

On the definition of phoneme categories on a distributional basis

Eli Fischer-jørgensen

To cite this article: Eli Fischer-jørgensen (1952) On the definition of phoneme categories on a distributional basis, Acta Linguistica, 7:1-2, 8-39, DOI: [10.1080/03740463.1952.10415400](https://doi.org/10.1080/03740463.1952.10415400)

To link to this article: <https://doi.org/10.1080/03740463.1952.10415400>



Published online: 09 Dec 2011.



Submit your article to this journal [↗](#)



Article views: 25



View related articles [↗](#)



Citing articles: 1 View citing articles [↗](#)

ON THE DEFINITION OF PHONEME CATEGORIES ON A DISTRIBUTIONAL BASIS¹

by ELI FISCHER-JØRGENSEN (Copenhagen)

I. Previous treatments.

Sapir was probably the first to suggest that phonemes might be grouped into categories according to their possibilities of combination with other phonemes in the speech chain². Bloomfield goes much farther. He maintains³ that this is the only definition of phoneme categories which is structurally relevant, whereas the classification by distinctive features is irrelevant, because it is in reality a physiological description. This statement is probably too categorical. At any rate it may be maintained that the distinctive features are also found by commutation and can be defined by their mutual combinations, that they must accordingly be considered as linguistic units, and that it is only the next step, the analysis of these features, which is concerned with pure substance⁴. Both classifications would in that case be structurally relevant, and in a complete description of a language phonemes should be classified in both ways: (1) according to their constituent parts (their distinctive features) and (2) according to their possibilities of combination (their distribution or relations in the speech

¹) This paper was read at a meeting of the Cercle linguistique de Copenhague on the 18th of May 1951. Part of the material had been presented at the Nordisk Filologmøde, Helsingfors-Åbo, August 1950. I am grateful to Louis Hjelmslev for many discussions of the problems involved.

²) E. Sapir, *Sound Patterns in Language* (*Language* I, 1925, p. 37—51).

³) L. Bloomfield, *Language* 1933, p. 129—30.

⁴) cp A. Martinet, *Où en est la phonologie?* (*Lingua* I, p. 34—58); Roman Jakobson, *On the Identification of Phonemic Entities* (*TCLC* V, 1949, p. 205—213); Roman Jakobson and J. Lotz, *Notes on the French Phonemic Pattern* (*Word* V, 1949, p. 151—158).

chain). But this article is only concerned with the second problem, the establishment of phoneme categories on a distributional basis¹.

Bloomfield did not only demand a distributional definition, he gave a complete analysis of the English phonemic system as an example of his method. But it is a striking fact that in spite of the enormous influence which Bloomfield has had on American linguistics, there have been very few to follow him on this particular point. Not that there have been objections to his method: many American linguists quote this point in Bloomfield's book with approval², but they do not apply his method in their actual language descriptions. G. L. Trager is one of the few exceptions³. But it may nevertheless be due to Bloomfield's influence that most American linguists, even in short phonemic descriptions (such as the numerous descriptions of American Indian languages in the *International Journal of American Linguistics*), give a rather detailed statement of the syllabic structure of the language, and in this way present the material on the basis of which the phoneme categories may be established.

In contradistinction to Bloomfield, Trubetzkoy considers the internal description of phonemes as consisting of a definite number of distinctive features and their classification according to these features as the most important task. But he mentions the classification based on different possibilities of combination as a desirable supplement, and gives a classification of Greek consonants along these lines⁴. He emphasizes, however, that it is not possible in all languages to give each phoneme a unique definition in this way. This is certainly true⁵,

¹) Fritz Hintze (*Zum Verhältnis der sprachlichen »Form« zur »Substanz«* (*Studia Linguistica* III, 1949, p. 86 ssq.)) uses the terminology "internal" and "external" for these two ways of establishing categories. Knud Togeby (*Structure immanente de la langue française* (*TCLC* VI, 1951, p. 47 and 89 sqq.)), which I have been able to utilize for this last version of the present paper) uses the terminology "synthetic" and "analytic".

²) e. g. B. Bloch and G. L. Trager, *Outline of Linguistic Analysis*, 1942, p. 45; Ch. F. Hockett, *A System of Descriptive Phonology* (*Language* XVIII, 1942, p. 3—21).

³) *La systématique des phonèmes du polonais* (in this review, I, 1939, p. 179—188).

⁴) *Grundzüge der Phonologie*, *TCLP* VI, 1939, p. 219.

⁵) although his Burmese example, *l. c.* p. 220 was not correct, cp. e. g. Togeby, *l. c.* p. 15.

but it should not be used as a reason for rejecting the method¹. On the contrary, the different possibilities of establishing subcategories show interesting differences in linguistic structure.

In general the Prague phonologists do not pay much attention to this problem but like the American phonemicists they very often describe the syllabic structure of the language in question, whereas the London school of phonetics is distinguished by its almost complete disregard of syllabic structure.

But other scholars, chiefly in Scandinavian countries, have tried to find methods for a classification of phonemes in this way, partly under direct influence from Bloomfield. H. Vogt has given a detailed analysis of phoneme categories in Norwegian². Hjelmslev has repeatedly called for a relational definition and suggested methods which he found appropriate for this purpose³, and he has applied his method to Danish⁴ and French⁵. A. Bjerrum has described the categories of the Danish dialect in Fjælde⁶, Ella Jensen has mentioned some possible classifications in the dialect of Houlbjerg⁷, K. Togeby has given a complete description of French combined with a theoretical discussion of the method employed⁸. And J. Kuryłowicz has given original contributions to the methodological discussion⁹. But these various descriptions have been made according to so widely divergent principles that a comparison between the languages described is hardly possible, and it seems therefore highly desirable to take up a general discussion of this question.

¹) As I have done *Nordisk Tidsskrift for Tale og Stemme*, VII, 1945, p. 92.

²) H. Vogt, *The Structure of the Norwegian Monosyllables* (*Norsk Tidsskrift for Sprogvidenskap*, XII, 1942, p. 5—29).

³) e. g.: *Langue et parole* (*Cahiers Ferd. de Saussure*, II, 1942, p. 29—44) and *La structure morphologique* (*V^e Congrès int. des ling. 1939, Rapports*, p. 66—93); but his basic point of view is different, since he attempts a purely formal analysis.

⁴) *Grundtræk af det danske udtrykssystem med særligt henblik paa stødet* (*Selskab for nord. Filologi, Årsberetning for 1948—49—50*, p. 12—23).

⁵) *Bulletin du Cercle Linguistique de Copenhague* 1948—49 (in preparation).

⁶) A. Bjerrum, *Fjoldemålets lydssystem*, 1944, p. 118 ff. and 228 ff.

⁷) Ella Jensen, *Houlbjergmaalet*, 1944, p. 46.

⁸) *Structure immanente de la langue française* (*TCLC* VI, 1951), p. 44—88, particularly p. 79 ff.

⁹) *Contribution à la théorie de la syllabe* (*Bull. de la Soc. pol. de ling.*, 1948), p. 80—114, particularly p. 107 ff.; and *La notion de l'isomorphisme* (*TCLC* V, 1949, p. 48—60).

II. The purpose and methodological background of the present treatment.

The purpose of this paper is to propose a method for establishing distributional categories of phonemes which will give a sound basis for comparisons between languages. This purpose may come into conflict with the endeavour to classify the phonemes of a particular language in the simplest possible way. There will generally be several possible ways of grouping the phonemes of a language, and most authors have chosen one of these ways as the most simple, or as that characterizing the language in the best way, or as the one which has the most evident affinity to the phonetic classification. But for these purposes it has often been necessary to choose criteria of classification which are too specific to allow of any comparison with other languages. This conflict is, however, only real when it is maintained that a language should only be described in one way. When on the other hand it is required (as in the glossematic method) that a description of a language should be exhaustive in the sense that all possible classifications should be registered, the conflict is reduced to the observation that different classifications may be preferable for different purposes.

The methodological background of this paper is that of conventional phonemics. This means above all that the procedure is not purely formal, and particularly that identifications (including the identification of units belonging to different languages) are made on the basis of phonetic substance.

The terms "form" and "substance" which were introduced by F. de Saussure and have been employed by several European linguists since then, particularly by Hjelmslev, are perhaps not very happy, because they may suggest all sorts of metaphysical implications which need not interest us here, but it is mostly in these terms that the problem has been treated. Form is here taken to mean a complex of specific linguistic functions (or relations), comprising both the important relation between the two planes (content and expression), which allows the establishment of a restricted number of distinctive units in each plane (e.g. the relation between the expression [sti:m] and the content 'steam-') and the relations between these distinctive units within one plane, e. g. between s and t in [sti:m]. These relations cannot be derived from the system of functions of other sciences. — But the end points of the relations may also be described in terms of other sciences, e. g. physics or physiology, and this is the "substance" point of view.

In a previous paper¹ I have discussed the possibility of establishing the inventory of distinctive elements of the expression without taking the phonetic substance into account. The result was that the linguistic analysis cannot start from pure form without taking the substance into consideration. The number of commutable elements in each position (or paradigm) is found through an analysis of the interrelations between sound and meaning (in the case of spoken languages), which presupposes the recognition of differences (as yet perhaps unspecified) in these substances. And the identification of elements in different paradigms (e. g. *p* before *i* and before *u*; initial and final *p*) must in many cases take phonetic facts into account. If it does not, the reduction will be either impossible or completely arbitrary (e. g. initial *p* identified with final *k*), which would complicate the description of the phonetic manifestation of the elements and thus be in contradiction to the principle of simplicity. In the above mentioned article the problem was simplified by treating commutation and identification as two consecutive steps. But as a matter of fact the statement that *p* and *t* are commutable in *pin* and *tin* presupposes the identification of the *in* of *pin* with the *in* of *tin*². This means that these two operations must take place simultaneously, and that the problem of dissolving the chain into phonemes consists in deciding which phonetic differences have to be considered as distinctive and which as automatic. The decision must be based on an interpretation having the purpose of describing all the facts (including the phonetic manifestation) in the simplest way³.

Commutation and identification form the basis for the establishment of the categories. A consonant cannot be considered as both initial and final until these two variants have been identified. But when this has been done, it must be possible to define the categories on a purely functional basis, and this whole formal structure may be transferred into another substance without any change in the defini-

¹) *Remarques sur les principes de l'analyse phonématique (TCLC V)*, particularly p. 231.

²) as emphasized by Buyssens (*Cahiers Ferd. de Sauss.*, VIII, 1949, p. 49 ff.).

³) The point of view adopted here, i. e. that commutation and identification must involve substantial considerations if the analysis is to be of any use, is not incompatible with Hjelmslev's theory in its present form. His "purely formal analysis" is not meant as a preliminary linguistic operation, but as a final control of the results gained in this way by trial and error.

tions. It is the merit of glossematics to have emphasized this possibility.

It must also be possible to compare various languages on a purely formal basis, identifying the categories by reference to a general system of formal definitions. This is however not the generally adopted method which consists in identifying expression units in different languages on a phonetic basis¹. It must be emphasized that these two methods will yield quite different results. From a traditional phonemic point of view it is, for instance, perfectly legitimate to compare the syllabic structures of French, Russian, and Finnish, stating the differences in consonant clusters, etc. But from a purely formal point of view it may be different. Starting, for instance, from glossematic definitions, the so-called syllables in these languages are of completely different kinds, since in French their combination is free, whereas in Russian and Finnish some categories of syllables presuppose others. In glossematic terminology the latter type is called direction-syllables, the French type pseudo-syllable. The direction can be shown by further analysis to take place between smaller parts of the syllables. These parts are called accents. But these accents are stresses in Russian and vocoids² in Finnish. The Finnish contoids are therefore not consonants, but unspecified constituents. In other languages accents may be manifested by tones, but tones may also formally be constituents (e. g. parts of vowels) if there is no direction between them. — Consonants are defined as presupposing vowels, and vowels as presupposed by consonants. If a language has only the syllabic type *cv*, not *v* alone³, it can consequently not be said to have vowels and consonants in this sense. And even if two languages possess consonants both in the traditional and in the glossematic sense, their subcategories may be differently defined by the two methods. Suppose e. g. that one language has the syllabic types *V*, *CV*, *CVC* (i. e. final position presupposing initial position),

¹) Even Toegeby (*Structure immanente de la langue française*), who claims to give a purely formal description, employs this traditional method.

²) It may sometimes be convenient to use Pike's terminology 'vocoids' and 'contoids' for phonetic units, 'consonant' and 'vowel' for formal units.

³) *c* and *v* symbolize two different classes of elements, manifested chiefly by vocoids and contoids respectively. *C* and *V* symbolize consonants and vowels in the formal sense of the words.

another V, VC, CVC (— initial position presupposing final position (this combination, by the way, has hardly ever been found), and a third V, CV, VC, CVC (with free combination between the positions), and all have the consonants *p*, *t*, *k* occurring exclusively in initial position: then, when the categories of consonants are defined by their positions, *p*, *t*, *k* will belong to the same category in the three languages if the positions are identified on a phonetic basis, but from a formal point of view *p*, *t*, *k* will belong to differently defined categories in all three languages.

This means that it is necessary to distinguish between the two methods of comparison. The purely formal method is the most consistent one, and it is an important task to attempt a description along these lines; but it requires a complete system of general definitions. Such a system is being elaborated by glossematics, but it has not yet been published in detail. The traditional procedure, which is followed here, is in a certain sense a hybrid method, since the elements and the relations are chosen, for the purpose of comparison, on the basis of phonetic similarity. This method may, however, lead to interesting observations, e.g. concerning the affinities between the phonetic qualities of a sound and its syllabic position, and concerning the frequency in actual languages of the theoretically possible categories. Finally the tendencies to free combination or to definite restrictions between different parts of the syllable seem to be more easily formulated when the parts of the syllable are identified on a phonetic basis.

The designation “phoneme”, then, is also used here in a conventional sense. It has been defined in many ways, but all definitions have aimed at the same object, namely the first class of distinctive units of the expression (meaning the first class of units met with in a division of the speech chain into smaller and smaller units), of which most members (e. g. English *s*) are not capable of any further decomposition into successive distinctive units (some members may, however, be capable of such a decomposition, in English *ph* could be dissolved into the successive units *p* and *h*, but *ph* belongs nevertheless to the same level as *s*, not to the level of e. g. *pr*, because it cannot be dissolved into units of which both are capable of functioning in the same environments as the larger unit (*ph*, *p*, and *h* are not distinctive in the same environment, but *pr*-, *p*, and *r* are)).

This is not meant as a new definition but simply as a description of

what is generally termed a phoneme¹. It is usual to distinguish between segmental and suprasegmental phonemes. The latter class (comprising stress and tone) is characterized by not being able to enter into relations of sequence with members of the first class. We shall restrict our discussion to the relations between segmental phonemes.

III. The basic unit.

The first difficult problem is the choice of the unit which is to be taken as the basis within which the relations operate.

The minimal sign (the "morpheme" according to the American and the Prague terminology) may be discarded at once as not suitable for this purpose², because its internal structure is much too variable: it may, for instance, contain a series of syllables (e. g. French *pantalon*) or consist of a single consonant (*s*) or a group of consonants (e. g. *-st* in German). The same is true of the "word", which, moreover, is a unit of a more dubious kind. This does not mean that the phonemic structure of words and minimal signs should not be described, but only that they should not be chosen as the general frame for the definition of the phoneme categories.

This frame must be some sort of phonemic "syllable". Most linguists who have treated this problem, simply speak of the syllable without giving any definition. K. L. Pike describes the "phonemic syllable" as "the basic structural unit which serves best as a point of reference for describing the distribution of the phonemes in the language in question"³, and according to Pike this may be a unit of tone-placement or a unit of stress-placement or of length, or a "morpheme" or it may simply be the phonetic syllable. This point of view is not very different from that held by Togeby, who gives different structural definitions of the syllables of different languages⁴; and

¹) Trubetzkoy (*Grundzüge*, p. 34) defines phonemes as »phonologische Einheiten, die sich nicht in noch kürzere aufeinanderfolgende phonologische Einheiten teilen lassen«. The restriction "first" introduced here is necessary to exclude the distinctive features. Without this restriction the term "aufeinanderfolgend" is superfluous. If the features are not recognized as distinctive phonemic units, the phoneme will simply be the minimal distinctive unit. Trubetzkoy did not recognize the distinctive features as "phonologische Einheiten", but had taken over the term "successive" from Vachek, who did.

²) It has been employed by Trubetzkoy, *Grundzüge*, p. 224 ff.

³) K. L. Pike, *Phonemics*, 1947, p. 144.

⁴) *Structure immanente de la langue française*, p. 47 and 48.

there is probably no escape here: the unit serving as the best basis for describing the relations between phonemes will hardly be structurally the same in all languages. The most suitable method will probably be to choose the structural unit presenting the closest affinity to the phonetic syllable¹. This implies the possibility of an identification between phonetic syllables in different languages, and such a possibility can in effect be maintained to a very large extent, notwithstanding the fact that the phonetic syllable has been defined in many different ways, and that its very existence has been denied. A discussion of the various definitions will not be attempted in this place. It is considered for this purpose as a unit of speech containing one relative peak of prominence. The division of the chain of speech into syllables may be due simply to the inherent loudness of the successive sounds, but the peaks may be reinforced or altered by arbitrary changes of loudness, and this means may also be used to give a clear delimitation of the units. The rhythmic impression may be reinforced by what Pike calls syllable-timing², i. e. the peaks occur with equal intervals of duration as in Romance languages and in Japanese, where this seems to be a predominant feature³. It is in all probability particularly the rôle played by the inherent loudness of sounds (creating a certain similarity of internal structure) which makes the phonetic syllable a practical point of reference for describing the distribution of phonemes. But it is evident that from a phonetic point of view there will be borderline cases, perceived differently by different people, and such cases will then have to be decided on the basis of the corresponding structural unit in the particular language.

In many languages the syllable can be defined as a unit of tone- or stress-placement. But if we seek a basis for the definition of categories of segmental phonemes, it is not the syllable as a whole, but the syllable minus tones and stresses, i. e. the syllabic base, which must be chosen as the basic unit. In most languages this syllabic base may be defined structurally as the class of the smallest units, of which each (in connection with stress, tone, and intonation, if such units are distinctive in the language in question) is capable of constituting an utterance by itself. "Utterance" is taken to mean the

¹) This is also the common feature of all Pike's different phonemic syllables.

²) *Phonemics*, 1947, p. 73 a.

³) B. Bloch, *Studies in Colloquial Japanese IV, Phonemics (Language XXVI, 1950, p. 90 ff.)*.

same as Hjelmslev's term "lexia"¹, e. g. the first unit met with in the analysis, the parts (i. e. the immediate constituents) of which cannot all function as the whole unit. — "capable of" does not imply that all members of this class are actually found as utterances (e. g. in French most syllables can be found as utterances, but not *pə*), but it implies that the fact that some are not found must be due to accidental gaps in the inventory of signs, and cannot be explained by structural laws of the language preventing particular types from having this function. This means that if the syllabic bases can be divided into two categories with different internal structure, one capable of constituting an utterance, the other not, then the class of syllabic bases as a whole cannot be said to have this function. But this case seems to be very rare. It is often found that one type of syllables, e. g. the unaccented syllables, cannot be found alone, but the syllabic bases of the unaccented syllables will generally be the same as those found in accented syllables. Cases might be adduced where the vowel *ə* is only found in unaccented syllables, but normally this *ə* will not be a separate phoneme but will be identifiable with one or more of the vowels found in accented syllables. There are, however, some real exceptions to which we shall return below.

The fact that the syllabic base is capable of constituting an utterance base is important, because this makes it possible to decide the number of syllables in a chain and to fix the boundaries between them on the analogy of the phonemes found initially and finally in utterances. There may be cases presenting more than one possibility of division; then the choice will be of interest for the interpretation of the concrete words or phrases under consideration², but it cannot have any influence on the establishment of the syllabic types or the possibilities of combination of phonemes, since this double possibility presupposes that both combinations have already been found.

But the opposite case, i. e. that some medial clusters cannot be dissolved into actually occurring final and initial clusters, is relevant to our problem. This is e. g. the case of *vr* in Italian; and many examples

¹) *Grundtræk* . . . ; cp. note 4, p. 10, above. And the syllabic base corresponds roughly to Hjelmslev's "syllabeme", *ibid.* p. 15.

²) For a discussion of methods determining the choice, see F. W. Twaddell, *A Phonological Analysis of Intervocalic Consonant Clusters in German (Actes du IV^e Congr. int. de ling. 1936, p. 218—225)*, and J. Kuryłowicz, *Contribution à la théorie de la syllabe (Bull. de la Soc. pol. de ling., 1948, p. 80—114)*.

may be adduced from the descriptions of American Indian languages in IJAL¹; and although some may be due to restrictions in the material used, it is evident that the phenomenon is not rare. But generally these cases are exceptions, even within the system of the language in question, and if the descriptions of medial clusters were formulated not in terms of particular phonemes, but in a more general way, the exceptions would often disappear.

But there are very extreme cases of this phenomenon, which may require a different interpretation. Finnish constitutes a good example. In Finnish the only consonants admitted finally are *n, r, l, t, s*, and initially genuine Finnish words have only one consonant; but medially a great diversity of clusters is found, e. g. *ks, rst, mp*, etc. The type *kansa* may be dissolved into *kan* and *sa*, both having a structure permitted initially and finally in an utterance, but the type *maksa*, which is very common, cannot be dissolved in the same way. In Finnish, then, there is discrepancy between the syllabic base (which may be identified on a phonetic basis, and which, in Finnish, may receive a structural definition based on vowel harmony) and the minimal unit capable of constituting an utterance. And in this case it appears to be the best solution that the description of the phoneme categories on a relational basis should be founded on the syllabic base (the division of medial clusters may be undertaken on the analogy of the structure found initially, i. e. before the last consonant), but the fact that a whole class of consonants are only found finally in the syllabic base within the utterance, should not be completely neglected, but must be taken into account in the classification of the consonants².

¹) e. g. H. P. Aschmann, *Totonaco Phonemics* (IJAL XII, 1946, p. 37—42); Viola Waterhouse and May Morrison, *Chontal Phonemes* (IJAL XVI, 1950, p. 35—39); A. M. Halpern, *Yuma I: Phonemics; II: Morphonemics* (IJAL XII, 1946, p. 25—33 and 147—151); Paul L. Garvin, *Kutenai I: Phonemics* (IJAL XIV, 1948, p. 37—42).

²) Hjelmslev has suggested a connection between the particular structure of Finnish syllabic bases and the fact that Finnish has vowel harmony. As already mentioned, the Finnish vocoids are, according to Hjelmslev's terminology, accents (because of their heterosyllabic relations), and the contoids are unspecified constituents (neither consonants nor vowels) and therefore not submitted to the same rules of combination as consonants in other languages. — This might also be formulated by saying that in Finnish there is a more intimate connection between the syllables within a word than in most other languages. This appears at two points: (1) vowel harmony, according to which certain categories of vocoids in the final syllable(s) presuppose the presence of

A somewhat similar case would be a language like Keresan¹, in which no utterance can end or begin with a vowel (the minimal monosyllable being *cvc*, but which nevertheless has words of the structure *cvcvc* and *cvcvcvc*, which, according to the author, should be decomposed into the syllables *cv-cvc* and *cv-cv-cvc* (the other theoretically possible decomposition *cvc-vc* would not be better). The syllabic type *cv* cannot form an utterance alone, but presupposes a following syllabic base. An exception of a different kind is formed by languages of the Mixteco-type. In Mixteco² the minimal utterance is *cvcv* or *cvv*, containing two syllabic bases.

The difficulty, then, is this, that in languages where there is no coincidence between the syllabic base and the minimal unit capable of constituting an utterance, there is no safe means of dissolving medial clusters and delimitating the syllabic bases. A way out of this difficulty would be to choose the (phonemically) minimal utterance as the frame of reference and not the syllabic base, and classify the consonants according to their occurrence and combinations initially, finally, and medially in such utterances. But this involves a definition of vowels and consonants on the basis of the utterance (e. g. vowels being capable of forming an utterance alone), which might give some more problems than the definition within the syllable (e. g. in languages where *vcv* is found, but not *v* alone). And, in practice, the procedure would not differ much from that proposed here, for it would only be advisable to describe medial clusters in minimal utterances, not dissolvable into smaller parts which in principle might occur alone, and that means that only few languages would have medial clusters. Taking all utterance-medial clusters into account would complicate the description needlessly, since all combinations of final-initial clusters will normally be found, and restricting "medial clusters" to

certain categories in the first syllable; and (2) the fact that certain initial syllables cannot form utterances alone, but presuppose a following syllable. There is thus presupposition both ways. — A tendency to a similar cohesion is found in languages with distinctive stress (which, according to Hjelmslev, have the same type of syllables as Finnish, if there is presupposition): the weak syllable cannot be found alone as an utterance, it may have particular syllabic bases containing special phonemes (*ə*), and often there seem to be particular rules for the occurrence of medial consonants and clusters before such weak syllables with *ə*, e. g. in German.

¹) Robert E. Spencer, *The Phonemes of Keresan* (*IJAL* XII, 1946, p. 229—236).

²) K. L. Pike, *Tone Languages*, 1948, p. 77—94.

those found in "words", means the introduction of a rather dubious concept.

IV. The technique.

When the basic unit has been determined the next problem will be how to establish the categories. Two different procedures have been employed: (1) overlapping structural sets and (2) a hierarchy of categories and subcategories. Bloomfield employs the former method, Hjelmslev, Togeby, and Bjerrum the latter. The methods of Vogt and Trager present a mixture of these two procedures.

Structural sets means classes of phonemes having in some respect or other the same relations. In Bloomfield's description of English¹ the consonants form 38 different sets. Thus [ŋ] and [ʒ] form a set, because they are not found initially, [p, t, k, f, m, n] form a set, because they occur after [s], and for the same reason [s] forms a set of its own; [s] and [h] form a set because they never occur before [r] etc. The same phoneme may belong to different sets, so that there is mutual overlapping, but different phonemes will generally not all be members of the same sets. The sets have arbitrary numbers, and one phoneme may thus be defined by being a member of sets 1, 5, 8, and 9, another by being a member of sets 3, 5, 7, 10 and so on. In its present form this method can hardly be recommended. It is much too complicated, and it does not allow of any comparison with other languages. — The method might be used for comparisons, if only a few sets based on criteria found in various languages (e. g. four different positions) were employed, and if the numbering were undertaken according to a definite principle.

The hierarchic method may proceed by pure dichotomies (this is the form employed by Trubetzkoy), or it may be modified in such a way as to allow a class to be divided into more than two subclasses; there may be not only one subcategory having a definite relation, and another having an opposite relation, but also two other possibilities: both-and and neither-nor (this is the form employed by Hjelmslev). In both these forms the hierarchic procedure is superior to the procedure based on overlapping sets, it is simpler, and it permits of comparisons between different languages, provided that an appropriate order of the criteria is chosen. There may of course be overlapping in a certain sense, since the same criterion may be

¹) *Language*, p. 130 ff.

used in different branches of the hierarchy at the same level, and the members of the last subcategories must be defined by their membership of this and all the preceding classes, but the hierarchic order and the categories should be respected.

A particular problem concerning the general procedure is the use of statistical considerations. Bjerrum¹ divides the consonants into two groups having in most, but not in all, cases different relations; and Kuryłowicz² employs the same method, speaking of primary and secondary functions. This can hardly be recommended; it is difficult to tell just how common the relation must be.

V. The criteria and their order.

If we want to divide the phonemes of particular languages into as many subcategories as possible, the use of very specific criteria, different in different languages, can hardly be avoided. This, however, need not impair the possibilities of comparison, provided that these criteria are used at the last stages of the hierarchy to establish the smallest subcategories. But it is important that the criteria used for the larger categories should be such that they can be employed in a very great number of languages.

The descriptions given e. g. by Trubetzkoy, Vogt, and Trager of Greek, Norwegian, and Polish respectively³ do not satisfy this requirement. It is evident that they have chosen their criteria and arranged the procedure in such a way as to obtain a close affinity between the classes established on a relational basis and the phonetic classification of phonemes. It is of course interesting that this can be done, but it can only be done by choosing very specific criteria, employed in a rather unsystematic order. — On the whole, any procedure starting with relations between particular phonemes will be of a very limited application, whereas a procedure which, apart from the distinction between consonants and vowels, is mainly based on position, will be of a much more general application.

A. Vowels and consonants.

It will probably be possible in nearly all languages to divide the phonemes into two classes, in such a way that the members of each

¹) *Fjoldemålets lydssystem*, 1944, p. 230.

²) *La notion de l'isomorphisme (TCLC V)*, p. 56—57.

³) cp. footnotes 3 and 4 p. 9, and footnote 2 p. 10.

class are mutually commutable (i. e. are distinctive in a common environment), whereas members of the two different classes are not commutable (i. e. are not found in the same environment) but may be combined in the syllable¹. If we find, for instance, the syllables *pi, ti, ki, pu, tu, ku, pa, ta, ka*, we may, on this basis, establish a class of mutually commutable members (*p, t, k*) which may be combined with another class of mutually commutable members (*i, a, u*). Theoretically there would be a possibility of identifying members of the two classes in pairs as variants of the same phoneme (e. g. *p* with *a, t* with *i*, etc.). This is not done, because there is generally no phonetic motivation for doing it in one definite way rather than in another², but in some cases the phonetic relationship is evident and the identification is made (*i/j, u/w*). In this case we get a third class, whose members are commutable with members of both of the other classes.

If members of one of the two (or three) categories can constitute a syllabic base by themselves (e. g. *i, a, u*), there is an old tradition for calling members of this category vowels, and members of the other category consonants³. And in so far "vowels" and "consonants" are defined formally. This is a very common case. But it is not rare that no one phoneme can constitute a syllabic base by itself (i. e. *cv* is found, but not *v*). In this case we may follow the traditional procedure and call one of the categories vowels, and the other consonants, giving the name vowels to the category covering roughly the same phonetic zone as the vowels of other languages. This can be done because it has been found that the category capable of standing alone will always cover approximately the same phonetic zone, and in any case include the vocoids. — It is often said that the category forming the syllabic peak is called vowels, but this amounts to the same thing, considering that the phonetic zone normally covered by the vowels (e. g. the zone of the vocoids) has more inherent loudness than the zone covered by the consonants, and the vowels will there-

¹) cp. Vogt, *The Structure of the Norwegian Monosyllables* (*Norsk Tidsskrift for Sprogvidenskap*, XII, 1942, p. 11.)

²) *Remarques . . .* (*TCLC V*), p. 227—228.

³) Later these terms have also been employed for classes of sounds, i. e. for the sounds functioning as vowels and consonants in well-known languages, particularly Latin; according to this terminology *l* would be called a consonant, even in Czech, although functionally it belongs here to the class both-and. — It is in order to avoid this ambiguity that Pike has proposed the terms vocoids and contoids for the phonetic classes.

fore be perceived as the peak of the syllables. (This is not a formal definition, as Bloomfield¹ and others seem to believe, but it differs from the point of view taken here by considering the phonetic differences in each syllable taken separately).

Vowels and consonants can be divided into smaller subcategories. Generally the consonants present more possibilities of categorizing than the vowels. They will therefore be treated first, and in more detail.

B. Subcategories of consonants.

(1) *Position as the chief criterion.* The most general criterion for classifying the consonants must be position. This phenomenon, position or sequence, may be considered from different aspects. Bazell² has emphasized that formally it need not be considered as a relation. It might be replaced, for instance, by a definite pitch combined with each phoneme without affecting the system. In this he is certainly right (and that is why the term position is preferred here to order or sequence). Position is here considered as a phonetic feature which, like other features, may be distinctive or not. It is usually said that the difference in meaning between e. g. *tap* and *pat* is due to the permutation of the initial and final consonants, but this is only a particular consequence of two facts: (1) that in the language considered, initial and final positions are distinctive (cp. *tea/eat*); (2) that in this language both *p* and *t* (as well as other consonants) are commutable in initial position (*pin, tin*), and also in final position (*hat, hap*). And it would not be impossible to consider position as a distinctive feature belonging to the phonemes. If initial and final position are designated I and II respectively, we would then have two commutable consonants t^I and t^{II} , and we might write *ta, at, tap, pat* as $t^I a, t^{II} a, t^I p^{II} a, t^{II} p^I a$ and consider position as automatic, but this would complicate the inventory of phonemes enormously, and it is therefore preferable to consider *t* as one phoneme which may be combined with both I and II, but these two elements must somehow be considered as belonging to the phonemic system of the language. And if position is also distinctive within clusters, these positions must also belong to the system.

¹) *Language*, 1933, p. 130 ff.

²) *On the Neutralisation of Syntactic Oppositions (TGLC V, 1949, p. 77—86)*, particularly p. 78—79.

(2) *The hierarchic order.* The general principle should be to start with the criteria applicable to the greatest number of languages. In languages possessing only the syllabic type *cv* (and *v*) there is no possibility of subdivision of the consonants, but this is possible in languages having in addition the types *cvc* or *ccv*, if not all consonants occur in all positions. It may be subject to discussion whether it would be most practical to start with the difference between initial and final consonants or with the difference between their positions in clusters. The occurrence of the types *cv* + *ccv* may perhaps be more frequent than the occurrence of *cv* + *cvc* (i. e. many languages have no final consonants), but it gives a simpler procedure to start with the difference between initial and final consonants.

The first step should therefore be a classification of the consonants according to their possibility of occurring initially and finally, or, in other words, according to their possibility of combination with position I or position II. These two positions seem always to be distinctive, when both occur in a language. There will be three possibilities: only initial, only final, both initial and final.

The next step should be a division of the categories found at the preceding step according to their capacity of entering into clusters. There will be two possibilities: entering into clusters, and not entering into clusters. It may be asked why we have not proposed a similar step before the classification into initial and final consonants, i. e. a division of the consonants into those which cannot be combined with other consonants in the combination initial-final, i. e. which cannot be combined with other consonants in the same syllabic base, and those which can. The answer is that probably nothing would come out of such a division. If the language has only initial consonants, it is evident that none of these can be combined with final consonants, and if it has both initial and final consonants, it is very improbable that some of the initial consonants should not be able to combine with any final consonants. I do not know of any such language, but the possibility that such a language may be found can of course not be denied, and it would then be possible to introduce such a preliminary criterion of classification.

As the third step we propose a subdivision of the consonants entering into clusters according to their possibilities of entering into initial or final clusters. This division can only be applied to the consonants found both initially and finally, and there will be three possibilities:

entering into initial clusters only, entering into final clusters only, and entering into both.

As a further criterion we may use the position of the consonants in clusters. Kuryłowicz¹ starts his classification of Greek consonants with clusters of three consonants as a basis. This may give a simple description of Greek, but it precludes comparison with the numerous languages having clusters of two consonants only. It will be better to start with position of consonants in two-consonantal clusters. Here two positions may be distinguished: the position immediately adjoining the vowel (in the following called position 1) and the position not immediately adjoining the vowel (called position 2). It is practical to start the numbering from the vowel, because then it can be continued for clusters of more than two consonants. The three possible classes at this fourth step will thus be: consonants only occurring in position 1, consonants only occurring in position 2, and consonants occurring in both positions.

The first four steps of the classification as proposed here may be represented schematically as follows (I meaning initial, II: final, cl.: entering into clusters, ÷ cl.: not entering into clusters, 1: adjoining the vowel, 2: not adjoining the vowel).

CONSONANTS

(1)	I		II		I—II			
(2)	÷ cl.	cl.	÷ cl.	cl.	÷ cl.	cl.		
(3)		I cl.		II cl.		I cl.	II cl.	I—II cl.
(4)		1 2 1—2		1 2 1—2		1 2 1—2	1 2 1—2	1 2 1—2

Kuryłowicz maintains that the classification of consonants should always be based on the distribution of consonants in initial clusters, the distribution in final clusters serving only as a corollary². This may be a good method to use for Greek or for the Slavonic languages, but there seems to be no reason for establishing it as a general procedure. But the last column in the diagram (i. e.: consonants entering into both initial and final clusters, and both adjoining the vowel and not) might be further subdivided according to position of the consonants in

¹) *La notion de l'isomorphisme (TCLC V)*, p. 56.

²) *Contribution à la théorie de la syllabe (Bull. Soc. pol. ling., 1948)*, p. 107 ff.

initial and final clusters respectively. This might be done by choosing arbitrarily the position in initial clusters as the first criterion, and the position in final clusters as the second criterion, or it would be possible to establish four overlapping sets.

In languages containing clusters of more than two consonants, these may be employed for further subdivisions. Bjerrum¹ is of the opinion that clusters containing two consonants will be a sufficient basis for the classification, since more comprehensive clusters are nearly always composed of clusters of two already registered. This argument is hardly tenable. In the first place the rule is not absolute, although it is valid in many languages. Hjelmslev² has formulated the "empirical law" that clusters of three consonants can always be dissolved into two clusters of two consonants (1 + 2 + 3 dissolved into 1 + 2 and 2 + 3) already found in the language. But there are exceptions, e. g. in Russian, where *mgl-* and *mgn-* occur initially, but *mg-* does not, and *mzd-* is found, whereas *mz-* is not. And a good many of the clusters of 3 and 4 consonants in Kutenai, as described by Garvin³ cannot be dissolved. — But perhaps the rule is valid in a more general form, namely that consonants adjoining the vowel in clusters of more than two consonants are also found adjoining the vowel in clusters of two, and that consonant number 2 (counting from the vowel) is also found as first consonant in clusters of two, e. g. the group *sgv-* would involve that *v-* is found in groups like *kv-*, *sv-*, and *g-* in *gr-*, *gl-*, but not necessarily *gv*⁴. — But even if the rule is valid in this form, it cannot be used as an argument against undertaking further classifications on the basis of clusters of 3 consonants, on the contrary: it would mean that such a further classification would be possible, since it would not involve a complete redistribution, but respect the hierarchy already established; and the rule cannot be reversed, so that all clusters consisting of two members may be combined into clusters of three. Generally the number of clusters consisting of more than two consonants is more restricted than the number of clusters consisting of two. It might therefore be possible

¹) *Fjoldemålets lydssystem*, p. 218.

²) *Proceedings of the 2nd Int. Congr. of Phon. Sc. 1935*, p. 53.

³) *l. c.*, *IJAL XIV*, 1948, p. 37 ff.

⁴) This is the case in Danish, but as *k* is not found after *s*, it would also be possible to interpret *sg-* as *sk-* and *sgv-* as *skv-*, and then there would not be any exception, since *kv-* occurs. Cf. Uldall, *Proc. 2nd Congr. Phon. Sc.*, p. 57.

to divide the given subcategories further according to the function of the consonants in clusters of more than two members.

(3) *The actual occurrence of the categories.* There are some interesting differences in the actual occurrence of corresponding categories at different steps. This concerns particularly steps 1 (initial and final consonants) and 4 (consonants adjoining and not adjoining the vowel) as compared with the first division into consonants and vowels.

In most languages the phonemes can be divided into two rather comprehensive classes: consonants and vowels, whereas the class "both-and" is usually small when it exists at all. Contrariwise with the initial and final consonants, where it will often be found that the class "both-and" comprises most of the consonants of the language, supplemented by small classes of purely initial or purely final consonants; or the class "both-and" may be the only class. — It is also frequently found that the class "only initial" comprises most or all of the consonants, supplemented by a small class of "both-and". A third possibility is this that the two classes "only initial" and "both-and" are of equal importance. — But the class "only final" is generally small, and it seems never to be the only class found. Moreover it is very rare to find the two classes "only initial" and "only final" in the same language. The only wellknown example always quoted is *h/ŋ* in English and German and in some other languages, but even this exception may perhaps be discarded, since *ŋ* may be considered = *n + g*. Yuma seems to present both categories, but the facts might be interpreted differently¹. Anyhow the phenomenon is rare. This means that normally all consonants are mutually commutable either initially or finally (and the same is true — *mutatis mutandis* — of the vowels), and that the further division of consonants (and vowels) into subcategories is only a further redistribution of elements which all belong to the same analytical level.

Looked at from the phonetic aspect this fact may be formulated like this: sounds found initially and finally in the marginal parts of the syllable are generally so closely related phonetically that they may be reduced two by two as variants of the same phoneme. A phonetic explanation of this may be that it is of no importance for

¹ A. M. Halpern, *Yuma I, Phonemics (IJAL XII, 1946, p. 25—33)*. There are 6 consonants found only initially in words (but 4 are velarized or palatalized and may perhaps be considered as clusters), and 3 found only finally (*ʃ, ʃʷ, tʃʷ*); but these latter are found initially in unaccented syllables within words.

the syllable as a phonetic unit that initial and final consonants should be phonetically of different types (excepting their particular way of pronunciation as “explosive” and “implosive” — “releasing” and “abutting” in Stetson’s terminology — pronunciations which may be combined with all types of sounds), whereas it is of importance that there is a distinct peak in the syllable and therefore the classes of vowels and consonants are normally phonetically rather different. A consequence of this is that whereas it is mostly possible to identify two categories called vowels and consonants in different languages on the basis of their phonetic type, this is not possible for the subcategories of consonants.

There are, however, certain affinities between position and phonetic type: the sound *h* is often found exclusively in initial position, and it is not rare that voiced consonants, as distinguished from unvoiced, are found only initially (e. g. in some Germanic and Slavonic languages). And if the class of phonemes occurring finally (generally it will be the class of “both-and”) is very small, it happens very often that it comprises exclusively dentals (e. g. Greek, Italian, Finnish) or nasals (e. g. Mandarin Chinese, Mixteco, and various African languages). It is hardly accidental that precisely these types show a particular power of resistance in sound history. They are evidently more capable than others of standing in the final part of the syllable, which, as shown by Grammont and verified by others, is weaker than the initial part and exposed to all sorts of weakenings and assimilations¹. But these affinities are only slight and cannot form any basis of identifications of categories between different languages. Such identifications must be based on position in the syllable.

Corresponding to the three possible categories at step 1 (initial, final, both-and) we find at step 4 the three categories: only occurring in position 1 (adjoining the vowel), only occurring in position 2 (not adjoining the vowel), and occurring in both positions. But the actual occurrences of these categories are different. As stated above, it is extremely rare to find the categories “only initial” and “only final”

¹) The specific power of resistance of dentals must be due to their place of articulation (an organ which can be moved with great precision (the tongue tip) articulating against a hard and fixed object). The nasals on the other hand may perhaps be protected by a partial fusion with the preceding vowel, and perhaps by their rôle as part of the tonal basis (the languages quoted are all tone languages).

in one and the same language; but the corresponding categories "only in position 1" and "only in position 2" are often found together. This does not, however, imply that (as in the case of vowels and consonants) some of them might be reduceable to variants of one and the same phoneme, for they may all occur separately with mutual commutation, and so cannot be reduced. — The frequency of the two extreme categories means that position in clusters is often distinctive for only few consonants. But if it is distinctive in one case, the other distributions can be regarded as defective, and it is perfectly legitimate to define the consonants by their possibilities of combination with positions 1 and 2. If there is no case of distinction, it may nevertheless be possible to distinguish two categories on the basis of their possibilities of mutual combination (e. g. if the only clusters are *pr*, *tr*, *kr*, *pl*, *tl*, *kl*, there is a category *p*, *t*, *k*, and a category *r*, *l*), but if these categories are identified with the categories occurring in positions 1 and 2 in other languages, then a feature (position) which is only phonetic in one language has been identified with one that is phonemic in another.

The affinity between the two classes "only in position 1" and "only in position 2" with certain types of sounds will be greater than was the case with the corresponding classes of initial and final consonants. It is not rare that the former comprises nasals and liquids, and the latter mostly stops and fricatives; thus the type *pr*- is common initially and *-rp* finally. This has the well-known phonetic explanation that the shifting between peaks and valleys of prominence (or crests and troughs in Pike's terminology) will be smoother if the consonants immediately adjoining the vowel have more inherent loudness than the consonants farther away from the peak. But it should not be forgotten that this is only essential in languages which do not use other phonetic means of delimiting the phonetic syllables (e. g. the Germanic languages). In languages with a fresh stress-onset before each syllable or with syllable-timing, the rules need not be so strict; sometimes such languages (e. g. the Romance languages) also prefer the above-mentioned type, which from a phonetic point of view may perhaps be called the optimal type of syllable; but others do not, and this "optimal" type of syllable is by no means so common as it appears from the classical textbooks of phonetics (Jespersen, Sievers, etc.). It is not at all rare to find particularly nasals entering into the category of phonemes never adjoining the vowel in clusters (position

2, type *nta*); this is the case e. g. in Terena¹, and Cuicateco², where the affinity is therefore opposite, or there may be no affinity at all.

C. *Subcategories of vowels.*

The vowels may be classified according to similar principles. Corresponding to the first stage in the classification of the consonants, it would be possible to start with a classification into vowels found only initially in syllables, only finally, and both initially and finally. But the type *vc* is often of restricted frequency, and it seems in these cases to be accidental which vowels are found in this position and which not; on the other hand, the possibility of occurring finally or not seems to yield a good basis for a classification, e. g. in German and Dutch. So it would perhaps be preferable to divide the vowels into categories according to their possibilities of occurring: only before final consonants, only alone finally, or/and in both positions. Step 2 should be a classification according to their possibilities of entering into clusters (diphthongs and triphthongs), or not, and step 3 a classification according to their positions in these clusters.

D. *Discussion of further general criteria.*

It is questionable whether any further general rules can be given. This does not mean that the classification in each particular language should necessarily stop here. Further subdivisions may be made according to the particular phonemes entering into mutual combinations. But a comparison between different languages at these stages would be difficult. In languages containing not dissolvable medial clusters further subdivisions should take this fact into account.

Togebly³ has given a complete classification of the phonemes of French according to a procedure which is intended to be general, and he makes an interesting attempt to continue the general procedure two steps further. After having divided the phonemes into consonants and vowels, he proceeds in much the same way as proposed here⁴, establishing categories of consonants on the basis of their position initially or finally in the syllable and of their adjoining the vowel or

¹) Margaret Harden, *Syllable Structure in Terena* (*IJAL* XII, 1946, p. 60—63).

²) Doris Needham and Marjorie Davis, *Cuicateco Phonology* (*IJAL* XII, 1946, p. 139—146).

³) *Structure immanente de la langue française* (*TCLC* VI, 1951), p. 79—88.

⁴) We have both been influenced by Hjelmslev.

not. But there are some differences in detail. The latter division is, for instance, not restricted to the occurrence in clusters, so that all consonants are registered as adjoining the vowel.

Togeby's next stage is a subdivision on the basis of syncretisms. The class "initiale-finale vocalique" comprising \int , z , m , is thus divided into \int (not entering into syncretisms), m (entering into syncretism with n), and z (entering into syncretism with s). — A purely practical difficulty involved by this criterion is the general disagreement about syncretisms (neutralizations). Most American phonemicists do not distinguish between syncretisms and defective distribution. In Europe this distinction is generally made, but according to divergent principles. But apart from this practical difficulty it might be asked why syncretisms are considered as more fundamental than defective distribution in general. Togeby does not give any reason for his preference, but it might be argued that syncretisms seem to constitute a very stable part of the system of a language, normally extended to foreign words, even when other new combinations are adopted. But at any rate the subdivision on the basis of syncretisms with particular other phonemes does not allow of any comparison between different languages; it would probably be better to divide according to the criterion: entering into syncretisms or not. (On the whole syncretisms may probably be described more simply on the level of the distinctive features).

The last stage in Togeby's division is called "extension". Here the phonemes of the last classes are further subdivided according to their mutual relations as "intensive" or "extensive". These terms are used in a rather vague sense, "extensive" meaning: capable of entering into more combinations compared with the other(s), depending on syncretisms or defective distributions or, perhaps simply on frequency. The idea of establishing this as a general criterion is ingenious, but it might be objected that the concept is somewhat too vague to allow of a precise comparison, and that it may be rather accidental whether phonemes entering into an evident opposition as extensive and intensive will be found together in the last subdivisions. In many cases, by the very reason of the difference in distribution, they will belong to different subcategories.

When a phoneme has received a unique definition, Togeby refrains from any further characterization on the basis of the criteria of later stages. The possibility of continuing in such a way that all phonemes

are characterized (as far as possible) according to all criteria should however be taken into consideration.

VI. *Structural law or accidental gaps*¹.

A. *The general problem.* Most linguists who have established phoneme categories on a distributional basis have attempted to arrive at a specific definition of each phoneme (in so far as this has been possible in the particular language) by utilizing all differences of distribution. Hjelmslev seems to be the only exception. After having divided the consonants on the basis of the two criteria 1) initial or final, 2) adjoining the vowel or not, he refrains from further subdivisions. One reason has been that further criteria would be too particular to allow of comparisons between languages. This is perhaps true, but provided that the first criteria have been such that the existing possibilities of comparison have been utilized, this consideration should not prevent us from attempting an exhaustive categorizing of the phonemes of the particular language. Another reason has been the fear of getting beyond the limit between structural laws and accidents of utilization in the given stock of words. This indeed is a very difficult problem². — Generally one has a vague feeling that there is a difference, and there would be general agreement in the extreme cases: anyone would probably admit that *prust* would be a possible monosyllable in English, although it does not exist, whereas *mlgapmt* would not. The question is whether we can find valid arguments in the particular language, and whether it is possible to find general rules for all languages.

Many linguists have mentioned this problem briefly without attempting any analysis of it³; others have implicitly fixed such a limit;

¹) I am indebted to H. Spang-Hanssen for some improvements of the formulation of this chapter.

²) It is presupposed in this argument that the aim of the description with which we are concerned is not simply an enumeration of the combinations of phonemes found in the given syllables and words, but the formulation of general laws governing these combinations, allowing for possible combinations not utilized in the given vocabulary.

³) e. g. A. Martinet, *Phonologie du mot en danois* (BSL, 1937), p. 6; A. W. de Groot, *Structural Linguistics and Phonetic Law* (Archives néerlandaises XVII, 1941), p. 92; A. Bjerrum, *Fjoldemålets lydssystem*, p. 117; K. L. Pike, *Phonemics* 1947, p. 73 ff. and 81 ff.

it is for instance evident from the examples given by V. Mathesius¹ that he considers combinations between consonants in clusters as submitted to rules, whereas combinations between vowels and consonants are considered as accidental. Bloomfield², on the other hand, defines the English vowels by means of their possibilities of combination with the following consonants, and consequently he must consider these combinations as submitted to rules. Vogt³ defines the Norwegian vowels by means of their combinations with the preceding consonant clusters, but somewhat hesitatingly, and he emphasizes that restrictions here may be accidental and that the vague feeling one has for such differences can probably be stated by linguistic means in terms of structural rules, articulatory patterns and statistical frequency⁴. These very brief remarks at the end of Vogt's article seem to include the essential aspects of the problem. In the following pages a somewhat more detailed analysis will be attempted⁵.

First it must be emphasized that it is theoretically impossible to fix a non-arbitrary borderline between law and accident. Laws may be stated as deviations from accidental distribution; and there are many degrees of deviation. But not all cases are equally dubious.

In the first place it should be kept in mind that a gap — e. g. the non-occurrence of a specific cluster — may be due to rules having a different place in the hierarchy of categories. And as this hierarchy has been established in such a way as to begin with the more general classes, it follows that the higher the rule is placed in the hierarchy the greater is the number of particular cases which it will generally cover, and the safer it is. An example may illustrate this: the fact that the cluster *-sp* is not found in a certain language may be due to a very general rule (covering many other gaps) that the language in question has no final consonants; it will also be due to a very general rule, if final consonants are found, but no clusters; it will be

¹) *TCLP* I, 1929, p. 67—89.

²) *Language*, 1933, p. 134.

³) *The Structure of the Norwegian Monosyllables* (*Norsk Tidsskrift for Sprogvidenskap*, XII, 1942), p. 25.

⁴) *l. c.*, p. 29.

⁵) The same problems arise for the descriptions of word structure, cp. Uhlenbeck, *De Structuur van het Javaanse Morpheem*, 1949, p. 5—10. He distinguishes between negative and positive structural laws. But if these positive laws include simply the possibility of combination, it is only a reversal of the negative laws.

due to a somewhat more specific, but still comprehensive, rule if clusters are found but no final clusters, and to a still more specific rule if final clusters are found but none with *s* adjoining the vowel, and none with *p* not adjoining the vowel, and the rule may be somewhat more restricted, if only one of the two consonants does not occur in this position, but this rule might still comprise the non-occurrence of e. g. *st* and *sk*. In all these cases we may maintain with relative certainty that the lack of the cluster *sp* is due to structural laws of the language. But if the only explanation which can be alleged is the very fact that *sp* has not been found, then the chance that we are on the borderline between structural law and contingency is very great.

In these cases it is necessary to consider the relative frequency of the phonemes in the given position (not the frequency in a text, but the frequency in the material of words). In German *j* is not found before *oi*. This may be due to pure accident, for initial *j* is relatively infrequent compared with other initial consonants, and the diphthong *oi* is also relatively rare in other combinations. The probability of their occurring together is therefore not very great, and the non-occurrence need not be due to a specific law preventing this particular combination. On the other hand, there does not seem to be a similar explanation of the lack of e. g. *tl-* in English. And the systematic nature of this gap seems to be corroborated by the lack of *dl-*. One would probably, on the whole, be more inclined to recognize a law if the occurrence or the non-occurrence can be formulated in terms of phonetically similar groups of phonemes (e. g. dentals, high vowels, etc.) and think of an accidental gap if this is not the case. Psychologically this is of course of importance. Structurally it might be motivated by the fact that in the former case the rule could be formulated in a more general way in terms of distinctive features. But this is dubious.

It is evident that if not only combinations of two, but of three, four, or more elements are considered, then the chance of finding all possible combinations realized within the (always restricted) word-stock of the language will be smaller. It is not very probable that all combinations of *str-* with different final clusters will be found, and consequently it cannot be proved that the non-occurring combinations are excluded by a structural law.

It is perhaps this consideration which is behind Twaddell's remark about English¹: "We find, in American English, that all fundamental characteristics involving the absence of (presumably potential) distinctive forms can be correlated with immediately preceding or following phonetic fractions, including the omnipresent factor of stress". And he gives the example that *fet* is a possible syllable in English, because the combinations *fe-* and *-et* occur. But in this general form (i. e. if we find $x + y$ and $y + z$, then $x + y + z$ is possible) the rule is not valid, either in English or in other languages.

B. *Empirical rules concerning the connexion between different parts of the syllable.* Twaddell's assertion might be true if the syllabic base consisted simply of a series of phonemes and did not allow of any further division into parts or units. But the division into central and marginal units (comprising vowels and consonants) and into initial and final clusters prove to be significant from this point of view. — It is not a theoretical necessity, but it is an empirical fact that in most languages there are relatively strict rules for the combinations within the units, but not for the combinations at the limits, i. e. between phonemes belonging to different units. The consonantal and vocalic clusters actually found in a language will normally be of a restricted number (compared to the theoretical possibilities), and the phonemes found in the different positions in these clusters will be still more restricted, so that the clusters found can normally be said to belong to a few frequently recurring types, and thus it will not be possible to maintain that the non-occurring clusters are simply accidental gaps. — It is true that there are languages possessing a very great number of different clusters of various types (e. g. some American Indian languages) and in these languages it might be possible to assume that the non-occurrence of some of the clusters were simply due to accidental gaps. But in most languages there are laws not only for the combination of two adjoining phonemes, but also for the combinations of three and more if such occur. It is however very rare that there are any rules for the connexion between initial and final consonants, or consonant clusters (that is why Twaddell's example *fet* is tenable), although a certain tendency to avoid the same consonants or the same phonetic types of consonants immediately be-

¹ *On Defining the Phoneme (Language Monographs XVI, 1935), p. 50.*

fore and after the vowel has been discovered in various languages¹; but generally it is only a tendency.

It seems also to be very rare to find rules for the combination between the initial consonantal unit and the central unit, not only so that the combination of the first and last member in groups of three members can be said to be free (i. e. if *pr* and *ri* are found, then *pri* is a possibility), but also so that even the combination of two phonemes (a single initial consonant and a following vowel) seems to be free. Normally all theoretically possible combinations are found, and if not, the non-occurrence can often be explained by the fact that one or both of the phonemes are relatively rare in this position, so that it is statistically justified to speak of an accidental gap. In the combinations of three phonemes, example *pri*, the probability of finding accidental gaps, and consequently the justification of considering non-occurrence as accidental, is greater, since more elements are involved, and some clusters or vowels may be rare².

The connexion between the central unit and the final consonantal cluster seems also to be relatively free, i. e. there are less strict rules than for combinations within the units, but often it is not so free as the connexion between the initial consonant and the central unit. There may be some restrictions, which can hardly be accidental. Twaddell mentions the occurrence of vowels before *r* in English; in Danish the short vowels *i*, *y*, *u* do not occur before final nasal consonant; and before *r* there is no distinction between *i*, *y*, *u* and *e*, *ø*, *o* (the pronunciation varies)³. There may also be restrictions concerning the combination of groups: in German and Dutch diphthongs are not

¹) W. F. Twaddell, *Combinations of Consonants in Stressed Syllables in German* (*Acta Linguistica* I, p. 189—199 and II, p. 31—50); H. Vogt, *l. c.*, p. 22 (Norwegian); E. M. Uhlenbeck, *De Structuur van het Javaanse Morpheem*, 1949, p. 10 (in Javanese the types *clvl* and *crvr* do not occur); Trnka, *Die Phonetik in tschisch und slowakisch geschriebenen Arbeiten* (*Archiv für vergleichende Phonetik* VI, 1943, p. 65—77), mentions that repetition of the same phoneme before and after the vowel in English shows foreign origin or expressiveness.

²) In German the gaps after clusters of two consonants concern particularly the rare vowels *ö* and *ü* (e. g. *ö*: is not found after, *gl-*, *gn-*, and others). Among the clusters of three consonants, some are relatively rare and are consequently only found before few vowels (*[pl]* e. g. only before *i:*, *i*, *ai* (and in foreign words *e*)). These gaps are accidental.

³) In the Danish dialects described by Ella Jensen and Bjerrum (cp. p. 10, notes 6 and 7), the combination between vowel and final consonant seems also to be submitted to certain rules.

found before r^1 , and there are also definite restrictions to the consonantal clusters found after diphthongs; in the Germanic languages long vowels do not occur before η (and it is possible that both long vowels and η should be interpreted as clusters). And there are certainly languages where consonant clusters do not occur at all after long vowels (in Germanic languages a certain tendency to avoid this is obvious). This means that in many languages there is a more intimate connection between the central unit and the final one than between the central unit and the initial one. And this might serve as a further argument for the analysis of the syllabic base proposed by Kuryłowicz², namely $C + (V + C)$. (This is an analytical operation and does not prevent the establishment of vowels and consonants as the two main categories of phonemes. The establishment of categories is based upon the analysis, but does not coincide with it).

The empirical rules concerning accident or law in the combination of different parts of the syllable mentioned on the preceding pages, seem in any case to be valid for well-known languages. This means that Vogt goes too far, when he establishes categories of vowels in Norwegian defined by their possibilities of combination with preceding consonant clusters, and that Trnka³ goes too far when he describes English vowels in terms of their ability to combine with preceding or following consonants and consonant clusters. The same thing can be maintained of Abrahams' definition of Danish consonants⁴, particularly of his definition of the difference between t and d , consisting in the restrictions of combination between the cluster dj and a following vowel. — On the other hand, it will often be possible to go farther than Hjelmslev, who does not use combinations between particular phonemes within the clusters to define smaller subcategories. And it should not be forgotten that the assumption of accidental gaps has consequences for the commutation. When the gap is accidental, the combination in question is possible, and it does not matter for the

¹) In the historical development this has been avoided in two different ways: in Dutch by not diphthongizing long i :, u :, y : before r (e. g. *vuur*); in German by inserting an ə and developing a new syllable (*Feuer*). These particular rules before r may be explained phonetically, cp. L. L. Hammerich, *Tysk Fonetik*, pp. 140—141.

²) *TCLC* V, p. 50 ff.

³) *A Phonological Analysis of Present-Day Standard English*, (*English Studies*, 1935).

⁴) *Tendances évolutives des consonnes occlusives du germanique*, 1949, p. 96.

commutation that a word-pair with a minimal difference is not found, provided that it can be constructed without breaking the laws of the language. The border between law and contingency should be established for each language, and the accidental gaps should be utilized for the commutation, and all structural laws for the establishment of subcategories of phonemes.

It should be possible to verify the validity of the empirical rules concerning the relations between the different parts of the syllable, and of the hierarchy of more or less general laws, established above, by an inquiry into the treatment of loanwords containing combinations of phonemes not occurring in the receiving language. If the non-occurrence was due to an accidental gap, the introduction of the foreign word should not make any difficulties, e. g. the introduction of a word "*prust*" in English. But the more general the law forbidding this combination, the more difficult it would be to introduce the word without any change. — Thus the word *sklerose* has been introduced into Danish without too many difficulties (although the group *skl-* is not found in Danish words), since clusters of the type *spl*, *skr*, etc., exist, i. e. clusters with *s*, *k*, and *l* in the positions required, and the combinations *sk-* and *kl-* exist. The same thing is true about the group *pn-* (*pneuma*), since *pl*, *pr* and *kn*, *gn* occur. *ps-* is more difficult, since *s* is not found elsewhere as a second member of an initial group, and the *p* is therefore usually left out. A language having initial clusters but no final clusters, should then have more difficulty in introducing a final cluster than an unknown initial cluster (and still more if final single consonants were also unknown). — But only the relative difficulty of assimilation would be of interest in this connection, not the absolute difficulty, for this depends also on social and psychological factors: many European languages are more inclined to take over foreign words without alterations nowadays than some centuries ago. In Finnish all initial clusters were simplified in older loanwords; but in recent loanwords clusters can be found. And this is not simply a question of time, but of social attitude. — There are linguistic communities where the "correct" pronunciation of foreign words is considered very important (German is a typical example), others where this pretension does not exist. These social differences must be taken into account in an evaluation of the material.

The above observations, and also the proposals concerning a fixed procedure for the classification of phonemes for comparative purposes

are of a preliminary nature and do not pretend to give definitive solutions. Many questions need further discussion. — And it should not be forgotten that for other purposes other classifications may be preferable. Position seems to be a useful basis for comparative purposes, but for the description of a single language the relations between particular phonemes might be considered equally essential, e. g. the fact that in English *p, t, k* adjoining the vowel are only found after *s*¹.

Finally we want to emphasize that the result of such a classification depends on the way the phoneme inventory has been established. The more the inventory is reduced, the greater will be the uniformity of distribution, and the more restricted the possibilities of classification on distributional grounds. These two aims of the analysis (to get few phonemes, and many categories), seem to a certain extent to be in mutual contradiction.

¹) For an interesting description of English consonant clusters from this point of view, cp. the article by Mel Most (to appear in *Word*).