bühler, 276 for Dirr). As to consonants, the section examined in Bühler contains 636 consonantal phonemes, and in Dirr 429. In other words, a word in Bühler contains 3.2 consonants on the average, and in Dirr 2.1 consonants. The ratio between consonants and vowels is about the same in both texts. The consonants account for 61 percent, the vowels for 39 percent, of all phonemes. But the total number of phonemes is 1,036 for Bühler, and 705 for Dirr. Accordingly there exists a ratio of about 3:2. It should not be assumed that this difference would disappear in longer sections. It is very closely related to *stylistic differences*. The scholarly language which is geared to a higher intellectual level of hearer is characterized by long words, while short words are preferred in the simple narrative, being geared to a rather primitive level of audience. Another peculiarity of educated speech in German is a superabundance of consonant combinations. While only 55 consonant combinations occur in the section examined in Dirr, with 116 consonants participating, or 27 percent of all consonantal phonemes, 127

* *Translator's note:* Also *m* (= *əm*).

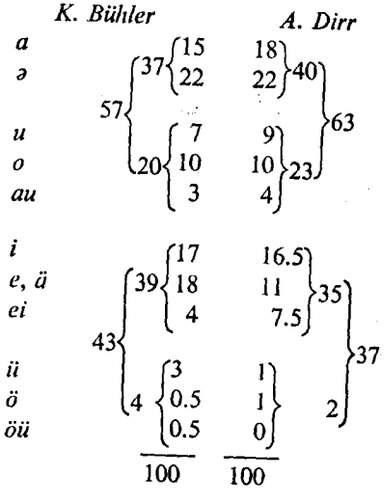


consonant combinations occur in the section examined in Bühler's *Sprachtheorie*, with a total of 281 consonants participating, or 44 percent of all consonantal phonemes. As regards the distribution of these consonants within the word or morphemes, in both texts most combinations occur at internal morpheme juncture (in Dirr 40%, in Bühler 42%), and morpheme-finally (in Dirr 33%, in Bühler 32%). Both texts show quite a different relationship in morpheme-initial and morpheme-medial position. In Dirr 22 percent of all consonant combinations occur in morpheme-initial position and 5 percent in morpheme-medial position, while in Bühler 12 percent of all consonant combinations occur in morpheme-initial position and 14 percent in morpheme-medial position. Furthermore, in Bühler combinations such as *çj* ("Situation"), *gm* ("Dogma"), *skr* ("deskriptiv"), are attested in morpheme-medial position. Not only are these absent in the section examined in Dirr, they do not even occur once in his entire collection of Caucasian fairy tales. This is a result of an increased use of borrowings, which is characteristic of any scholarly language.

The two types of style which were chosen as examples, that is, the intellectualized scholarly language and the intentionally simple narrative speech imitative of the primitive, are two poles. Between these, various other types of style are found and each has its specific characteristics. Each text belongs to some kind of style. And if we propose to study the frequency of certain phonological elements in a particular language by means of a text, we must ask ourselves especially which text would be the most appropriate for this purpose. The problem seems to allow for two solutions: one should either choose a text that is "stylistically neutral" or one should choose portions from several texts of different styles. Neither solution is very satisfactory, however. The question remains as to what should be considered "stylistically neutral" and in what proportions should sections of texts of different styles be analyzed?

It seems, therefore, impossible to free phonological statistics completely from the influence of the various types of style. In phonological statistical studies the specific idiosyncrasies of the various types of style must always be taken into consideration. It has to be determined above all which of the phonological phenomena are stylistically conditioned and which exist independently of style. We have already seen that, at least for German, length of semantic units (words or morphemes) and frequency of consonant combinations are stylistically conditioned. The frequency of individual phonemes, on the other hand, appears to be rather independent of the style of the text.

Compare, for example, the frequency of vowel phonemes (in percentages) in the above-mentioned excerpts from Bühler and Dirr:




The small differences in the case of *a*, *e*, and *ei* can hardly be attributed to the influence of style. It is possible that these differences would disappear in a statistical study of a larger section of text.

Phoneme frequency thus does not seem to be stylistically conditioned, at least not in German. To study it statistically any text may be chosen. (An exception are poems and texts of particularly artificial prose, in which an intentional artificial deviation from the natural frequency of phonemes is produced to evoke specific effects.)[7] But as a measure of caution an attempt should be made to neutralize the types of style for these studies as well. Best suited for this purpose appear to be transcriptions of various conversations,[8] or newspapers in which different styles are represented (political headlines, telegrams, semiscientific articles, official communiqués, sports reports, economic reports, serial stories, etc.).[9]

## 3 PROPOSED INTERPRETATIONS OF PHONEME FREQUENCY

To date far too few languages have been studied statistically with reference to phoneme frequency. Interpretations of statistical data and generalizations on this subject may, therefore, still be premature. But even today studies of this type are not lacking. J. van Ginneken advanced a theory on the cause of frequency differences in individual phonemes within the various languages.[10] According to this theory, each person has a hereditary preference for certain types of articulation. In speaking, he



instinctively selects those words in which the respective sounds occur. But since all peoples came into existence through the mixture of different races, a certain combination of hereditary racial characteristics is contained in every representative of a particular people. These characteristics also correspond to articulatory preferences. And since the racial components are the same for different representatives of the same people, the phonemic system, too, is the same for all. Individual fluctuations in phoneme frequency are explained by differences in the numeric ratio of the racial components for individual representatives of the same people. This theory was not attained inductively nor was it deduced from concrete facts. Rather, it was an a priori invention. The phonemic material that was used does not serve as a basis and control for this theory, but is merely explicated by this theory. The explication always remains purely hypothetical: if some phoneme in a particular language indicates an especially high or an especially low frequency count, it is assumed that the racial characteristics of the particular people favor or impede the particular articulatory movements. But this is begging the question, for it must first be shown that a high or low frequency of a phoneme in connective speech depends on the racial characteristics of the speaker. Negro languages do not have the same phoneme frequency as the Indian languages of North America. But this is by far no proof that phoneme frequency is dependent on racial characteristics, since Negro languages are distinguished from Indian languages not only by phoneme frequency but also by their phonemic inventory and their grammatical structure. Objective proof could only be given by an experiment in which the factors in question would be completely isolated from all others. For example, two subjects belonging to a different race, but with the same mother tongue and the same level of education, would have to be examined with respect to phoneme frequency. (Their speech must also belong to the same style.) The results of such an experiment could, however, acquire scientific significance only if the experiment were to be repeated several hundred times with representatives of various races and in different languages. Only then could this question be discussed.

Another theory on the frequency of phonemes was proposed by George Kingsley Zipf.[11] According to this theory, the less complicated the realization of a phoneme, the greater its frequency. In this theory Zipf thus proceeds from a purely scientific point of view. When examining the tenability of this theory one must, therefore, also proceed from a strictly scientific point of view. But the degree of articulatory complexity cannot be measured purely from the standpoint of the natural sciences. The vocal cords are tense in the production of voiced occlusives but at the same time, the

organs of the mouth are relaxed. Conversely, in the case of voiceless occlusives the vocal cords are relaxed while the organs of the mouth are tensed. Which is more complicated? In the case of the aspirated consonants the glottis is wide open, that is, it remains in the same position as in normal breathing, while in the case of unaspirated consonants the glottis must shift position at the moment the consonant is released, lest aspiration follow. But, on the other hand, the greater the flow of air, the more tensed the organs of the mouth. It is therefore also difficult to say, with regard to the opposition of aspiration, whether the aspirated or the unaspirated consonants are "more complicated." The same holds true also for all oppositions based on the manner of overcoming an obstruction. In the case of oppositions based on localization, the degree of complexity can even less be determined. Zipf indicates the opposition *m-n* as an example. He believes it is possible to conclude from the greater frequency in many languages of *n* as compared to *m*, that *m* is the "more complicated." But *m* is articulated with closed lips and a lowered velum. In other words, the speech organs are in a position of complete rest (except that the vocal cords are tensed), while the articulation of *n* entails raising the tip of the tongue to the teeth or alveolar ridge and usually also a corresponding movement of the lower jaw (in addition to tensing the vocal cords, which it has in common with *m*). This theory must therefore also be decidedly rejected, at least in its present formulation.

The two theories discussed above can be considered as subject to attack primarily because they try to explain phonological facts by means of biological, extralinguistic causes. But Zipf's theory can also be "translated into phonological terms," so to speak. Marcel Cohen in his discussion of Zipf's book already hinted at this.[12] In its phonological formulation this theory would be somewhat as follows: "Of the two members of a privative opposition the unmarked member occurs more frequently in continuous speech than the marked member." This formulation should generally hold true, but it should by no means be considered a law without exception. One must make a distinction between neutralizable and nonneutralizable oppositions and also consider the extent of neutralizability. In Russian, where the opposition between palatalized and nonpalatalized consonants exists in twelve phoneme pairs, the rule applies only to eleven of these pairs. Nonpalatalized *p, b, f, v, t, d, s, z, m, n, r* in fact occur much more often than the corresponding palatalized *p', b', f', v', t', d', s', z', m', n', r'* (the ratio being approximately 2:1). But this rule does not apply to the phoneme pair *l:l'*: palatalized *l'* is more frequent in Russian than nonpalatalized *l* (*l:l'* = 42:58). It is probably no accident that the opposition *l-l'* can only be neutralized before *e*, while the oppositions *p-p'*, *t-t'*, etc.,



are neutralized in other positions as well (before apicals, sibilants, and palatalized labials). The correlation of voice is neutralizable in Russian: in word-final position, before a pause, or before words beginning with sonorants only voiceless obstruents are permitted. This marks them as the unmarked members of the correlation of voice. However, the phoneme *v* (as well as the corresponding palatalized *v'*) occupies a special position: on the one hand, it cannot occur in word-final position; and in medial position, too, it is replaced by *f'*, its voiceless equivalent before voiceless obstruents. On the other hand, voiceless consonants can occur before *v* (e.g.: "tvoj" [your], "svad'ba" [wedding], "zakvaska" [sour dough]). This is not permitted before the other voiced obstruents. In other words, *v* does not have the same effect on the other obstruents as do the marked members of the correlation of voice. This is probably related to the fact that *v* occurs about four times as frequently as *f*. In contrast, in the remaining phoneme pairs of the correlation of voice, the voiced members are about three times less frequent than the voiceless ones.[13]

The examples given by Zipf can all be reconciled with the above formula. For in languages with a correlation of voice the voiceless obstruents are the unmarked opposition members, just as in languages with a correlation of aspiration the unaspirated obstruents fulfill this function. Languages such as Lezghian (K'üri), in which the aspirated occlusives are the unmarked members of the correlation of consonantal intensity,[14] teach us that it is not aspiration itself but the opposition relationship that is important. Aspirated occlusives are here, as a rule, more frequent than the corresponding unaspirated occlusives ($p^h$ 1.8: *P* 0.8; $t^h$ 5.2: *T* 2.2; $k^h$ 8.8: *K* 0.7; $c^h$ 9.0: *C* 0.1). The relationship is only reversed with respect to the back velar series of localization ($q^h$ 1.6: *Q* 3.8). It is to be noted here that in contrast with all other Lezghian oppositions based on the correlation of consonantal intensity, the opposition $q^h$: *Q* is not neutralized in posttonic syllables.

There is no doubt that the differences between unmarked and marked opposition members, and the differences between oppositions that can be neutralized and those that cannot, affect phoneme frequency. Yet it is clear that this fact alone is not sufficient to explain the frequency relationships. There always exist oppositions in the various languages for which a privative character cannot be objectively established. For example, in French the correlation of voice is privative and neutralizable. However, it is only subject to a contextually conditioned dissimilative type of neutralization [of the type (*a*)]. The choice of archiphoneme representative is here conditioned externally so that the unmarked character of the one or the other member of this opposition is not objectively proven.[15] As a

whole, French voiceless obstruents are more frequent than voiced obstruents (approx. 60:40). The ratio is different, however, for each individual phoneme pair: *ž* and *v* are much more frequent than *š* and *f*; *d* and *t* have approximately the same frequency, while in the other pairs (*p-b*, *k-g*, *s-z*) the voiceless member is much more frequent than the voiced member.

## 4 ACTUAL AND EXPECTED FREQUENCY

In general it appears hopeless to establish strict rules for phoneme frequency since phoneme frequency is the result of a whole sequence of propelling forces. The absolute figures of actual phoneme frequency are only of secondary importance. Only the relationship of these figures to the theoretically expected figures of phoneme frequency is of real value. An actual phoneme count in a text must therefore be preceded by a careful calculation of the theoretical possibilities (with all rules for neutralization and combination in mind). Let us imagine, for example, a language in which a particular opposition of consonantal phonemes is neutralized in initial and final position, and where only the unmarked opposition member appears in the position of neutralization. In such a language the unmarked member of the opposition in question can thus occur in initial position in each syllable as well as in word-final position, while the marked member can occur initially in all syllables except the first. If the average number of syllables in this language equals $\alpha$, one would expect that the frequency of the unmarked opposition member behaves to the frequency of the marked member as $\alpha + 1$ to $\alpha - 1$. In Chechen, where geminated consonants occur only in medial position (as they do in most languages with a correlation of gemination) and where words contain an average of 1.9 syllables (at least in folktales), the frequency ratio of geminated consonants to the corresponding nongeminated consonants should therefore be 9:29 (i.e., approximately 1:3). Actually statistics yield the following figures:

| | | |
|---|---|---|
| *tt*:*t* | 12:90 | (4.. J) |
| *qq*:*q* | 6:45 | (4:30) |
| *čč*:*č* | 25:59 | (13:30) |
| *ll*:*l* | 16:32 | (15:30)[16] |

Geminated *čč* and *ll* are thus used more frequently than one would have expected theoretically, while geminated *tt* and *qq* are used much more rarely. The Chechen language also has the correlation of recursion for occlusives. But it is only found initially. Medially and finally it is neutralized (the archiphonemes being represented by the nonrecursive occlusives). The marked members of this opposition can, therefore, only occur



$\frac{\beta}{\alpha}$ times initially (if one designates the total number of syllables in a text by $\beta$ and the average number of syllables of a word by $\alpha$). The corresponding unmarked opposition members, on the other hand, can occur initially in each syllable as well as word-finally, that is, they can occur $\beta + \frac{\beta}{\alpha}$ times. The expected frequencies thus are in a ratio of $\frac{\beta}{\alpha}$ to $\beta + \frac{\beta}{\alpha}$, that is, of 1 to $\alpha + 1$. Since the average number of syllables in a word in Chechen is 1.9, we obtain the ratio of 1:2.9. Actually the following figures are found:

| | | |
|---|---|---|
| t':t | 33:90 | (11:30) |
| k':k | 38:47 | (24:30) |
| q':q | 21:45 | (14:30) |
| c':c | 17:97 | (5:30) |
| č':č | 5:59 | (2½:30) |
| p':p | ?:27 | ( ? )[17] |

The ratio of frequency figures for recursives and nonrecursives as a whole corresponds approximately to the expected ratio of (114:365 = 0.9:2.9). However, individual phonemes deviate considerably from this ratio in both directions. The unmarked members, too, always remain more frequent than the marked members. The tabulation of theoretical possibilities is not always as simple as in the examples quoted above. However, one should not be discouraged by the technical difficulties of such a tabulation. For only in a comparison with the *possible* frequency figures obtained on the basis of such a tabulation do the *actual* frequency figures acquire value. They show whether a phoneme is frequently or infrequently utilized in a given language.

When examining a text for phoneme frequency one must not only consider the frequency with which a phoneme occurs in general but also the frequency with which it occurs in a particular position. If, for example, the unmarked member of a neutralizable opposition occurs with special frequency in the position of neutralization (where it represents the archiphoneme), this is evidence that the opposition in question is not much utilized. If, however, such an opposition member occurs particularly often in the position of relevance (in other words, if it occurs more often than one would theoretically expect), this is an indication that the utilization of the opposition in question is favored. The extent to which various oppositions, including nonneutralizable oppositions, are utilized can also be determined statistically. In many languages there are environments in which only very few phonemes are permitted and where accordingly only

few distinctive oppositions exist. Depending on whether the theoretically expected frequency for these positions is exceeded or whether that frequency is not reached, it is possible to determine whether the extent to which these oppositions are utilized is great or small.

The gross global statistical tabulation of phonemes must, therefore, be replaced by more detailed specific tabulations. The object of such tabulations no longer centers in phonemes but in oppositions, for in this area of phonology as well as in all others it should always be remembered that it is not the phonemes but the oppositions that represent the true object of phonological study.

## 5 PHONOLOGICAL STATISTICS AND VOCABULARY

The above discussion clearly shows that a statistical examination of texts alone is not sufficient to gain a picture of the relative utilization of the various phonological elements. Studies of this type must be supplemented by an examination of the vocabulary which is also statistical in nature. Also to be taken into account here is the relationship between the actual figures and the theoretically possible figures. V. Mathesius and B. Trnka have already made important attempts in this direction. The studies by Mathesius give particularly clear evidence for the importance of such investigations for the phonological typology of languages. One easily becomes persuaded thereof if one compares words consisting of two phonemes in various languages. In German 18 consonants (*b*, *p*, *m*, *d*, *t*, *n*, *k*, *g*, *c*, *z*, *š*, *f*, *v*, *p̌*, *h*, *r*, *l*, *j*) can occur word-initially, and 14 consonants (*p*, *m*, *t*, *n*, *k*, *ŋ*, *x*, *c*, *s*, *p̌*, *f*, *š*, *r*, *l*) word-finally, while all stressed vowel phonemes (i.e., 10 phonemes, if one does not distinguish *ä* and *e*) can occur initially as well as finally. Not allowed are the combinations *j* + *i*, *au* + *r*, *au* + *ŋ*, *eü* + *r*, *eü* + *ŋ*, *ai* + *r*, *ai* + *ŋ*, *o* + *ŋ*, and *ö* + *ŋ*. Accordingly 179 ([18 × 10] − 1) words of the type "consonant + vowel" and 132 ([14 × 10] − 8) words of the type "vowel + consonant" are theoretically possible in German. (Differences in type of contact are not taken into consideration.) In reality the type "consonant + vowel" is represented by 57 words in German ("du" [you], "Kuh" [cow], "zu" [to], "Schuh" [shoe], "wo" [where], "loh" [blazing, bright], "roh" [raw], "Bau" [structure], "Tau" [rope, dew], "kau" [chew, imp.], "Gau" [province], "Pfau" [peacock], "Vau" [v], "Sau" [sow], "schau" [look, imp.], "hau" [hew], "lau" [lukewarm], "rauh" [rough], "die" [the], "nie" [never], "Vieh" [cattle], "wie" [as], "zieh" [draw], "sie" [she, they], "hie" [here], "lieh" [lent], "mäh" [mow, imp.], "Tee" [tea], "näh" [sew, imp.], "Weh" [pain], "Zeh" [toe], "See" [sea], "je" [ever], "geh" [go, imp.], "bei" [near, at], "weih" [bless], "zeih" [accuse, imp.], "sei" [be, imp.], "reih" [arrange, imp.], "leih" [lend, imp.], "Küh'" [cows], "Höh'" [height], "neu" [new], "scheu" [shy], "Heu" [hay], "Leu" [lion, poet.], "Reuh'" [remorse], "da" [there, since], "nah" [near], "sah" [saw], "ja" [yes], as well as the letters "Be" [b], "Pe" [p], "De" [d], "Ha" [h], "Ka" [k]). The type "vowel + consonant" is represented by 37 words ("Uhr" [watch], "Ohr" [ear], "ob" [whether], "Aug'" [eye], "auch" [also], "aus" [from], "auf" [on], "ihr" [you, pl.; her, dat.], "im" [in, dat.], "in" [in], "iss" [eat, imp.], "er" [he], "El" [l], "Em" [m], "En" [n], "eng" [tight], "Eck'" [corner], "ätz" [etch, imp.], "es" [it], "Esch'" [ash tree], "Eid" [oath], "ein" [a], "eil" [hurry, imp.], "Eich'" [oak tree], "Eis" [ice], "Eul'" [owl], "euch" [you, pl.], "Aar" [eagle, poet., or any large bird of prey], "Aal" [eel], "am" [at the, dat.], "an" [at], "ach" [oh], "ass" [ate], "Aff'" [ape], "ab" [off], "Asch'" [ash]). In French 15 consonants (*b*, *p*, *d*, *t*, *g*, *k*, *v*, *f*, *s*, *š*, *ž*, *m*, *n*, *r*, *l*) are allowed in initial position, and 18 consonants (*b*, *p*, *d*, *t*, *g*, *k*, *v*, *f*, *z*, *s*, *š*, *ž*, *m*, *n*, *ɲ*, *r*, *l*, *j*) in final position. Of the vowel phonemes 12 are permitted in closed syllables (*u*, *o*, *ɔ*, *a*, *ɛ*, *i*, *ø*, *y*, *õ*, *ã*, *ɛ̃*, *œ̃*), 13 in open syllables (the same phonemes + *e*). The phonemic sequences "nasal vowel" (*õ*, *ɛ̃*, *œ̃*, *ã*) + *m*, *n*, *ɲ*, *r*, *l*, *j* are not permitted. Accordingly 195 (15 × 13) words of the type "consonant + vowel" and 192 ([12 × 18] − [4 × 6]) words of the type "vowel + consonant" are theoretically possible. In reality the type "consonant + vowel" is here represented by 142 words and the type "vowel + consonant" by 50 words. In other words, in German only 31.8 percent of the theoretical possibilities of the type "consonant + vowel" are realized, while in French 73 percent are realized. For the type "vowel + consonant" the realization of theoretical possibilities amounts to approximately the same percentage in both languages: 28 percent in German, 26 percent in French. However, while words of this type in German make up 40 percent of all monosyllables consisting of two phonemes, they only account for 26 percent of such monosyllables in French. One can therefore see that even within such a narrow framework the individuality of languages is clearly evident. V. Mathesius, in *TCLP*, I, compares Czech and German with regard to the utilization of phonological means. He finds, among other things, that among the words that consist of two or three phonemes, words beginning with a vowel amount to 25.2 percent in German, but only to 8.2 percent in Czech. Further, consonant combinations in German are utilized more in final position, while in Czech they are utilized more initially.

All these peculiarities, which lend to each language its particular character, can be expressed in numbers. By this method of examining the

vocabulary it is also possible to determine for each language in numbers the extent to which the individual phonological oppositions are utilized distinctively (their functional load), as well as the average load of the phonemes in general. It develops that there are "economical" and "wasteful" languages in this respect. In the "economical" languages words that are only distinguished by one phoneme are very numerous, and the percentage in which theoretically possible phoneme combinations are realized is very high. The "wasteful" languages have a tendency to distinguish words by several phonological elements and to realize only a small percentage of the theoretically possible phoneme combinations.

Against the background of a phonological statistical vocabulary study, the phonological statistical study of continuous texts takes on a new meaning. Frequency figures acquire a double relativity, so to speak, for the problem is to determine to what extent the theoretical possibilities given by the combinatory rules, and realized in the vocabulary, are actually exploited in continuous speech. The greater the number of phonemes in a word type, the higher the number of theoretically possible words of this type. A statistical study of the vocabulary shows what percentage of these theoretical possibilities is realized, in other words, the number of phoneme combinations of a particular type which have a specific lexical meaning. But it indicates nothing about the actual frequency of occurrence of words of this type in normal continuous speech. Only a statistical study of texts can supply information on this point. It may develop that word types in which a high percentage of theoretical possibilities is realized are less frequent than word types with an insignificant percentage of such realization. It is impossible to say, at least for the present, whether there are generally valid laws or whether languages vary in this regard since far too little work has been done in phonological statistics. An express warning should be sounded, in any event, against any premature conclusions and theories in this field.

In conclusion, it should be pointed out that lexical statistics must often face difficulties similar to those found in statistics of texts. Not all areas of vocabulary are alike or comparable. There are technical terms known only to a small circle of experts, though they are not loanwords in the usual sense of the word. Should such terminology be included in statistical studies? There are words that in their written shape are probably only found in dictionaries, and actually exist only in dialectal sound shape, for, based on what they signify, they belong to the domain of dialects (various technical terms for farm life, etc.). Which phonic shape should be used for statistical purposes? Problems of this type appear in studies of lexical statistics for almost any language. But for certain Oriental written languages such questions become almost fateful. The matter should, in any event, not be conceived of as being too easy.



[1] Cf. his essays, "La structure phonologique du lexique du tchèque moderne," in *TCLP*, I, 67–85, and "Zum Problem der Belastungs- und Kombinationsfähigkeit der Phoneme," in *ibid.*, IV, 148 ff.

[2] B. Trnka, "A Phonological Analysis of Present-day Standard English," in *Práce z vědeckých ústavů*, XXXVII (1935), pp. 45–175.

[3] W. F. Twaddell, "A Phonological Analysis of Intervocalic Consonant Clusters in Modern German," in *Actes du IV^e Congrès International de Linguistes à Copenhague* (1938).

[4] G. K. Zipf, *Selected Studies of the Principle of Relative Frequency in Language* (Cambridge, Mass.: Harvard University Press, 1932), and *Psycho-Biology of Language* (Boston-Cambridge, Mass.: Riverside Press, 1935).

[5] Karl Bühler, *Sprachtheorie* (Jena, 1934).

[6] "Kaukasische Märchen selected and translated by A. Dirr," in *Die Märchen der Weltliteratur*, ed. by Friedrich von der Leyen and Paul Zaunert (Jena, 1920).

[7] Cf. J. Mukařovský, "La phonologie et la poétique," in *TCLP*, IV, 280 f.

[8] Peškovskij presents statistics of sound based on such transcriptions of spontaneous discourse for Russian (Peškovskij, *Des'at' tys'ač zvukov russkogo jazyka* [Sbornik statej, Leningrad, 1925], pp. 167–191).

A similar study is available for Swedish, based on stenographic transcriptions of speeches in the Swedish Parliament. Unfortunately both cases involve statistics of phones and not of phonemes.

[9] Cf., for example, B. Eldridge, *A Thousand Common English Words* (Buffalo: The Clement Press, 1911).

[10] Cf. J. van Ginneken, "Ras en Taal" (*Verhandl. d. Kon. Akad. van Wetensch. te Amsterdam, Aft. Letterkunde*, N. R. XXXVI, 1935); *De ontwikkelingsgeschiedenis van de systemen der menschelijke taalklanken* (Amsterdam, 1932), *De oorzaken der taalveranderingen* (Amsterdam, 1930); and "La biologie et la base d'articulation" in *Journ. de psychol.*, XXX, 266–320.

[11] G. K. Zipf, *Psycho-Biology of Language*, pp. 68 ff. Cf. N. S. Trubetzkoy's references in *Slovo a slovesnost*, II (1936), 252 f.

[12] Cf. Marcel Cohen in *BSL* XXXVI (1935), 10.

[13] Furthermore, voiced *ž* occurs more frequently in Russian than voiceless *š*. But this exception does not apply to those Russians who pronounce "*š*" as *šč*.

[14] For the statistics of the Lezghian phonemes, fairy tale no. 5 from the Supplement to P. K. Uslar's "Kjurinskij jazyk" in *Etnografija Kavkaza*, pp. 291–299, was counted.

[15] Cf. A. Martinet in *TCLP*, VI, 51 ff.

[16] Text No. IV in the collection of Karl Bouda, "Tschetschenische Texte," in *Mitteilungen des Seminars für orientalische Sprachen zu Berlin*, Jahrg. XXXVIII, Abt. II *Westasiatische Studien* (Berlin, 1935), 31–35, was counted as follows: the entire text for *tt*, *t*, *qqq*, *čč*, and *č*, only the first 300 words for *ll* and *l*.

[17] Recursive *p* does not occur once in the entire text investigated.

# PART II

# THE THEORY OF DELIMITATIVE ELEMENTS

## The Delimitative Function of Sound

### I PRELIMINARY REMARKS[1]

In addition to the phonological means serving to distinguish individual units of meaning (sememes), each language has a number of means that effect the delimitation of such individual units of meaning. These two functions of sound, that is, the distinctive function and the delimitative function, must be carefully distinguished. For language as such the distinctive function is indispensable: it is absolutely necessary that the individual sound complexes which correspond to the units of meaning be different in order not to be confused. For each sound complex to be sufficiently characterized as to its individuality, it must have specific "phonic marks" in specific sequence. Each language has only a limited number of such "phonic marks" which are combined into meaningful sound complexes in accordance with specific rules. This cannot be any other way; it is related to the nature of human speech. The external delimitation of meaningful complexes of sound, on the other hand, is not at all absolutely necessary. In an uninterrupted speech flow these complexes can occur in succession, without their boundaries needing to be indicated. Whether a particular one of these "phonic marks" (= realized phonemes) occurs at the end of a

meaningful complex of sound (= word or morpheme), or at the beginning of the immediately following complex of sound, can in most cases be surmised from the entire context. The possibility of a misunderstanding is in most cases very slight, especially as usually when one hears a linguistic utterance one is already attuned to a specific and very limited conceptual sphere, and one needs only to consider the lexical elements that pertain to this sphere. Still, each language possesses specific, phonological means that signal the presence or absence of a sentence, word, or morpheme boundary at a specific point in the sound continuum. But these means are only ancillary devices. They can probably be compared to traffic signals in the street. Until recently no such signals existed even in big cities. Even today they have not been introduced in all cities. It is possible to get along without them: one need only be more careful and attentive. Therefore they are not found on every street corner but only on some. Similarly, linguistic delimitative elements generally do not occur in all positions concerned but are found only now and then. The difference lies only in the fact that traffic signals are always present at "particularly dangerous" crossings, whereas the distribution of linguistic delimitative elements in most languages seems to be quite accidental. This is probably due to the fact that traffic is artificially and rationally regulated, while language shapes and develops organically. Yet, according to their psychological nature, linguistic delimitative elements do resemble traffic signals: every now and then the ones as well as the others permit a relaxation of attentiveness.

We designate the linguistic delimitative means as *boundary signals.* They can be classified on the basis of various principles: first, on the basis of their relationship to the distinctive function; second, on the basis of their homogeneous or complex character; third, according to whether they indicate the presence or the absence of a boundary; and fourth, according to what type of boundary they signal (that is, whether a word, morpheme, or sentence boundary is involved). In order to characterize a language, it is very important to determine what types of boundary signals dominate in that language, as well as the frequency of their use. The delimitative function of sound thus requires special statistics.

[1] Cf. N. S. Trubetzkoy, *Anleitung zu phonologischen Beschreibungen* (Brno, 1935), pp. 30 ff., and "Die phonologischen Grenzsignale," in *Proceedings of the Second International Congress of Phonetic Sciences* (Cambridge, 1936), pp. 45 ff.

# II PHONEMIC AND NONPHONEMIC BOUNDARY SIGNALS

In the discussion of structurally conditioned types of neutralization above (p. 235) we noted that some languages have certain distinctive oppositions found only in initial or final position in the units of meaning (words or morphemes). In all other positions they are neutralized. In such cases the marked members of the particular oppositions also have the value of boundary signals in addition to their phonemic (that is, distinctive) value because they occur only at the (initial or final) boundary of a unit of meaning. This is true, for example, for the aspirated occlusives of the Scottish-Gaelic dialect of Barra Island, the aspirated and recursive consonants of East Bengali, the recursive occlusives and emphatic palatalized consonants of Chechen, and others. The nasalized vowels, the long vowels, and the vowels of the central series (*y*, *ø*, *ə*) in the Scottish dialect of Barra Island, and all rounded vowels (*ū*, *u*, *ō*, *o*) in (the Kazum dialect of) North Ostyak[1] are likewise phonemes and boundary signals at the same time since they occur only in initial syllables. However, in this position they form distinctive oppositions (oppositions differentiating meaning) with the corresponding unmarked vowels. All cases mentioned involve a reductive neutralization of entire correlations in "nonboundary position." In "boundary position" entire categories of marked phonemes thus become boundary signals. But it may also be the case that only individual privative oppositions of phonemes, not correlations, are subject to reductive neutralization. However, the result in this case too must be the merger of the distinctive function of a particular marked opposition member

with the delimitative function. The unmarked opposition member, on the other hand, fulfills in this as in the case discussed above only a distinctive function. Classical Greek, for example, had the contrast between aspirated and unaspirated vowel onset in initial position only. Accordingly the aspirated vowel onset (spiritus asper) was simultaneously a phoneme with distinctive force (e.g.: "ὡς" [as], "ὧς" [ear], "ἕξ" [six], "ἒξ" [out]) and a signal marking the beginning of a word. Western Nuer has the opposition of voice in the occlusives of all localization series. While this opposition cannot be neutralized in the labial and the two apical series, it is subject to reductive neutralization in the guttural and palatal series. Accordingly the phonemes *g* and *j* occur only word-initially, where they are simultaneously phonemes and boundary signals.[2]

In addition to these *phonemic* boundary signals, many languages have special *nonphonemic* boundary signals. By this term we understand a combinatory variant (permissible in a boundary position only) of a phoneme that is permitted in other positions as well. For example, in Tamil obstruents are realized as aspirated voiceless occlusives ($p^h$, $t^h$, $k^h$) word-initially. However, in medial position they are realized in part as voiced and in part as spirantized (and in the case of gemination as unaspirated occlusives).[3] $p^h$, $t^h$, and $k^h$ are therefore here only boundary signals: the opposition $k^h$-*x* or $k^h$-*g* (or $p^h$-*v* or $p^h$-*b* and $t^h$-δ or $t^h$-*d*) has no distinctive force. In short, it cannot be used to differentiate words, but serves exclusively to delimit words: $k^h$ (or $p^h$, $t^h$) here always signals the beginning of a word. In the same language short *u* in final position is realized as a high back unrounded vowel ("*ɯ*"). Since it is not realized in this way in any other position, *ɯ* signals only the end of a word, and the opposition *u*-*ɯ* has no distinctive but only delimitative force. In Japanese a relationship of combinatory variance exists between *g* and *ŋ*. *g* only occurs word-initially, and *ŋ* only intervocalically. Accordingly the contrast between *g*:*ŋ* cannot here distinguish word pairs, but it does serve to delimit words, *g* always signaling the beginning of a word. In several languages certain fricatives are realized as "affricates" in initial position: in Upper Sorbian the voiceless guttural fricative *x* is always pronounced as a guttural affricate *kx* (written "kh") in morpheme-initial position. The same phenomenon can also be observed in some dialects of the Buryat language (Buryat Mongolian), as, for example, in the Alar dialect.[4] In the Sosva dialect of Vogul word-initial *s* is realized as a type of affricated "*c*."[5] And in the earlier-mentioned Western dialect of Nuer the phoneme that is elsewhere realized as an *f* is pronounced as a labiodental affricate *p̆* ("pf") word-initially. In all these languages the affricates in question are only combinatory variants of the respective fricatives. They serve only to signal



the beginning of a word (or of a morpheme). A nonphonemic boundary signal is likewise "the vowel onset preceded by a glottal stop" which is found in languages such as German, the Southern dialects of Polish, the Bohemian dialects of Czech, Armenian, etc. It is not a phoneme but merely a "natural way of pronouncing" vowels in morpheme-initial position.[6] In Finnish, on the other hand, the glottal stop is a phonemic boundary signal. It occurs only after vowels in word-final position, where it is in distinctive opposition, however, with "final vowels without a glottal stop" (e.g., "vie'" [lead]: "vie" [he leads]).

Finally, the so-called "nonfree" or "fixed" accent is also a nonphonemic boundary signal. Since all words with the same number of syllables (or morae) always carry this accent on the same syllable (or mora), the position of the accent cannot differentiate the meaning of words. However, it always indicates the relationship of the accented prosodeme to the word boundary.[7] In by far the majority of languages in question the "fixed" (dynamic) accent falls on the word-initial syllable. Take, for example, Gaelic, Icelandic, Lapp, Finnish, Livonian, Upper and in part also Lower Sorbian, Czech, Slovak, Hungarian, Chechen, Darghinian, Lak, Yurak-Samoyed ("Nenets"), Tavgi Samoyed ("Nganasan"), Yenisei-Samoyed ("Enets"), Vogul, Yakut, Mongolian, and Kalmuk. In other languages the fixed accent always occurs on the final syllable, as, for example, in Armenian, the Tawda dialect of Vogul, the overwhelming majority of Turkic languages, and in Tübatulabal (Shoshonean group of Uto-Aztecan). In all these languages the dynamic accent thus indicates directly with which syllable the word begins or ends. In some other languages the fixed accent is separated from the word boundary by a prosodeme. In other words, it falls on the second or on the penultimate prosodeme of the word. This type of fixed accent is not rare, but it seems to occur only in a geographically limited area. In Europe the fixed accent on the penultimate *syllable* is represented in Polish (with the exception of the Kashub dialects), in the neighboring dialects of Czech and Slovak, and the Eastern dialects of Lower Sorbian.[8] This same "accentuation of the penultimate" is further found in certain Bulgarian dialects of Macedonia and Albania.[9] The accent in the now extinct Polabian fell on the penultimate *mora* of the word.

However, the most important range of distribution in which the fixed expiratory accent falls on the penultimate syllable of a word is not in Europe but in Africa. It seems to comprise all the Bantu languages. As for the fixed accentuation of the second prosodeme, it appears to be especially widespread in American languages: above (in the discussion of the features of the mora-counting languages), reference has already been made to Southern Paiute and Maidu, where the expiratory primary accent falls on

the second mora of the word (p.174). In all these cases where a prosodeme separates the accent from the "word boundary," the accent does not signal the word boundary directly but merely the vicinity of the word boundary. The distance between accent and word boundary, however, is always the same. There are even more complicated cases, as, for example, the fixed accent on the antepenultimate syllable in certain Bulgarian dialects of Macedonia,[10] or the accent on the penultimate mora before the final syllable in Classical Latin. All these types of accentuation which are automatically determined by the number of prosodemes are incapable of differentiating meaning between word pairs. They serve only to signal the proximity of a word boundary, that is, they are nonphonemic boundary signals.

Inasmuch as the "fixed accent" signals a word boundary, it is actually only meaningful within a sentence. In a language where the final syllable of every word is accented, thus signaling the word boundary, this final accent should actually be omitted with respect to the last word of the sentence since the final boundary of the word is already sufficiently signaled by the final pause of the sentence. And this is in fact the case in many languages. According to E. D. Polivanov,[11] Korean accentuates the final syllable of every word. Only in the last word of the sentence is the initial syllable accented. In Uzbek the accent in all words falls on the final syllable. Only the verb forms of the preterite have the primary accent on the first syllable. This, according to Polivanov's very plausible opinion, is related to the well-known syntactic idiosyncrasy of Turkic languages, namely, that the finite verb occurs in sentence-final position. This idiosyncrasy might also explain the "retraction" of the accent in certain verbal forms of Ottoman Turkish, for example, in the present tense in *-jor-* and in the interrogative forms. In Czech, where the fixed accent falls on the word-initial syllable, monosyllabic conjunctions such as "a" (and), "že" (that), etc., are not accented. The reason for this is that they generally occur sentence-initially, and the initial boundary of a sentence need not be signaled. It is true, of course, that in most languages with a fixed accent the rules of accentuation have already become so automatic that sentence boundaries are no longer taken into consideration.[12]

[1] Cf. W. Steinitz, "Chantyjskij (ostjackij) jazyk," in *Jazyki i pis'mennost' narodov Severa*, I (1937), 200 ff.

[2] Cf. J. P. Crazzolara, "Outlines of a Nuer Grammar," in *Linguistische Bibliothek "Anthropos,"* XIII (1933).

[3] Cf. J. R. Firth, *A Short Outline of Tamil Pronunciation* (offprint of the new and revised edition of Arden's *Grammar of Common Tamil* [1934]).



[4] Cf. N. N. Poppe, "Alarskij govor" in *Materialy komissii po issledovaniju Mongol'skoj i Tuvinskoj Narodnych Respublik*, II (Leningrad, Akad. Nauk SSSR, 1930).

[5] Cf. V. N. Černecov, "Manzijskij (vogul'skij) jazyk," in *Jazyki i pis'mennost' narodov Severa*, I (1937), 171.

[6] In German the same pronunciation is also found medially in "hiatus position" (e.g., in "Theater"). However, words containing a sequence of two vowels which cannot be divided up morphologically are loanwords in German. Accordingly this is a case where a boundary signal is used to mark loanwords (see below).

[7] Cf. R. Jakobson, *O češskom stiche* (Berlin, 1923), pp. 26 ff., and in *Mélanges . . . van Ginneken*, pp. 26 f.

[8] Cf. L. Ščerba, *Vostočnolužickoje naréčije* (Petrograd, 1915), pp. 35 ff.; and Zd. Stieber, *Stosunki prokrewieństwa języków lużyckich* (Kraków, 1934), pp. 70 ff.

[9] Among others, for example, the dialect of Boboštica, cf. A. Mazon, *Documents, contes et chansons slaves de l'Albanie du Sud* (Paris, 1936).

[10] Cf. B. Conev, *Istorija na bălgarskij ezik*, I (Sofia, 1919), 465 ff.

[11] E. D. Polivanov, "Zur Frage der Betonungsfunktionen," in *TCLP*, VI, 80 f.

[12] French represents a very special case. Accentuation has nothing to do here with word boundaries. Its sole function is to organize speech into sentences, sentence sections, and sentence rhythm. The circumstance that a word in isolation is always accented on its final syllable is solely due to the fact that such a word is treated as a unit of sentence rhythm. French accent does not signal the end of a word as such but the end of a unit of sentence rhythm, a sentence section, or a sentence. Retraction of accent in French serves solely "phonostylistic" purposes.

# III INDIVIDUAL SIGNALS AND GROUP SIGNALS

The boundary signals discussed in the preceding chapter may be designated as *individual signals*. They either involve a single phoneme that occurs only at a word or morpheme boundary, or they involve a combinatory variant of an individual phoneme, which can only occur in a specific boundary position.[1] But there is still another type of boundary signal, namely, special combinations of (phonemic or nonphonemic) units which occur only at the boundary between two words or morphemes and therefore signal such a boundary. These may be designated as *group signals*.

*Phonemic group signals* are combinations of phonemes which occur only at a boundary between two units of meaning. The first part of such a combination belongs to the end of the preceding unit of meaning, the second to the beginning of the following unit. Boundary signals of this type are extremely numerous and varied. For example, with reference to German, the following combinations may be cited, to mention only two-member group signals: "consonant + h" ("ein Haus" [a house], "an-halten" [stop], "Wesen-heit" [essence], "der Hals" [the neck], "verhindern" [prevent], "Wahr-heit" [truth]); "nasal + liquid" ("an-liegen" [to border on], "ein-reden" [to convince oneself], "irrtüm-lich" [erroneous], "um-ringen" [to surround]); further, *nm*, *pm*, *km*, *tzm*, *fm*, *mw*, *mg*, *mch*, *mtz*, *nb*, *np*, *ng* (i.e., *ŋg* in contrast with *ŋ*), *nf*, *nw*, *pw*, *pfw*, *fw*, *chw*, *spf*, *schpf*, *schf*, *schz*, *ssch*, *fp*, *k*, *fch*, *chf*, *chp*, *chk*, etc.* With respect to

* *Translator's note:* In phoneme terms these are *nm*, *pm*, *km*, *cm*, *fm*, *mv*, *mg*, *mx*, *mc*, *nb*, *np*, *ŋg*, *nf*, *nv*, *pv*, *p̌v*, *fv*, *xv*, *sp̌*, *šp̌*, *šf*, *šc*, *sš*, *fp*, *k*, *fx*, *xf*, *xp*, *xk*.



French, the phoneme sequence "nasalized vowel + *m*" may be mentioned (e.g., *un marin*, *on mange*, *grand'mère*, *emmener*, *nous vinmes*); for English, the combinations *θs*, *δz*, *sθ*, *zδ*, *čt*, *čs*, *šs*, *sš*, *dz*, and very many others.

Similar phonemic group signals can probably be cited for most European languages,[2] but they are not rare in other geographical areas either. In Northern Greenlandic there are two types of consonant combination: "*r* + consonant" and "occlusive + consonant." The former occurs only in medial position, while the latter always occurs at the word boundary, the occlusive (*p*, *t*, *k*, or *q*) ending the preceding word, the following consonant beginning the next word. In Tonkawa (an isolated Indian language in Texas) the combination "two consonants + *č*" occurs only at the word boundary, the first consonant belonging to the preceding word. The combination "*č* + *š* + consonant" is here likewise a phonemic word boundary signal. In this case the boundary occurs between *š* and the following consonant.[3] In the Santee dialect of Dakota the combinations *tx̌*, *mt*, *mk*, *ms*, *mč*, *mx̌*, *sk'*, *x̌k'*, *gs*, *gč*, *gb*, and *np* occur only at the morpheme boundary.[4] It follows from the rules for the use of consonants and consonant combinations in initial and final position given by Ida C. Ward that in Efik the combinations "*k*, *d*, *p* + consonant," "t + consonant except *r*," "*m* + nonlabial consonant," and "*n* + nonapical consonant" can only arise upon contact between two words in syntactic context.[5] Accordingly they are phonemic group signals. With respect to the Turkic languages, a great deal of instructive material can be found in chapter 12 of W. Radloff's *Phonetics*. In the Altai and Abakan dialects and in Kazakh-Kirghiz (now Kazakh) the combination "(voiceless) obstruent + sonorant (*j*, *m*, *n*, *r*, *l*)" occurs only at the place of contact between two words. In the Altai dialects the combinations *tp*, *ts*, *tč* (= *čč*), *pp*, *st*, *sč*, *sp*, *št*, *šč*, *šp*,

*šs*, *čq*, *čk*, *čt*, *čs*, and *čp* signal either the morpheme (*op. cit.*, pp. 226 f.) or the word boundary. In Kazakh-Kirghiz (p. 231), the Northern Abakan dialects (p. 229), and the Altai dialects, with the exception of Teleut, original *pq* and *pk* became *qp* and *kp* in medial position (so far as it could not be divided morphologically). The combinations *pq* and *pk* in these dialects today accordingly always signal a morpheme (or word) boundary. The same is true for the combinations *qs* and *ks* in the Abakan dialects (p. 229). In Yakut the phoneme sequences *t* + *k*, *t* + *s*, and *s* + *t* always signal a word boundary (pp. 236 and 238). In Lak consonant combinations that include a liquid or a nasal are permitted within a morpheme. The combinations of two obstruents are always boundary signals. The combinations "obstruent + *s*" occur at the morpheme as well as the word boundary. The remaining combinations of obstruents occur only at the place of contact between two words in syntactic context. Avar, which otherwise permits a great variety of consonant combinations within a morpheme, does not allow the phoneme sequence "labial + liquid" within a word. In cases where it should occur metathesis takes place. For example: "qomòr" (wolf): ergative *qormìc'a* (< **qomrìc'a*); "xibìl" (side): ergative *xolbòc·a* (< **xilblòc·a*); also such loanwords as "ilbis" (satan) = Arabic "iblis," "q'ilba" (south) = Arabic "quibla." The phoneme sequence "labial + liquid" therefore occurs here only at the place of contact between two words within a sentence (e.g., "k'udìjab ròso" [big village], "qàḫab lèmag" [white sheep]). It must be regarded as a phonemic group boundary signal.

There are languages in which units of meaning are delimited in advance by their phonemic structure. This is the case in the so-called "monosyllabic" or "isolating" languages. In Burmese, where all words (i.e., morphemes) are monosyllabic and consist either of a vowel phoneme or of the phoneme sequence "consonant phoneme + vowel phoneme," the phoneme sequences "vowel phoneme + vowel phoneme" or "vowel phoneme + consonant phoneme" can only occur at the place of contact between two words in a sentence. They are therefore phonemic group boundary signals. In Northern Chinese, where a morpheme can either end in a vowel or in a diphthong, or in an indeterminate nasal (or in an indeterminate liquid, but not in all dialects), and where it can begin either with a vowel or with a consonant, the boundary between two morphemes is usually also signaled quite unambiguously by phoneme sequences (e.g., by the sequences "nasal + consonant," "liquid + consonant," "vowel + consonant"). The sequences "vowel + vowel" are usually unambiguously phonemic group signals since not all vowels form diphthongs with each other. And only in exceptional cases is the phonemic structure of



such a sequence not sufficient to delimit the morphemes from each other (e.g., in a sequence such as *u̯aio̯* = *u̯ai̯* + *o*, or *u̯a* + *i̯o*). In cases of this type nonphonemic factors will decide.

Just as common as phonemic group boundary signals are nonphonemic group boundary signals. The opposition between velar and palatal *x* as well as *g* in German may be cited as an example. The syllables *xə* and *gə* ("che," "ge") are pronounced with a velar *x* and *g* after back vowels (*u*, *o*, *a*, *au*: "suche" [seek], "Woche" [week], "Wache" [watch], "rauche" [smoke], "Fuge" [fugue], "Woge" [wave], "sage" [say], "Auge" [eye]), but with a palatal *x* and *g* in all other positions. One may therefore be led to believe that the opposition between palatal and velar *x* and *g* is quite irrelevant before a *ə*. In reality the velarizing effect of the preceding *u*, *o*, *a*, and *au* does not extend beyond the scope of one morpheme. In "im Zuge stehen" (to stand in a draught/in a train) the *g* is velar because it belongs to the same morpheme as the preceding *u*. In "zugestehen" (to confess), however, the *g* is palatal because a morpheme boundary exists between it and the *u* (*cu-gə-šte-n*). Likewise, in "machen" (to make) the *x* is velar because it belongs to the same morpheme as the *a* (*max-n*); but in "Mamachen" (mother, dimin.) the *x* is palatal because a morpheme boundary exists between it and the *a* (*mama-xən*). The palatal realization of *g* and *x* after a back vowel in German is thus a nonphonemic group boundary signal. As for English, reference may be made to the distribution of the two types of *l*. The rule says that *l* is pronounced "clear" before vowels but "dark" before consonants and in final position. But instead of "before vowels" one should rather say "before a vowel of the same word." For this rule is not effective across word boundaries. Accordingly the *l* in "we learn" (phonet. *wilə:n*) is "clear" but "dark" in "will earn" (phonet. *wiɫə:n*). Clear and dark *l* in English are therefore only two combinatory variants of a single phoneme. But in the phoneme sequence "vowel + *l* + vowel" the opposition between the clear and the dark variant of the phoneme *l* has a delimitative function. "Dark realization" of the phoneme *l* in such a phoneme sequence indicates that there is a word boundary between the *l* and the following vowel. In Russian (as in German or English) the contrast between palatal and velar *k* is nonphonemic: before *e* and *i*, *k* is pronounced as a palatal; in all other positions it is pronounced as a velar. But this rule does not apply across the boundaries of a word. If a word ends in a *k* and the next word begins with an *e* or an *i*, the *k* remains velar, and the vowels *i* and *e* are shifted toward the back correspondingly (*e* > *ɛ*, *i* > *ɯ*). For example: "k etomu" (to this) pronounced *kɛtəmŭ* (but "keta" [a Siberian type of fish] pron. *k'etă*); "mog eto" (could this) pronounced *mɔkɛtə*; "k izbam" (to the huts) pronounced *kuzbəm* (but

"kis by" [would become sour] pronounced *k'izby*); "drug i prijatel'" [bosom friend] pronounced *drùkŭ pr'ijǽt'il'* (but "ruki prijatel'a" [the hands of a friend] pronounced *ruk'ĭ pr'ijǽt'il'ə*). The sequences *kE* and *kш* in Russian thus are group boundary signals that indicate the presence of a word boundary between the phoneme *k* and the following vowel phonemes *e* or *i*. Before *e* only palatalized consonants are permitted within a morpheme in Russian. The correlation of palatalization is thus neutralized in this position. However, if a morpheme boundary occurs before the *e*, the preceding consonant can also remain unpalatalized. For example: "s-etim" (with this), "iz-etogo" (from this), "v-etom" (in this), "pod-etim" (under this), "ot-etogo" (from/of this). These are pronounced *set'ĭm, iztəvə, vɛtəm, pădetĭm, ătɛtəvə* respectively. The absence of a palatalization before the phoneme *e* is a nonphonemic group signal for a morpheme boundary. The Russian phoneme *ă* (unaccented *a*) is realized as an *a* in initial position, after vowels, and in directly pretonic syllable, but as a *ə* elsewhere. In a sequence such as in the following phrase "zvùkabrŭvə̀(j) icərǎzəm" a morpheme boundary has to occur before the first *a* (*a* would have to be realized as a *ə* after a *k* in an unaccented, directly pretonic syllable). But a word boundary must also occur between *ə* and *r* because in a directly pretonic syllable in the same word *a* could not be realized as a *ə* but has to be realized as an *a*. Accordingly there is only one way in which to divide the above phoneme sequence: "zvuk ăbrŭvə̀jĭcə rə̀zəm" (phonol. "zvuk *ăbrĭvajĭcă razăm*" [the sound stops abruptly]). The phones *a* and *ə* in Russian are thus combinatory variants of the phoneme *a*. In their relationship to the accented syllable they form a part of group signals for word boundaries.

A special type of nonphonemic group signal is represented by what is called "vowel harmony." Certain border cases exist here between nonphonemic and phonemic boundary signals. We have already discussed the vowel system of Ibo, where a word can either contain only open or only close vowels (p. 109). If in this language a syllable with an open vowel occurs next to a syllable with a close vowel within the context of a sentence, a word boundary has to be present between these syllables. It is obvious that a group signal is involved here, but it is not quite clear whether this signal is phonemic or nonphonemic. On the one hand, open and close vowels are different phonemes that have distinctive force in certain positions (namely, in the first syllable of the root). On the other hand, the opposition between open and close vowels is neutralized in noninitial root syllable (in accordance with the law of vowel harmony). A similar case appears to exist in Finnish. As already mentioned (p. 102), the oppositions *u-y*, *o-ö*, and *a-ä* are there neutralized in noninitial syllable



after a syllable containing *u*, *y*, *o*, *ö*, *a*, or *ä*. Only *u*, *o*, and *a* can occur after *u*, *o*, and *a*, and only *y*, *ö*, and *ä* after *y*, *ö*, and *ä*. Should these vowels occur in a different sequence in syntactic context (e.g., "hyvä poika" [good boy], "iso pyssy" [big can]), this signals the presence of a boundary between the two words. But there are also clearer cases of nonphonemic boundary signals associated with vowel harmony. In Lamba unaccented *e* and *o* in word-initial syllable are realized as close *e* and *o* after a syllable containing *ē*, *ō*, *ī*, *i*, *ū*, and *u*. In all other cases they are realized as open *ɛ* and *ɔ*.[8] Open realization of these phonemes after a syllable containing *i* and *u* is thus a sign that a word boundary falls between these phonemes. Likewise in Zulu, where *e* and *o* are close before a syllable containing *i*, *u*, *m*, and *n* of the same word, and open elsewhere (*ɛ* and *ɔ*),[9] open realization of the phonemes *e* and *o* before a syllable with *i*, *u*, *m*, and *n* signals the presence of a word boundary immediately after *e* and *o*. In Tamil *e*, *ē*, *o*, and *ō* are realized as close vowels before *i* and *ī* and as open vowels before *a* and *ā*.[10] Where this law is disturbed, a word boundary is found after the phonemes *e*, *ē*, *o*, and *ō*. From "vowel harmony" in the proper sense, the so-called *synharmonism* must be distinguished. It is found most clearly in certain Turkic languages, for example, in Volga Tatar, or Kazan Tatar, Bashkir, Kazakh-Kirghiz or Kazakh, and in the Kipchak dialects of Uzbek. From a purely phonetic point of view, synharmonism consists in that each word in the particular language can either contain only front vowels and palatalized consonants or only back vowels and velarized consonants.[11] Since such synharmonism is only effective within the frame of a word, the sequences "palatalized consonant or front vowel + velarized consonant or back vowel" and "velarized consonant or back vowel + palatalized consonant or front vowel" are a sign of the presence of a word boundary between the two constituents of that sequence. In the same languages a different series of nonphonemic group signals for word boundaries also results from the laws of so-called labial attraction. According to these, vowel phonemes in word-noninitial syllable which phonologically are not characterized by any class of timbre are realized as rounded vowels after certain rounded vowels.[12] A word boundary is found at the point of the sound continuum where this law is violated. Phenomena related to synharmonism and labial attraction outside the Turkic languages are also found in some Finno-Ugric languages and in the Mongolian and Tungus languages. They always function as signals of word boundaries.

Synharmonism can be compared to tonality in music. In a "synharmonic" language each word is like a string of sounds moving within a particular key. But there are only two such keys in the language, and

synharmonism utilizes the change in key in the context of a sentence to signal the word boundary. But just as the word in "synharmonic" languages is, as it were, a unit of timbre, there are other languages in which the word is regarded as a specific *rhythmic unit*. These are languages with unfree, fixed accentuation which, in addition to a primary accent, also have secondary accents (which are also automatically determined). Sometimes all quantity relationships, and even the qualitative marks of the vowels and consonants, are affected by the distribution of the expiratory accent. For example, in Southern Paiute (Shoshonean group of the Uto-Aztecan language family), in which the primary accent falls on the second mora, and the secondary accent on the even morae of a word (i.e., on the fourth, sixth, eighth, etc.), the "weak" morae (i.e., morae that have neither primary nor secondary accent) are voiceless before geminated consonants. Before such voiceless vowels the occlusives are pronounced as voiceless aspirates, and the continuants (fricatives, nasals, and *r*) as voiceless consonants. Before voiced vowels, on the other hand, the occlusives are (voiceless but) unaspirated, and the continuants are voiced except for the sibilants. A short vowel in word-final position is always voiceless, regardless of accent distribution.[13] The rhythmic structure of the word is accordingly reinforced here by the realization of all phonemes. Any disturbance of this rhythmic inertia, which always signals the end of a word and the beginning of another, thereby acquires a special potency. In most Finno-Ugric and Samoyed languages with a fixed initial accent, the secondary accents fall on uneven syllables or morae (i.e., on the third, fifth, seventh, etc.).[14] This produces a certain rhythmic inertia that, when disturbed, is a signal of the word boundary. In some of these languages this rhythmic inertia of the word is reinforced by various other means that are partially phonemic and partially nonphonemic. For example, in the Sea Lapp dialect of Maattivuono neither *c*, *ɜ*, *č′*, *ǯ′*, *d′*, *γ*, *δ*, *ŋ*, *n′*, *l′*, nor geminated consonants can occur directly after the vowel of an even syllable (i.e., the second, fourth, sixth, etc.). The number of consonant combinations that occur in this position is also very limited (*sk*, *st*, *sn*, *št*, *šD*, *jD*, *lD*, *rD*, *lG*, *rG*, *lm*). In addition to these phonemic means that serve to underline the opposition between even and uneven word syllables, there also exist nonphonemic means: the vowels of even syllables are "excessively short" and whispered when they occur between voiceless consonants; the fortes *p*, *t*, *k* are always aspirated after vowels of even word syllables. The trochaic rhythm of the word is thereby anchored not only in the accentual relationships but also in the entire phonic makeup of the individual syllables. Further, the "tempo" in which the word syllables are realized depends on the total word. The length of the same etymologically long or



short vowel in the same consonant environment is determined by whether it occurs in word-initial syllable or noninitial syllable, and further by the number of syllables of the word in question.[15] The word in this Lapp dialect thus is a rhythmic unit. A violation of the rhythmic inertia of individual points in the context of a sentence is a signal of the word boundaries. It may be noted that in languages such as Lapp the tendency for a nonphonemic (phonetic) joining of words into rhythmic units appears especially clearly. But this tendency is also found in many other languages in a less clear form (not all of these are languages with a fixed accent).

That the word can also be a *melodic* unit is readily evident. This is, of course, especially the case in those languages where the accent is primarily "musical," in other words, in mora-counting languages. In Lithuanian pretonic syllables are musically rising within the frame of a word, while posttonic syllables are musically falling.[16] Where this relationship is disturbed in the speech continuum, that is, in places where a musically falling syllable occurs before a musically rising syllable, a word boundary must occur between the two syllables. Accordingly a nonphonemic group signal for the word boundary results here too from the total melodic structure of the word.

In conclusion it should be mentioned that in certain cases it is difficult to decide whether a nonphonemic or a phonemic boundary signal is involved. In certain Middle Indic ("Prākrit") dialects, for example, in Mahârâshṭrî, the occlusives *p*, *ph*, *b*, *t*, *th*, *d*, *dh*, *k*, *kh*, *g*, *gh*, *c*, *ch*, *j*, *jh* were always geminated after a short vowel medially or in a noncompounded word. In ungeminated form these occlusives occurred after a short vowel only when they were found initially in the second member of a compound. For example: "digghakaṇṇo" (long ear) = "diggha" (long) + "kaṇṇo" (ear). The geminated and the nongeminated occlusives of the labial, apical, guttural, and palatal series thus could be regarded as two combinatory variants, and the combination "vowel + nongeminated occlusive" as a nonphonemic group signal of the word boundary (or of the boundary between the constituents of a compound). But this relationship was disturbed in that in Mahârâshṭrî certain consonants participated in a distinctive correlation of gemination (namely, the voiced retroflex occlusives *ḍ* and *ḍh*, the nasals *ṇ* and *m*, the liquid *l*, and the spirant *s*).[17] This would create a feeling of evoking a sense for the phonemic value of the oppositions of consonant gemination, so that the *k* (in "digghakaṇṇo" [long ear]) and *kk* (in "vakkala" [cow]) were perhaps not regarded as combinatory variants, but as two different phonemes. (In such event the combination "vowel + nongeminated labial, apical, guttural, or palatal" had to be considered a phonemic group signal.)

Following this chapter some remarks will be made on combinatory variants. Recently a voice has been raised among phonologists to remove the study of combinatory variants from the domain of phonology.[18] According to this view, combinatory variants belong to the domain of parole. They owe their existence to the physiology of speech sounds. Consequently they have nothing to do with phonology. If phonologists still make mention of combinatory variants and take them into consideration, this is a vestige of the old phonetic orientation, or it is done in consideration of the diachronic (historical) study of sounds. A misinterpretation of the role of combinatory variants is obviously involved here. Combinatory variants are not merely causally but also teleologically conditioned phenomena that have a specific purpose and perform a definite function.[19] This function always consists of signaling the direct proximity of another linguistic element, which may be either a specific phoneme or a (word or morpheme) boundary, or both. Now, it is clear that where a combinatory variant signals a word or morpheme boundary directly, its function belongs to the domain of the system of language (langue). For the delimitation of morphemes within a word is no less "glottal" than the differentiation of words. On the other hand, a combinatory variant that merely signals the proximity of a phoneme clearly belongs to the domain of the act of speech. For only insofar as the speech act is concerned is it meaningful to assure the perception of a phoneme, not only by its own realization but also by specific peculiarities in the realization of the neighboring phonemes. Such an "assurance of perception" presupposes an orientation toward speech, which is characteristic for the domain of parole but alien to the system of language (langue). Those combinatory variants that signal at the same time the proximity of a phoneme and the relationship to the (word or morpheme) boundary represent a case of transition. Combinatory variants of this type (i.e., nonphonemic group signals), hover between the system of language and the speech act, thus requiring the attention of the phonologist as well as that of the phonetician. Specific word sequences, of course, in which nonphonemic group signals mark the word boundaries, occur only in the speech act. However, the rules for pronunciation, which yield these group signals, belong to the domain of the system of language, just as do the syntactic rules for word ordering and concordance.

[1] Likewise the "fixed accent" is nothing more than a special combinatory variant of an individual syllable nucleus (marked by loudness of voice).

[2] For Czech, compare, for example, the list given by B. Trnka in his study "Pokus o vědeckou teorii a praktickou reformu těsnopisu," in *Facultas Philosophica Universitatis Carolinae, Sbírka pojednáni a rozprav*, XX (1937), 40 ff.



[3] Cf. Harry Hoijer, "Tonkawa, an Indian Language of Texas," in *Handbook of American Indian Languages*, III (The University of Chicago Press).

[4] Cf. Franz Boas and R. J. Swanton in *Handbook of American Indian Languages*, I (*Bureau of American Ethnology*, Bulletin XL), 882.

[5] Cf. Ida C. Ward, *The Phonetic and Tonal Structure of Efik* (Cambridge, 1933).

[6] W. Radloff, *Vergleichende Grammatik der nördlichen Türksprachen*, I: *Phonetik der nördlichen Türksprachen* (Leipzig, 1882).

[7] Cf. N. Jakovlev, *Tablicy fonetiki kabardinskogo jazyka* (Moscow, 1923), pp. 70 f.

[8] Cf. Clement M. Doke, "A Study of Lamba Phonetics," in *Bantu Studies* (1928).

[9] Cf. Clement M. Doke, "The Phonetics of the Zulu Language," in *Bantu Studies*, II (1926), Special Number.

[10] Cf. J. R. Firth, *A Short Outline of Tamil Pronunciation* (1934).

[11] Cf. Halimdžan Šaraf, *Palatogrammy zvukov tatarskogo jazyka* (Kazan, 1927), especially pp. 35 ff. Phonologically the matter appears differently. The consonant *j* does not have any palatalized or velarized variants, and many words consist only of vowels and *j* ("aj" [moon], "aju" [bear], etc.). Accordingly it is possible for vowel phonemes to have a specific property of timbre independent of consonantal environment, while the consonants are palatalized or velarized only in connection with vowels. (The vowelless interjections such as *pšt*, *k'l't'*, etc., which are cited by H. Šaraf, are no ordinary words.) Oppositions of timbre are therefore phonemic for vowels. The palatalized and velarized variants of the consonants represent only combinatory variants without distinctive (but with delimitative) force.

[12] On this point, cf. W. Radloff, *op. cit.* (Chaps. I–III), and a clear survey by V. A. Bogorodickij, *Étjudy po tatarskomu i tjurkskomu jazykoznaniju* (Kazan, 1933), pp. 58–73.

[13] Cf. Edward Sapir, "The Southern Paiute Language," in *Proceedings of the Amer. Acad. of Arts and Sciences*, LXV, nos. 1–3, pars. 8–10, 12.

[14] The uneven morae of a word receive secondary accents in Tavgy-Samjoyed ("Ngasan"). For example: "kúa" (birch): loc. "kúatànu"; but "lū" (dress): loc. "lū'tànu," etc. Otherwise most of these languages have the secondary accent on the uneven *syllables* (G. Prokofjev in *Jazyki i pis'mennost' narodov Severa*, I, 56).

[15] Paavo Ravila, *Das Quantitätssystem des seelappischen Dialektes von Maattivuono*, pp. 56 f., 59 ff., and 78 f.

[16] A similar situation may probably also be assumed for Proto-Slavic.

[17] Cf. R. Pischel, "Grammatik der Prakrit-Sprachen" (*Grundr. d. indoarischen Philol.*, Strassburg, 1900), and H. Jacobi, "Ausgewählte Erzählungen im Mâhârâshṭri."

[18] L'udovít Novák, "K základným otázkám štrukturálnéj jazykovedy" (*Sborník Matice Slovenskej*, XV (1937), no. 1).

[19] Cf. N. Jakovlev, *Tablicy fonetiki kabardinskogo jazyka* (Moscow, 1923), pp. 73 ff.

# IV POSITIVE AND NEGATIVE BOUNDARY SIGNALS

The boundary signals discussed so far were positive. In other words, they indicated expressly that a word or morpheme boundary was present at the particular position. But there may also be *negative* boundary signals whose express function is to indicate the absence of a boundary in a particular position. Their role could be compared to the green lights that indicate to the traveler that all is well at the particular crossing and that he may proceed safely. However, in addition to such *generally negative* boundary signals, language also possesses *bilaterally negative* boundary signals. These merely indicate that no new word can begin or no word can end in a particular position. All negative boundary signals can either be phonemic or nonphonemic. They may be group signals or individual signals. Several examples of each of these types of negative boundary signals will follow.

## 1 PHONEMIC NEGATIVE BOUNDARY SIGNALS

### A Individual Signals

By phonemic negative individual signals those phonemes are to be understood that are permitted only word- or morpheme-medially in a language. In Finnish the phonemes *d* and *ŋ* (always geminated, *ŋŋ* written *ng*) belong to this category. In Tamil *ŋ*, retroflex *ɻ*, and *ɭ*, and the guttural liquid *ʎ* belong here. In Kazakh (formerly Kazakh-Kirghiz) and in Kirghiz (formerly Karakirghiz), as well as in the Turkic dialects of the Irtysh Basin, the voiced gutturals *γ* and *g* occur neither initially nor finally, only



medially. In Tübatulabal all voiced obstruents (*b*, *d*, *g*, *ʒ*, *ǯ*) occur exclusively medially. In Efik *h* and *r* are found medially only.

As bilateral negative signals the *ŋ* in German, English, Dutch, Danish, Norwegian, and Swedish, and French *n̨* (*gn*), can be mentioned. They are permitted in medial and final position, but not initially. The same is also true as follows: for *r* in Chechen and Tungus; for the "only liquid" in Korean (which is realized as an *r* intervocalically and as an *l* finally); for *p*, *t*, *k*, *q̣*, *ʒ*, *ǯ*, *θ*, *δ*, *γ*, *n̨*, and *l* in the Sea Lapp dialect of Maattivuono; for *b*, *d*, *k*, *g*, *c*, and *ć* of Yurak Samoyed; and for *p* of Efik. On the other hand, the *h* in German, English, Yurak Samoyed, Artshi, etc., is only permitted in initial and medial but not in final position. The same holds true for *g*, *k*, and *k'* in Haida, and for *f*, *s*, *n̨*, and *kp* in Efik. There are languages that finally only permit vowels, or in addition to vowels, only a very small number of consonants: *ν*, *ρ*, *σ* in Classical Greek, *n*, *r*, and *l* in Italian, and *n*, *t*, and *s* in Finnish, etc. In languages of this type all consonants, except those mentioned, may be regarded as signals that "negate final position."

### B Group Signals

Finnish does not permit any consonant combinations initially and finally. Furthermore, only vowels and the consonants *n*, *t*, and *s* occur in final position. Any consonant combination in which *n*, *t*, or *s* does not occur as a first member is, accordingly, a negative phonemic group signal. In words such as "kahdeksan" (eight), "hupsu" (stupid), "selkä" (back), etc., the combinations *hd*, *ks*, *ps*, and *lk* point to medial position. The same function is here also fulfilled by all geminated consonants (with the exception of *nn*, *ss*, and *tt*; these may occur not only medially but also at the word boundary. For example: "mies seisoo" [the man is standing],

"pojat tansivat" [the boys dance], "nainen neuloo" [the woman sews], etc.). In languages such as Russian, where obstruents are always voiceless in final position, the combination "voiced obstruent + vowel or sonorant" is always a sign that no word boundary is present between the components of this combination. In Northern Greenlandic, where *r* cannot occur in final position, the combination "*r* + consonant" is always a sign of medial position. The same is also true for the combination of "*l* + consonant" (except *s*) in Classical Greek. In German the combination *dl*, which occurs only word-medially, seems to be the only negative phonemic group signal. Negative phonemic group signals in general are a relatively rare phenomenon.

## 2 NONPHONEMIC NEGATIVE BOUNDARY SIGNALS

### A Individual Signals

In cases where a phoneme is realized in a particular way initially or finally, any other realization of this phoneme is consequently a negative boundary signal. As already discussed above, aspiration of $p^h$, $t^h$, and $k^h$ in Tamil must be regarded as a positive nonphonemic boundary signal. It is only realized in this way word-initially. The realization of the same phonemes as fricatives ($\upsilon$, $\delta$, $x$, or $h$ respectively) must be regarded accordingly as a negative nonphonemic boundary signal since it occurs only medially (intervocalically). In Japanese, where "*g*" initially is realized as the voiced obstruent *g*, and medially as a nasal $\eta$, *g* is a positive and $\eta$ a negative nonphonemic boundary signal. In Korean, where the "only liquid" is realized as an *l* finally, and as an *r* medially, the *l* is a positive, the *r* a negative nonphonemic boundary signal. In many Turkic languages of Siberia (e.g., in the dialects of Altai of the Baraba Steppe, in Teleut, in Shor, and in the Küärik dialect) all obstruents are realized as voiceless in initial and final position (i.e., as *q* or *x* respectively, and as *k*, *p*, *t*, *s*, *š*, and *c* or *č* or *ṭ* respectively). They are realized as voiced medially between vowels, however ($\gamma$, *g*, *b*, *d*, *z*, *ž*, and *ǯ*),[1] thus creating negative nonphonemic boundary signals. In Ostyak, too, the obstruents are voiceless in initial and final position. But medially they are more or less voiced.[2] In German and Hungarian *h* is voiceless initially (in Hungarian also finally), but voiced medially between vowels (Uhu! Oho).[3]

### B Group Signals

What has been said with regard to individual signals also holds true for negative nonphonemic group signals. As a rule, a positive nonphonemic group signal has a negative counterpart. For example, in German the sequence "back vowel + palatal *g*" is a sign of the existence of a morpheme boundary between these two phones. The sequence "back vowel + velar *g* (before *ə*)," on the other hand, indicates the absence of a boundary



between the vowel and *g*. In English the sequence "dark *l* + vowel" is a positive nonphonemic boundary signal. The sequence "clear *l* + vowel," on the other hand, indicates that no word boundary is present between these two components. Most of the examples for positive nonphonemic group signals, cited above, have negative group signals as their counterparts. However, this is not always the case. In a language with consistent synharmonism the disturbance of such synharmonism represents a positive boundary signal (e.g., the contact of a front vowel with a velarized consonant). However, synharmonism of this type has neither positive nor negative signaling value since it is very possible that two words "with back vowels" or two words "with front vowels" occur next to each other without affecting the synharmonism.

To the negative nonphonemic group signals belongs also lengthening of medial accented vowels in Italian. As is known, final accented vowels are never lengthened. Only accented vowels of the penultimate and antepenultimate syllable are lengthened, and, more precisely, they are only lengthened before a vowel, before an intervocalic consonant, or before the combination "consonant + liquid (*r*, *u̯*, and *i̯*)." If one considers that the word-final syllable in Italian can be accented only if it ends in a vowel, and, on the other hand, that in Italian a word can either begin only in a vowel or in a single consonant, or in a cluster "consonant + *r*, *u̯*, *i̯*," or in the combination "*s* + consonant," the purpose for lengthening the accented vowel in Italian becomes perfectly clear. Such lengthening precludes the presence of a word boundary after an accented vowel. Accordingly it occurs only in those positions where such a word boundary could be surmised, that is, before those phones and combinations of phones that can also occur initially. Before "*m*, *n*, *l*, *r* + consonant" a lengthening of accented vowels would serve no purpose. For after an accented vowel these combinations are already (phonemic) negative group signals. Only before the sequence "*s* + consonant" can the absence of a lengthened accented vowel lead to misunderstandings. For example, one could analyse the sequence "velocità straordinaria" as "velocitastra ordinaria." However, words beginning with "*s* (or *z*) + consonant" account for only somewhat less than 8 percent of the entire vocabulary in Italian. Cases in which the possibility for such misinterpretations exists are therefore not very numerous. Lengthening of accented vowels accordingly remains one of the most important negative nonphonemic group signals of Italian.

[1] Cf. W. Radloff, *op. cit.*, pp. 128 ff., 173 ff., and 199 f.

[2] However, only optionally with strong individual fluctuations. Cf. W. Steinitz in *Jazyki i pis'mennost' narodov Severa*, I, 202.

[3] Likewise also in Yurak-Samoyed, cf. G. N. Prokofjev in *Jazyki i pis'mennost' narodov Severa*, I, 13.

# V THE USE OF BOUNDARY SIGNALS

Individual languages vary considerably in their use of boundary signals. In some languages it is the morpheme boundaries that are signaled primarily or even exclusively, in others it is the word boundaries. To the first type belongs German, for example. All boundary signals valid for word boundaries in German are also valid for morpheme boundaries. In addition, there are several signals that are valid only for morpheme boundaries, but not for word boundaries. The consonant cluster *dl* (as in "redlich" [honest], "Siedlung" [settlement]) seems to be the only signal in German which does not relate to the morpheme but to the word. It is a negative phonemic group signal. Conversely, there are many languages where morpheme boundaries are not signaled at all but where word boundaries are indicated by specific boundary signals. Among these is Finnish, where word boundaries are characterized positively by a fixed initial accent, and negatively by *d* and *ŋ*, geminates (except for *tt*, *nn*, and *ss*), and consonantal clusters (except for *n*, *t*, and *s* + consonant). Morpheme boundaries, on the other hand, have no specific marks, and sometimes even fall within a "long" (geminated) phoneme (e.g., "talo" [house]: illative "taloon"; "vesi" [water]: partitive "vettä"). Mixed types can be found in many languages, to be sure. For most languages, however, a certain preference for either morpheme boundaries or word boundaries can be noted. These two basic types are important for the entire structure of the vocabulary. The positive phonemic boundary signals are also used without a delimitative function in loanwords as a substitution for foreign phonemes and phoneme combinations. This is done without any difficulty in the case of



positive individual signals. But it is not so easy to transfer a negative phonemic individual signal to an unusual phonic position. For a German it is not easy to pronounce "exotic" proper names beginning with an *ŋ* ("ng"). Equally difficult for a Finn are loanwords beginning in a *d* or ending in a *v*. As far as phonemic group signals are concerned, their use without a delimitative function to reproduce foreign phoneme combinations is only possible in those languages where these boundary signals already characterize morpheme boundaries. In German, words such as "pneumatisch" (pneumatic), "Sphäre" (sphere), "Szene" (scene), "Kosmos" (cosmos), etc., are easily pronounceable because the phoneme clusters *pn*, *sf*, *sc*, *sm* occur also in native German words as phonemic group signals for morpheme boundaries (e.g., "abnehmen" [reduce], "Ausfuhr" [export], "Auszug" [departure], "ausmachen" [amount to]). But in Avar, where the combination "labial + liquid" is a group signal not of the morpheme boundary but of the word boundary, this combination is not even permitted in loanwords. The way in which individual languages signal morpheme or word boundaries thus exerts a certain influence on the receptivity of these languages to loanwords.

Phoneme combinations that function as boundary signals in native words, but occur without this function in loanwords, are, of course, quite bothersome. Too frequent a use of loanwords in which such combinations are present weakens their delimitative capacity. Styles marked by the frequent use of loanwords are therefore also characterized by a weakening of the delimitative function because the phonemic boundary signals themselves are weakened. In a language otherwise rich in phonemic boundary signals, and specifically oriented toward morpheme delimitation, a large discrepancy arises between the "ordinary" style and the style

characterized by the use of loanwords. The latter style appears as a particularly cumbersome, strenuous style. This is one of the reasons for the purism found in certain languages, that is, the endeavor to create a scholarly language without loanwords. Such organic purism, which has its roots in the phonological structure of the language, must in principle be distinguished from an external type of purism conditioned by culture history. The German type of purism is more of the organic type. The German language did not have to fight for its existence or emancipation. For the role of German as an international language, the absorption of as many loanwords as possible would be rather advantageous (as is the case, for example, with English). The fact that in German from time to time strong puristic tendencies make themselves successfully felt nevertheless is due for the most part to the specific phonological structure of German, to the relatively small number of morpheme types, to their pregnant phonological structure, and to the large number of phonemic boundary signals by which the morphemes are clearly delimited from each other.

The distinction between languages that are predominantly delimitative with respect to words and those predominantly delimitative with respect to morphemes is not the only distinction of significance for the typology of the delimitative function. It is also very important to determine what types of boundary signals are preferred and how these signal types are distributed. For example, it is important to determine whether nonphonemic boundary signals are utilized to mark word boundaries, and phonemic signals to mark phoneme boundaries. Of importance is, further, the direction of bilaterally negative boundary signals and the position of positive individual signals; most languages show a preference for signaling the beginning of a new word. However, there are also those languages that primarily signal the end of a word.

Certainly most important for the characterization of a language with reference to its delimitative capacity is the statistical tabulation of boundary signals in continuous texts. Boundary signals in general are distributed with great irregularity. In a sentence containing six syllables, such as "die Hausfrau wäscht mein Hemd" (the housewife is washing my shirt), all six morpheme boundaries are signaled: *di-haus-frau-vɛšt-mæin-hemt.*[1] Yet in another sentence, consisting of ten syllables, not a single morpheme or word boundary is phonologically marked. For example: "Am Boden sassen drei kleine Buben" (three little boys were sitting on the floor). In larger continuous texts such irregularity of distribution is balanced out, so that one obtains a mean value for every language. Such a mean value is different for each language. There are languages that do not only have very few boundary signals but also use them only very sparingly. Accordingly only a very insignificant percentage of all word or morpheme boundaries is "signaled" in a continuous text. French, for example, belongs to languages of this type. It attaches very little importance to the delimitation of words or morphemes in a sentence. Other languages, on the other hand, show an exaggerated preference for boundary signals. In addition to a fixed accent that marks all word boundaries, they employ a profusion of other boundary signals, so that the number of boundary signals in a continuous text is at times greater than the number of delimited units. For example, in Tamil approximately 80 percent of all word boundaries are marked by special boundary signals (at least in the sample texts included by J. R. Firth in his *A Short Outline of Tamil Pronunciation*). This despite the fact that Tamil already has a fixed accent on word-initial syllables (as well as a secondary accent on the final syllable of longer words), by which the delimitation of words is sufficiently assured. German, too, is among the languages "with a predilection for delimitation." About 50 percent of all boundaries of accentuable morphemes and proclitic unaccentuable morphemes are marked by special boundary signals. This is only true, however, of those styles that do not use loanwords excessively.

Statistics are therefore also indispensable for the study of the delimitative sound function. And in this case the statistical tabulation of texts is almost entirely possible. Of course, the same difficulties as in a statistical study of phonemes emerge here also, and must be overcome in the same way. But too little has been done so far with respect to detailed statistical investigations of various languages. Accordingly almost nothing can be said on this subject.

[1] Cf. the analysis of this example by N. S. Trubetzkoy in *Proceedings of the Second International Congress of Phonetic Sciences*, pp. 49 f.

# APPENDIX I PHONOLOGY AND LINGUISTIC GEOGRAPHY

## 1

The phonic differences between two dialects may be of three types: they may involve the *phonological system*, or the *phonetic realization* of individual phonemes, or the *etymological distribution* of phonemes within words. Accordingly we speak of phonological, phonetic, and etymological dialect differences.

The *phonological* dialect differences, in turn, are divided into differences based on inventory and differences in function. A phonological difference based on inventory exists when a dialect possesses a phoneme that is not known in another dialect. A difference in phonological function is present when a phoneme in one dialect occurs in a phonological position in which it is not found in another dialect. A difference in phonological inventory exists, for example, between North Great Russian and South Great Russian. North Great Russian has four unaccented (reduced) vowel phonemes (*ŭ*, *ŏ*, *ă*, and *ĭ*), while South Great Russian has only three unaccented vowel phonemes, namely, *ŭ*, *ă*, and *ĭ*. It does not have an unaccented *ŏ*. A difference in phonological function exists, for example, between various South and Central Great Russian dialects. Some of these allow the phoneme *ă* only after hard (nonpalatalized) consonants, while others permit it after hard as well as soft (palatalized) consonants. In this second group of dialects a difference in phonological function in turn exists between those dialects in which the unaccented *ă* after soft consonants can occur only



before a hard consonant (e.g., *vădu*: *vĭd'oš*) and those that do not have this restriction (e.g., *vădu*: *văd'oš*).

The phonetic differences may be *absolute* when they affect the realization of a phoneme in all positions, or *limited* (combinatory) when they occur only in certain positions. An absolute phonetic difference exists, for example, between the Polish dialects that realize the *l* as *ļ* (a somewhat retracted *l*) and those that realize the *l* as *u̯*. A combinatory phonetic difference, for example, is found between the South Polish dialects in which *l* is palatalized before *i* ("l'is"/"las") and the North Polish dialects in which it is not modified in that position ("lis"/"las").

Among the etymological phonic differences there are likewise two types that can be distinguished. There are etymological phonic differences that are related to differences in phonological function. Should the function of a particular phoneme be restricted in one dialect as compared with another dialect, such restriction would generally occur in favor of the greater use of a different specific phoneme (in those positions in which the first phoneme cannot occur). The functional restriction of the first phoneme is thus, as it were, compensated for. In cases of this type one can speak of *compensatory* etymological sound differences. However, in other cases, where the etymological phonic differences are not related to any functional difference, these differences may be designated as *free* etymological phonic differences. The relationship between West and East White Russian may be cited as an example of a compensatory etymological sound difference. Although in West White Russian the unaccented *ă* occurs in all positions, it cannot occur before a syllable containing an accented *á* in East White Russian. Words that in West White Russian have an *ă* in that position generally appear with an *ĭ* in East White Russian. As an example of a free

etymological sound difference, the dialects of Little Poland may be cited. In some of these the "close *é*" of Proto-Polish is changed to *i*, in others, in the principality of Łowicz, for example, it is changed to *e*. If one compares these dialects with one another, and in so doing disregards any historical explanation, the only fact that can be established is that some words that in the dialects of the first group have the phoneme *i*, occur with the phoneme *e* in the second group. This phenomenon is here not bound by any particular phonological environment.

## 2

Up to now dialectology has always operated in diachronic terms. Any difference in sound was consequently interpreted as the result of a divergence in phonic development. In a conscious reaction against the doctrine that sound laws are without exception, modern dialectology or linguistic geography claims that each individual word that shows a sound change has its own distributional boundaries, that accordingly the geographical boundaries of a sound change can never be precisely and sharply drawn.

This claim has its foundation in the fact that the three types of phonic differences discussed above (i.e., the phonological, the phonetic, and the etymological) are generally not distinguished.

The thesis of the imprecision and vagueness of dialect boundaries is entirely correct if by dialectal differences one understands the etymological differences in sound alone. As far as such differences are concerned, there can be no question of any complete distributional regularity. An area in which a particular sound change has been rigorously carried out, that is, in which an old phoneme (or an old phoneme combination) has been replaced by a specific new phoneme in all words concerned, is generally bordered by areas where a portion of these words shows a phoneme different from the one expected, without any discernible reason for such "exceptions." Not far from these areas, however, there are generally still others in which these "exceptions" actually form the "rule." Accordingly one can say that between the areas of maximal etymological phonic differences (that is, between the areas where a given phonic difference occurs in the majority of words) there are always transition areas. In these the individual words sometimes show the one and sometimes the other of the particular "treatments" of the old phoneme. The distributional boundaries for the different sound forms of the individual words are here completely independent of one another.

As regards *phonetic* sound differences, the situation is quite different. If a phoneme is realized differently phonetically in two dialects, it must be



realized in that way in all words in which the given phoneme occurs in the same position. If this were not so, the different ways of phonetic realization would take on a distinctive function in the linguistic consciousness. Consequently they would acquire phonological validity. In other words, the phonetic distinction would become a phonological distinction. As far as phonetic dialect differences are concerned, it is at times difficult to draw any exact boundary between two areas. The reason for this is that between regions of maximally opposed phonetic realizations there are often either areas of "intermediate" or "intermediary" phonetic realization, so that the transition from one type of phonetic realization to the other is a gradual one. Or it may be that there are areas in between where both types of phonetic realization occur as optional variants of the same phoneme. However, in either case, such a phonetic phenomenon must occur in all words that contain the particular phoneme. Here the term "transition area" thus takes on quite a different meaning from that in the context of etymological sound differences.

Turning to *phonological* differences in sound, we are forced to note that the term "transition area" cannot here be used in any sense. A phoneme or a phoneme combination either can occur in a dialect or it cannot. There is no third possibility. It is frequently the case that a phonetic opposition in one dialect, so to speak, paves the way for a phonological opposition in an adjacent dialect.[1] We mentioned above the contrast of West White Russian *vădа*: *vădi̯* with East White Russian *vi̯da*: *vădi̯*. East White Russian proper is bordered by those White Russian dialects in which *ă*, when it precedes a syllable with an accented *á*, is realized as an indeterminate vowel *ə*. Objectively, this vowel is neither identical with *i̯* nor with *ă*. However, it is not felt as an independent phoneme by linguistic consciousness, but as a combinatory variant of the phoneme *ă*. The area that has the pronunciation *vəda*: *vădi̯* may, so to speak, be considered as the transition area between East White Russian (*vi̯da*: *vădi̯*) and West White Russian (*vădа*: *vădi̯*). However, this is only correct from a purely phonetic standpoint. Phonologically, this area belongs to West White Russian. In more precise terms, the difference between the region that is "totally West White Russian" and the *vəda-vădi̯* area is purely phonetic. The difference between the latter region and East White Russian is phonological in nature. And while the delimitation against the "totally West White Russian" area may present certain difficulties (especially because of the gradual transitional shadings between *ă* and *ə*), the delimitation against East White Russian is quite simple. Where the vowel of the initial syllable of *vi̯da* is felt as identical with the vowel of the initial syllable of *bi̯la*, East White Russian phonology is involved. Where this

is not the case, White Russian phonology is present. The situation is the same in all similar cases. In contrast with the gradual character of phonetic transitions of sound, which make the delimitation of phonetically different dialect areas difficult, phonological differences always have clear and sharp boundaries.

The above considerations result in a guide for the mapping of dialectal sound differences. *Etymological* differences cannot be mapped simply in the form of uniform isoglosses. The methods of word geography alone are suitable for differences of this type. The isoglosses for each individual word showing the particular sound change must be entered on separate maps, which must then be placed on top of one another. The synthetic map produced in this fashion reveals the common (i.e., coinciding) isoglosses in thick and dark lines. Those isoglosses that do not coincide appear as thin and pale lines. The transitional areas are marked by an accumulation of such pale lines, while the areas in which "the sound change is carried out rigorously" is completely, or almost completely, free of these lines. The *phonetic* differences can best be mapped by using different colors or a different type of marking. The areas of transitional sounds, or the areas of optional cooccurrence of both sounds, can be indicated by mixing the colors of both sounds, or by merging the respective markings. This would then express the gradual transitions of phonetic realization symbolically. As far as *phonological* differences are concerned, their geographical boundaries can either be represented by simple lines drawn sharply and clearly on the map, or the "phonological areas" may be represented by different colors, or both media may be used simultaneously. In any case, the mapping of phonological differences is very simple since there are no transitional areas to be considered.

## 3

In order to determine etymological differences in sound and their distributional boundaries, one has to take down the dialectal pronunciation of the same words in various parts of the linguistic area. The questionnaire that is prepared for these purposes will contain the question: "How is this word pronounced in dialect ——?" The study of *etymological differences in sound*, accordingly, always presupposes the presence of a more or less *uniform vocabulary*. A study of this type is therefore only possible within a uniform language, or, at the most, within a group of closely related languages.

In order to determine phonetic differences in sound and the boundaries thereof, it is necessary to study the pronunciation (i.e., the phonetic



realization) of the same phoneme in various localities. It does not matter, of course, whether the same words are selected as examples everywhere. What is important is to choose words in which the given dialect shows the particular phoneme. The study of *phonetic differences in sound* is thus independent of the nature of the vocabulary. What it presupposes is the presence of the *same phonological system* in all dialects under study, or at least the existence of similar systems.

In examining phonological differences in sound, the phonological inventory and the functions of the individual phonemes must be determined for each dialect. The questions here to be answered by the dialectologist are as follows: "Does this phoneme occur at all in dialect ——?" and "In which phonological position is this phoneme used in dialect ——?" It is, of course, quite irrelevant whether all dialects under study have the same vocabulary or the same grammatical structure. In contrast with the study of etymological differences in sound, the *study of phonological sound differences can also be pursued outside the boundaries of a language*, even outside the boundaries of *a language family*. Everything that has been said before on the mapping of phonological sound differences also applies if several languages are examined.

There is no question that such an extension of phonological dialectology across the boundaries of individual languages (without regard to linguistic relatedness) can be useful. Certain phonological phenomena are distributed geographically in such a way that they occur in several unrelated, but geographically adjacent, languages, or, vice versa, that they are absent from the larger geographical areas in which several languages are spoken. Roman Jakobson has demonstrated this for the consonantal oppositions of timbre and the vocalic pitch oppositions. The same could also be shown for other phonological phenomena. For example, the correlation based on type of expiration "with glottal stop"/"without glottal stop" is common in all languages of the Caucasus without regard to their origin (that is, not only in the North and South Caucasian languages, but also in the Indo-European and Turkic languages of this area). On the other hand, this correlation does not occur elsewhere in Europe or in the adjacent areas of Asia and Eurasia. Such geographical distributional areas can also be determined for individual phonemes. It should be noted here that the distributional boundaries for phonological phenomena coincide by no means always with language boundaries. Very often they cut across the area of one language. Distributional boundaries in such cases can only be established by phonological dialect investigation.

The existence of common phonological peculiarities in several adjacent, yet unrelated, languages or dialects has already been confirmed on several

occasions. But one was too quick to explain these facts on the basis of substratum theory or by assuming the influence of a "dominant" language for this purpose. Such interpretations are of no value as long as they only explain individual cases. In general it would be better for the present to refrain from any interpretation, until such time as all data have been gathered. Of importance today is the exhaustive collection of data and the establishment of facts; a comparative description of the languages of the world from the standpoint of phonological geography is now on the agenda. But such a study presupposes a phonological study of the dialects in the individual languages.

[1] Or conversely a phonological difference degenerates into a phonetic difference in an adjacent area. Both conceptions are equally justifiable from a static point of view.

# APPENDIX II THOUGHTS ON MORPHONOLOGY

By morphonology or morphophonology we understand, as is well known, the study of the utilization in morphology of the phonological means of language. Morphonology in Europe has so far been the most neglected branch of grammar. If one compares the studies of ancient Greece and Rome with the studies of the Hebrew, Arab, and particularly Sanskrit grammarians, one is struck by the lack of understanding with which classical antiquity and the Middle Ages in Europe treated morphonological problems. This situation has hardly changed in essence, even in modern times. In modern Semitic studies the morphonoiogical doctrines of the Arab and Hebrew grammarians were merely taken over without being adapted to a modern scientific viewpoint. Indo-Europeanists took over the morphonological doctrines of India as the basis for a morphonology of the Indo-European protolanguage. They developed this morphonology thoroughly, and thus the so-called Indo-European *Ablaut* system and the entire Indo-European root and suffix theory came into existence. But when we consider these results of modern Indo-European studies we see that they completely lack the true essence of a morphonological treatment. The roots ("bases") and suffixes take on the character of metaphysical entities, and apophony becomes a type of magical operation. In any event, these studies are characterized by the lack of any relation to a living language. Root theories, systems of vowel gradation, etc., only appear to have been possible and necessary in a hypothetical protolanguage.

Historically attested languages show only vestiges thereof, and even these have been so overlaid by subsequent development that there can be no question of a system. For Schleicher, who had made the basic distinction between a primitive period of language evolution and a historical period of language decay, such a point of view had been entirely justified. Today it is still subconsciously followed by most Indo-Europeanists, though the theoretical bases of Schleicher are rejected by all. Ablaut relationships and the various types of sound change in the individual Indo-European languages are always represented from a historical point of view. All existing types of sound change, apart from their present value, are then traced to their historical origin. Since productive and unproductive morphonological facts are treated without distinction, and since their function is not taken into account at all, any regularity in these facts must, of course, go unrecognized. Indo-Europeanists never liked to admit that morphonology formed a separate and independent branch of grammar, not only as far as the protolanguage was concerned but also in every individual language. Morphonology was regarded as the result of a compromise or an interaction of the history of sound and the history of forms. A part of the morphonological phenomena was therefore discussed in phonology, another part in morphology.

This state of affairs cannot be permitted to continue. As a link between phonology and morphology, morphonology must take the place it deserves, not only in the grammars of the Semitic and Indo-European languages but in any grammar. Only those languages that have no morphology in the proper sense can also do without morphonology. But in languages of this type certain chapters that would generally be part of morphonology (as, for example, the phonological structure of morphemes) are shifted to phonology.

A complete morphonological study comprises the following three parts: (1) the study of the phonological structure of the morphemes; (2) the study of combinatory sound changes that take place in the morphemes in morpheme combinations; (3) the study of sound alternation series that fulfill a morphological function.

Only the first of these three sections applies to all languages. In all languages that distinguish various morpheme types, the individual morpheme types have special phonic characteristics. These characteristics are different for each language. Root morphemes, in particular, show a variety of structural types. As is known, the nominal and the verbal root morphemes of the Semitic languages usually consist of three consonants. These limitations do not hold, however, for pronominal roots. But rules of this type can also be formulated for other non-Semitic languages. For



example, in certain languages of the Eastern Caucasus verbal and pronominal root morphemes always consist of one consonant. However, these limitations are not valid for nominal root morphemes. Indo-European languages also have similar rules. In the Slavic languages root morphemes consisting of only a single consonant occur as pronominal roots. Root morphemes that consist of only a vowel without a consonant are not found at all in present-day Slavic languages, apart from such relics as *u* in Polish "obuć." In Russian nominal and pronominal root morphemes must have a consonant in final position, etc. Other types of morphemes (such as final morphemes, prefix morphemes, suffix morphemes, etc.) also show a limited number of possible types of phonological structure in every language. It is the task of morphonology to determine the types of phonic structure of the various morpheme types.[1]

The study of combinatory sound changes of morphemes conditioned by the morpheme combinations corresponds to what is called "internal sandhi" in Sanskrit grammar. This part of morphonology is not of like importance for all languages. In certain "agglutinative" languages it constitutes all of morphonology (together with the study of the phonic structure of morphemes discussed above). In certain other languages, on the other hand, it plays no role at all.

*Mutatis mutandis*, the same can also be said for the third section of morphonology, that is, for the study of whole series of sound alternations that fulfill a morphological function.

It is very important, especially for this section of morphonology, to draw a clear line between productive and nonproductive phenomena, and to be cognizant of the functional specialization of the various alternation series. An examination of the morphonology of the Russian language reveals, for example, that the sound alternation series in the nominal forms in this language are not the same as those in the verbal forms. It further reveals that there is a big difference between the series of sound alternations that are used to make up paradigmatic forms and those used to make up derivational forms. A similar situation can probably be found in many other languages.

The change of the phonic shape of morphemes does not play a role only in the so-called inflectional languages, such as Indo-European, Semitic, and East Caucasian. We need only to call attention to the morphologically utilized quantitative and qualitative vowel gradation of Ugric and the consonant alternation of the Finnish languages. There is no doubt, however, that in many languages morphemes remain unchanged phonically. For languages of the latter type, this third section of morphonology is, of course, omitted.

Morphonology is thus a part of grammar which plays an important role in almost all languages, but there is hardly any language in which it has so far been studied. The study of morphonology will considerably deepen our knowledge of languages. To be stressed in particular is the importance of this branch of grammar for the typology of languages. The old typological classification of languages into isolating, incorporating (polysynthetic), agglutinative, and inflectional languages is unsatisfactory in many respects. Morphonology, as mentioned, represents a link between phonology and morphology. Already by reason of its central position in the grammatical system it is best qualified to furnish a comprehensive characterization of the peculiarities of each language. It is possible that those language types that would result from a morphonological treatment would make it easier to work out a rational typological classification of the languages of the world.

[1] As for languages that do not have different morpheme classes (e.g., Chinese), one has to establish the possible phonic types of words. However, this is not to be accomplished in morphonology but in a special chapter on phonology.

# APPENDIX III AUTOBIOGRAPHICAL NOTES ON N. S. TRUBETZKOY

## AS RELATED BY ROMAN JAKOBSON

"I was born in Moscow on April 16, 1890. My father, Prince Sergius Trubetzkoy (1862–1904), was professor of philosophy at the University of Moscow. He also took part in the liberal political movement as a writer for the liberal party and held the post of rector of the University of Moscow at the time of his death in 1904.

"By the age of thirteen I had already become interested in the sciences. Originally I studied primarily ethnography and ethnology. In addition to Russian folk poetry, my interests lay particularly with the Finno-Ugric peoples of Russia. After 1904 I regularly attended all meetings of the Moscow Ethnographic Society and established personal contacts with its president, Professor Vsevolod Fedorovič Miller, the noted authority on Russian folk epic and Ossetic. At the same time I maintained a close relationship with Stefan Kirovič Kuznecov, a distinguished archaeologist who specialized in the study of the Volga Finns. He guided and encouraged me in my studies in Finno-Ugric ethnography with his suggestions and his references to literature. Under the influence of S. K. Kuznecov I began to occupy myself with the Finno-Ugric languages and soon became interested in general linguistics. As early as 1905 I published two articles on Finno-Ugric folklore in *Ethnografičeskoje Obozrenije*, the journal of the Moscow Ethnographic Society. One of these articles discussed traces of an ancient common Finno-Ugric pagan funeral rite found in a West Finnish folk