

DISTINCTIVE FEATURES AND FINAL CONSONANT CLUSTERS IN ENGLISH

JAN CYGAN

Wroclaw University

The introduction of the concept of distinctive features to linguistics has rightly been compared to the splitting of the atom in physics (cf. Ivanov 1962 : 140). The idea that the phoneme, hitherto the smallest and indivisible linguistic unit, could be viewed as a bundle of distinctive features opened new and more effective means of handling the phonemes. It has always, for example, been difficult to classify consonants by place of articulation, since the number of places was more than two and consequently did not yield clear-cut oppositions. The distinctive features theory provided an ingenious way of classifying any phoneme in terms of binary oppositions. For instance, instead of being classified as labial, dental (alveolar), and velar respectively, /p/, /t/ and /k/ could now be classified by two features, compact and grave, as follows:

	/p/	/t/	/k/
compact	-	-	+
grave	+	-	+

where "compact" may be interpreted as "back" (or "posterior") and "grave" as "peripheral" in the mouth cavity. The wanting combination [+ compact, - grave] is taken in English by the affricate /tʃ/ which thus completes the system of four stops most economically defined by just two parameters. The system is easily extended onto eight stops by the introduction of a third parameter (either tenseness or voice). A fourth parameter (continuity) helps to cover the spirants while it disregards the articulatory differences between the stops and the spirants, there being in English two spirant positions, /θ/ and /s/, corresponding to the plosive /t/, but none corresponding to the plosive /k/.

The classification by means of the distinctive features has not, however, been free from arbitrariness. To make up for the above mentioned asymmetry of the English consonant system, for example, L. G. Jones (1956 : 246) proposed the following arrangement of the consonants

grave	compact	plosives	continuants
+	+	/k g/	/θ ð/
+	-	/p b/	/f v/
-	-	/t d/	/s z/
-	+	/č ě/	/š ž/

The alignment of /θ ð/ with /k g/ is, if anything, counterphonetic, and is not shared by other authors, who classify /θ ð/ as nongrave, noncompact (= diffuse, acute). Other discrepancies are, for example, that the nasals are nonvocalic in Jakobson and Halle (1956), but vocalic in Jones (1956) and Hultzén (1965); or that the semivowels /j r w/ are tense in Jones, but lax (lenes) in Hultzén.

There has been also, as pointed by Hultzén (1965 : 7n), no agreement as to the order of branching and the positive or negative assignment of the features, particularly in the case of compact vs. diffuse, grave vs. acute, and strident vs. mellow.

If, however, the two points, i.e. a hierarchy of the distinctive features and their plus or minus assignments are not of the utmost importance, a graver fact is that the dozen oppositions originally specified by Jakobson, Fant and Halle (1952), and claimed to be universal and exhaustive of all the possibilities of contrast in various languages, have not been found satisfactory for the specific languages. In actual descriptions extra features had to be introduced, such as accented vs. unaccented for Russian (Halle 1959), long vs. short and syllabic vs. nonsyllabic for Czech (Kučera 1961), dependent vs. independent for English (Scholes 1966). In Scholes's hierarchy the feature dependent-independent comes second highest, below consonantal but above vocalic, and, which is worse, he has a trinary node at this branching, which spoils the whole picture. It seems that the distinctive features provide a very useful tool for analysis, but the concept must not be abused.

Recent developments in the distinctive features theory have brought some rather radical changes. First, the number of the universal features has been increased to "some thirty or forty" (Postal 1968 : 58). Secondly, the terminology has shifted back from acoustic to articulatory (Chomsky and Halle 1968). Thirdly, the former marking of the features as plus, minus, or zero (no information), has been supplanted by two levels of marking, the deeper level of marked (m) vs. unmarked (u), and a further specification of "marked" as either plus or minus (Postal; Chomsky and Halle).

The first of these changes is to be regretted. The concept of distinctive features ceases to be at all attractive if their number reaches the number of the phonemes of a language. Either the features or the phonemes then become superfluous. In order to be of use in any phonological description or classification the distinctive features have to be limited in number to a necessary minimum.

The shift towards articulatory terminology, on the other hand, is welcome, since it is easier to handle and more understandable. Such terms as compact, diffuse, grave, acute, flat, etc. are less easy to identify than the almost self-explanatory terms anterior, coronal, low, high, round, etc.

Finally, the possibility of a positive (plus) feature functioning as unmarked, and a negative (minus) feature as marked, renders the whole concept more flexible and opens new horizons of interpretation.

In our treatment of the distinctive features in this paper we shall deal with them in the following manner.

(1) We shall try to keep the number of the features down to the indispensable minimum. It seems that the hitherto practice of describing the English consonants in terms of 8 features (Halle 1958, 1961, 1964; Hultzén 1965; Fisiak 1968) is quite satisfactory.

(2) In the terminology we find it desirable to follow the latest trend represented in Chomsky and Halle (1968). We thus use the features "anterior" (to cover the labials and dento-alveolars) and "coronal" (for the dento-alveolars and palatals) to replace the former "diffuse" and "acute" respectively.

(3) We shall take into account the suggestions of markedness of the features, scattered rather unsystematically in the latest works of Postal, and Chomsky and Halle, and so assign the feature specifications that a plus will automatically denote a marked feature.

The features taken into consideration in our classification of consonants will be the following.

I. Of the Major Class features, the features Consonantal vs. Nonconsonantal (1), and Vocalic vs. Nonvocalic (2). The feature Sonorant vs. Obstruent seems superfluous (cf. Chomsky and Halle 1968 : 85n.).

II. Of the Cavity features, first of all the feature Nasal vs. Nonnasal (3); also the features of primary structures, i.e. Anterior vs. Nonanterior (4) and Coronal vs. Noncoronal (5). The features Low vs. Nonlow, High vs. Nonhigh, and Back vs. Nonback are of no consequence and are ignored in the description of consonants (cf. Chomsky and Halle 1968 : 177).

III. Of the Manner of Articulation features only Continuant vs. Stop (6) is taken account of. Instantaneous Release vs. Delayed Release (to account for the difference between the plosives and affricates) does not seem necessary.

IV. Finally, of the Source features, Voiced vs. Voiceless (7), rather than the formerly used Tense vs. Lax, and Strident vs. Nonstrident (8) are both of paramount importance.

The markedness of the features will, for the purpose of this work, be accepted as constant (thus differently from Postal or Chomsky and Halle), in the following way.

m consonantal	= - consonantal
m vocalic	= + vocalic
m nasal	= + nasal
m anterior	= - anterior (+ compact)
m coronal	= - coronal (+ grave)
m continuant	= + continuant
m voice	= + voice
m strident	= - strident (+ mellow)

(Cf. Chomsky and Halle 1968 : 404-412, especially rules II, III, XIII, XXI, XXII b, XXIV b, XXVII a, b, XXIX, XXXI, and table 12).

A table of consonants in terms of the above specified marked features follows.

	j	w	h	r	l	ŋ	m	n	g	k	b	p	d	t	ʃ	ç	ʒ	ʂ	v	f	ð	θ	z	s	
Nonconsonantal	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vocalic	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nasal	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nonanterior	+	-	+	+	-	+	-	-	+	+	-	-	-	-	+	+	+	+	-	-	-	-	-	-	-
Noncoronal	+	+	+	+	-	+	+	-	+	+	+	+	-	-	-	-	-	-	-	+	+	-	-	-	-
Continuant	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+
Voice	+	+	-	+	+	+	+	+	+	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Nonstrident	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	+	+	-

There are two points to note. (1) /w/ is nonanterior in Chomsky and Halle, which would mean that they regard it as velar rather than labial. Treating it as labial (= - nonanterior) is sometimes more convenient, and helps to distinguish /w/ from /j/ without recurrence to other features. (2) /r/ is marked as coronal by Chomsky and Halle, which makes it go together with the other liquid /l/, the difference between the two liquids being that /r/ is nonanterior while /l/ is anterior. In certain situations, however, /r/ behaves more like a glide, and would then better be assigned the feature noncoronal, as other glides. (L. G. Jones 1956 marked it as \pm grave.)

It should be mentioned here that vowels cannot be differentiated by means of the above features, in terms of which they are all

+ nonconsonantal
+ vocalic
- nasal
+ nonanterior
+ noncoronal
+ continuant
+ voice
+ nonstrident

Our above specification of the distinctive features has the important advantage that the pluses in the table are all positive markings. We may note that the individual phonemes differ significantly as to the number of their positive marks. Thus the glides rank quite high with 5 or 6 pluses, the lateral has 4, the nasals from 3 to 5, the obstruents from 1 to 4. Particularly noteworthy are the single marks of /t/ and /s/. On the other hand, the highest marked phonemes are the vowels, which all have at least 7 pluses. These facts will be seen to correlate with facts of the syllable structure.

*

Viewed phonologically, as phonotactic complexes, the final clusters of English present a much less clear picture than that perceptible in the initial clusters. This was theoretically predictable, since final clusters may comprise, beside those motivated by the initial clusters, also unmotivated types (cf. Kuryłowicz's principle IX, 1948 : 213).

The general properties of the final clusters, noticed on the surface, are the following.

(a) In four and three member clusters the last sound is dento-alveolar (= anterior and coronal): it is /s/ or /t/ in 4-element clusters, /s z t d/ or /θ/ in 3-element clusters. Exception: /-mpf/ *nymph*.

(b) A majority of clusters (101 out of 156) in Hultzén's list of 1965, begin with a nasal or a lateral.

(c) Contrary to the vowel-adherent position of the nasals or the lateral, there are no established positions for the obstruents.

(d) Unlike in the initial clusters, there can occur two resonants /lm, ln/, two plosives /pt, kt/, and even three spirants in succession /-fθs/, but no two successive sibilants.

(e) The same phonemes, alveolars /s z t d/ can occur twice in a cluster, e.g. /-tst, -zdz, -sts, sθs, -sps, -sks/.

(f) Not even are the turbulents in a cluster always all voiceless or voiced, e.g. /-dst, -dθ/.

The above facts render an analysis of the structure of the final clusters in terms of phoneme classes like those in the initial clusters rather difficult.

Linguists tried in various ways to describe the structure of the clusters under discussion. Bloomfield (1933 : 132f.) distinguished the positions of main final, preceded by one or two pre-finals, and followed by a post-final. The membership of each of these positions was stated by means of a number of rather specific rules, but did not establish classes of any generality.

O'Connor and Trim (1953) posited, much like Bloomfield, a normal final, but two post-final positions, and only one pre-final. The membership of each of the positions was clearly tabulated, and the classes obtained were considerably fewer and much more coherent as to their composition. But there

was considerable overlapping in membership of the classes, which caused the analysis to be largely arbitrary in many instances. The number of three-element final clusters tabulated by O'Connor and Trim seems to be smaller than that listed by Hultzén (48 vs. 72), but this is only superficially so, if one compares the difference of 24 with the number of 25 "possible duplicates" in Hultzén. In this light the two tables come very close to each other, and are both very reliable. The same concerns the four-term clusters, where in spite of the apparent discrepancy (7 vs. 15), the types of clusters (in terms of phoneme classes) are all represented.

Probably the best attempt at a structural description was that of A. A. Hill's, since it was based on the structural classes of consonants extracted from an analysis of the initial clusters. Hill numbered his initial positions 1-, 2-, 3- from the beginning of the word towards the vowel, and tried to identify his final positions in the same way. In view of the total of four positions, however, he was short of the classes, and had to expand his final clusters by two new positions, -1⁺ (membership /t d/), and -3⁺ (membership /s z t/); a third position, 3⁺, concerning postvocalic /r/ of the r-full dialects will be neglected here (cf. also Hill's own remark, 1958 : 83).

The reversible order of spirants and plosives in the obstruent section made him, on the other hand, recognize two main types of "forward" and "reversed" clusters. As a result he obtained quite a consistent scheme of a dozen or so cluster types. But even in this classification there were some exceptions, e.g. /-fθ, -ksθ, -l(f)θ/ did not fit into any type. Moreover, not only did the number of pertinent clusters analysed total only 76, i.e. a half of Hultzén's, but also, which was worse, the classification did not account for such types as /-pts/, /-mpts/, while on the other hand it put together such clusters as /-sps/ and /-spt/. It was thus hardly satisfactory.

Nor were earlier attempts successful to describe the syllable structure in general phonetic terms of aperture (Saussure) or relative sonority (Jespersen). These theories did not work in the case of plosive and spirant, where the order SP- initially and -PS finally was contrary to the theory.

Hultzén's (1962 : 311) division of English consonants into fortes and lenes, with a further subdivision of the lenes into four groups: obstruents, nasals, lateral, and semivowels, and his postulated order (from the vowel)

j r w — l — m n ŋ — b d g ʃ v ð z ʒ — p t k ʈ f θ s ʃ h

is theoretically correct, but rather vague in that it does not explain the privilege of the obstruents to occur more than once in a cluster.

The present attempt at explaining the structure of final consonant clusters is based on the assumption that the phonemes cluster according to their valencies, i.e. the number of plus marked features, which decreases from the vowel outwards. Vowels, which constitute syllable peaks, all have more

than 7 pluses. The valencies of consonants, as tabulated earlier, are summed up below.

j	w	r	l	ŋ	m	n	g	k	b	p	d	t	ʃ	ð	ʒ	ʃ	v	f	ð	θ	z	s	
6	5	5	6	4	5	4	3	4	3	3	2	2	1	2	1	3	2	3	2	3	2	2	1

Compared with Hultzén's arrangement, these values, arranged according to the lowest valency in each group, show marked correlation, cf.

the semivowels /w j r/ have from 6 to 5 pluses,
 the lateral /l/ has 4,
 the nasals /ŋ m n/ from 5 to 3,
 the voiced obstruents from 4 to 2,
 the voiceless obstruents from 3 to 1.

Only /h/ with its 5 pluses does not fit into the voiceless obstruents class, but rather into the semivowels class.

The above theory justifies almost all of the two-consonant final clusters listed by Hultzén, except for /-sp, -sk, tθ, -sθ/. It justifies in particular the occurrence of /-pt/ (valued₂₁), and /-kt/₃₁, and the non-occurrence of the reversed clusters */-tp/, */-tk/. Cf. also the diminishing valency in /-ft, -θt, -št, -fs, θs/, and the utmost final occurrence of /t/₁ and /s/₁.

What concerns the exceptions,

(1) /-sθ/ is a doubtful cluster. It does not occur word-finally, only syllable-finally (Hultzén's example is *isthmian*). It is also interesting to quote Whorf (1940 : 229) in this respect: 'Although we can say "nth" power or "fth" power, it takes effort to say the unpermitted "sth" power or "hth" power.' In terms of valencies these clusters are: /nθ/₃₂, /fθ/₂₂, but /sθ/₁₂, /ðθ/₁₂.

(2) Genuine /-tθ/ occurs only in *eighth*, otherwise it is paralleled by /-dθ/: *width, widthed, widths*. The retention of /-dθ/, a voiced + voiceless turbulents cluster, nonoccurrent elsewhere is consistent with the valency principle. Besides, /tθ/ is special in that it may be regarded as a quiet dental affricate (see Postal 1968 : 189).

(3) /-sp/ and /-sk/, as well as /-st/, are well known from the initial clusters (cf. Cygan 1969 : 31). As a matter of fact, they are composite phonemes (Vogt 1942 : 14) of double function, explosive initially and implosive finally (Kuryłowicz 1948 : 219), i.e. they function parallel to /p t k/ initially, and to /s/ finally. We propose to assign these compounds the valencies of their vowel-directed member; thus both /-sp/ and /-sk/ are to be interpreted as having the valency ₁ rather than ₁₂ and ₁₃ respectively. /-st/ will be interpreted in the same way i.e. as having the valency ₁ rather than ₁₁, though this is of no consequence in this particular case.

Among the three-member clusters, /-spt/ and /-skt/ are then both valued ₁₁, the same as /-sps/, /-sks/ and /-sts/, the dichotomies of these clusters being /-sp. t/, /-sk. t/, /-sp. s/, /-sk. s/, /-st. s/.

The only other three-member cluster which does not conform to the theory is /-ksθ/. Here /ks/ is, in our opinion, to be regarded as a compound, of the valency of the vowel-oriented /k/, i.e. ₃. There is some evidence justifying such treatment. /ks/ is the only compound behaving like single consonants under Verner's law, compare

/ks/:	<i>exhibition</i>	—	/gz/:	<i>exhibit</i>
	<i>exercise</i>			<i>exert</i>
	<i>exhortation</i>			<i>exhort</i>
	<i>exhalation</i>			<i>exhale, etc.</i>

There are no examples of either /ts/ or /ps/ behaving like this. Also the combination /ks/ is unique as consisting of exactly opposite features

	/ks/	
compact	+	—
grave	+	—
mellow	+	—
continuant	—	+

(In full representation no common marked feature at all.)

Compare also the frequent appearance of /ks/ as morpheme final in English, contrary to /ts/ and /ps/, and the use of *x* in spelling, e.g. *lax, flax, tax, wax, coax, hoax, flex, sex, vex, fix, mix, six, calx, Manx, minx, sphinx, lynx, ox, box, fox, phlox, pox, flux, crux, etc.*

Yasui (1963 : 58, 90) says in this connection: "/ks/ is the only base-final -C₂C₁ (=two-member, J.C.) cluster among those not containing any sonorants or a semivowel /r/ that can be credited with the status "established". And O'Connor and Trim (1953 : 120): "A case may fairly be made out, in view of the fact that /k/ occurs as pre-final only before /s/, for regarding /ks/ as a close-knit compound consonant unit functioning as a simple consonant unit."

In view of the above, the cluster /-kst/ may be analysed either as /-k. st/ or as /-ks. t/, i.e. with a compound at the end or at the beginning, both interpretations boiling down to ₃₁.

Among the four-element clusters there are two with /ks/, viz. /-ksθs/ and /-ksts/. The latter would admit of two internal divisions, i.e. either /-ks. ts/ or /-k. st. s/. It is the division /-ks. ts/ that seems preferable: it parallels that in /-ks. θs/ and the dichotomy is clearer when the compound precedes the rest rather than go in the middle.

The above remarks concerning /tθ/, /sk/, /sp/, and /ks/ make us assume the existence in final clusters of compounds which are more coherent and value as single phonemes. It may be noticed in this connection that coherent groups acting as units of a specific valency are well known in chemistry, cf. e.g. the hydroxyl radical (OH), with the valency of H, not O, i.e. ₁. Cf. also that while the chemical formula of water is H₂O, its molecular structure is best

shown as H(OH). The former formula only characterizes water as an oxide (cf. CaO, etc.), but the latter not only reveals its spatial structure (H—O—H), but also explains the neutral properties of the compound which result from its being a combination of the acidic hydrogen H with the basic radical (OH).

Three-member clusters will then be dichotomized so as to account for the compounds, thus

/-sp. t/	/-sk. t/	/-sp. s/	/-st. s/	but /-sk. s/ or /-s. ks/;
/-p. st/	/-t. st/	/-d. st/	cf. the lack of /-ds/;	
/-tθ. t/;				
/-ks. θ/	but /-k.st/ or /-ks. t/.			

In /-sks/ and /-kst/ the division can be both ways: it is immaterial how it is done in triple clusters (but not in four-member all-obstruent clusters, as shown above).

The existence of closer-knit compounds within obstruents clusters leads us to the problem of prenasalized stops. As has been mentioned, two thirds of the final clusters in English are prenasalized or prelateralized. The most important thing, however, is that there is close connection between the nasal and the following stop: they are homorganic. The nature of the nasal seems to depend on the stop (cf. e.g. Chomsky 1965 : 175, Chomsky and Halle 1968 : 116n.): it is /m/ before /p/, /ŋ/ before /k/, and /n/ elsewhere. There is also a tendency to develop a homorganic stop between a nasal and a turbulent (e.g. *nymph*).

Articulatory explanation of these facts is simple, cf. Moulton (1956 : 373): "In the transition from a voiced nasal to a voiceless spirant or a non-homorganic voiceless stop, three operations must take place: (1) voice must cease; (2) the velum must be raised; and (3) the (bilabial, alveolar, or velar) closure must be opened. If all these operations take place simultaneously, the transition is direct. But if (1) and (2) take place before (3), the voiceless stop homorganic to the nasal is articulated. And similarly also in the transition from a voiced alveolar lateral to a voiceless spirant".

In a three-member cluster of this kind the nasal/lateral and the homorganic stop share more marked features than the stop and the following turbulent, therefore we dichotomize /-mp. t/, /-ŋk. t/, etc.

We have so far distinguished the following types of compounds within clusters:

- pre-sigmatized stops /sp st sk/,
- post-sigmatized stop /ks/,
- the quiet affricate /tθ/,
- pre-nasalized stops /mp ŋk nt nd/.

(N. B. the last group do not run counter to the markedness valency principle.)

The next problem is that of the strident affricates: are they one or two pho-

nemes, /č j/ or /tš dž/? In the latter case they would form another class of close-knit compounds. The problem cannot very well be solved on the basis of the initial clusters. In the final clusters it seems that the position decisive for the treatment of the affricates is that following /n/ or /l/. In this position only there is alternation of /č j/ with /š ž/, cf. e.g. *lunch, belch, plunge, bulge*, etc.

Independent of the mono- or bi-phonematic analysis, the valencies will be the same in any case: /č/ has the valency $_1$, /j/ $_2$; /tš/ and /dž/, if treated as compounds, would value as their first members, i.e. $_1$ and $_2$ respectively.

The fact that the two cannot be followed by /s z/ is of course due to the sibilant offset. But it is tempting to regard the parallel forms following /n/ and /l/ as forms with and without /t/ and /d/ respectively, thus /-n(t)š/, /-l(d)ž/, etc. One would be inclined to regard /t/ as an excrescence, comparable to that of /p/ and /k/ after /m/ and /ŋ/ respectively, cf. *nymph, length*, etc. The postvocalic nasal is always homorganic to the following stop: preceding /p/ we get /m/, and preceding /k/ — /ŋ/; but there is /n/ preceding both /t/ and /č/, although the latter is palatal!

Chomsky (1965 : 176) posits the rule

$$[+nasal] \rightarrow \left[\begin{array}{l} \alpha \text{ grave} \\ \beta \text{ compact} \end{array} \right] / - \left[\begin{array}{l} + \text{consonantal} \\ \alpha \text{ grave} \\ \beta \text{ compact} \end{array} \right]$$

which asserts that the nasal is /m/ before labials, /n/ before dentals, and /ŋ/ before velars. But the specification α grave, β compact would require the nasal to be /n/ before palatals, unless the rule is split into two, viz.

$$(a) [+nasal] \rightarrow \left[\begin{array}{l} + \text{grave} \\ \alpha \text{ compact} \end{array} \right] / - \left[\begin{array}{l} + \text{consonantal} \\ + \text{grave} \\ \alpha \text{ compact} \end{array} \right]$$

(i.e. that the nasal is /m/ before labials and /ŋ/ before velars),

$$(b) [+nasal] \rightarrow \left[\begin{array}{l} - \text{grave} \\ - \text{compact} \end{array} \right] / - \left[\begin{array}{l} + \text{consonantal} \\ - \text{grave} \end{array} \right]$$

(i.e. that the nasal is /n/ before both dentals and palatals).

The problem whether the stop is excrescent or reduced could be solved on historical grounds only. In a synchronic study as this one is, we cannot pretend to solve it. Orthography does not of course provide any reliable guide. As rightly observed by Yasui (1963 : 88), "we may in some cases look upon x+y+z forms as "normal" and x+z forms as "variants" (e.g. in /-mps/ vs. /-ms/ and /-ŋks/ vs. /-ŋs/); in some other cases we may look upon x+z forms as normal and x+y+z forms as variants (e.g. in /-mpf/ vs. /-mf/, /-nts/ vs. /-ns/, and /-ndz/ vs. /-nz/); in some cases, however, it is impossible to look upon either form as "normal" or "variant" (e.g. in /-lts/ vs. /-ls/, /-mpt/ vs. /-mt/, and /-ŋkt/ vs. /-ŋt/)."

The alternance of /c/ and /s/ which occurs only after /n l/ *fence, waltz* is strikingly parallel to the case of excrescent (vs. lost) /p/ and /k/ after /m/ and /ŋ/ respectively. In this case it would be best interpreted as /-n(t)s/, etc. The difference is that in /-mpC/, /p/ belongs to /m/, in /-nts/, however, /t/ goes with /s/. Similarly with /-lts/, where /ts/ belongs together.

As has been mentioned, the lateral or the nasals always appear nearest to the vowel in the final clusters, whatever the positions of the stops and spirants. As a matter of fact, this is the only position that can be taken by a resonant in a cluster. Resonants following turbulents postvocally automatically become syllabic.

What concerns the relative positions of the nasals and the lateral, the lateral precedes the nasal, being closer to the vowel, cf. /-lmz, -lmd, -lnd, -lnz/. (Not all speakers have the cluster /-lnT/: *kiln, kilned, kilns*.) This is in keeping with the phonetic nature of these resonants: the nasals are more consonantal in nature (there are no nasal vowels in English) than the lateral; notice also the "dark" value of /l/ postvocally in all English dialects, and the historical passage of /l/ into /w/ in *Holborn*, etc.

In the r-ish dialects /r/ would precede /l/, cf. *world*, etc., and the more so /m/ and /n/, which is understandable in view of the complete vocalization of /r/ in the r-less dialects. The relative order, from the vowel, would then be: /r/ — /l/ — N, and any change in this order postvocally would entail the formation of a new syllable, cf. the monosyllabic *film, kiln, worm, earn, curl*, but the disyllabic *camel, tunnel, kernel, collar, hammer, runner, singer*, etc. The turbulents in final clusters follow the resonants, but as already mentioned, stops and spirants between themselves are characterized by reversibility of order and general freedom.

What are now the mutual relationships of a nasal and a stop in a cluster? According to Kuryłowicz (1949 : 25) the resonant is constituent in the group. But it seems that the truly consonantal portion of the syllable margin is the more important one, being diametrically opposed to the vocalic centre. Also, the stop seems to govern the kind of the nasal, not vice versa. The nasal in forms such as *lump, hunt, bank*, etc. is comparable to the anusvāra of the Indian grammarians, or a nasal "prosody" (Firth) in pre-final position of the syllable structure CV~C.

How do we then account for the fact that it is the stop, not the nasal, that disappears in some clusters? The stop is optional only if another obstruent follows. In a two-element cluster the stop does not disappear. There seems to be a tendency (noticed by Hála) to close the syllable as much as possible.

The final conclusion concerning the structure of final clusters in English is that consonants do not form sequences individually, but rather on an intermediate level of close-knit compounds such as /sp, st, sk, ks, tš, dž, tθ, mp, nt, ŋk/. These compounds and single consonants are ordered according to the

principle of decreasing valency of marked distinctive features in the direction from the vowel outwards. The principle is valid, *mutatis mutandis*, also for the initial clusters, medial clusters (interludes), and vowel peaks, in short for the whole syllable structure in English.

REFERENCES

- Bloomfield, L. 1933. *Language*. New York: Holt & Rinehart.
- Chomsky, N. 1965. *Aspects of the theory of syntax*. Cambridge, Mass.: MIT Press.
- and M. Halle. 1968. *The sound pattern of English*. New York: Harper and Row.
- Cygan, J. 1969. "Consonant clusters and distinctive features". *Studia Anglica Posnaniensia* 2. 31-40
- Fisiak, J. 1968. "Prevocalic consonant clusters in the history of English". *Studia Anglica Posnaniensia* 1. 3-14.
- Fodor, J. A. and J. J. Katz. 1964. *The structure of language*. Englewood Cliffs, N. J.: Prentice-Hall.
- Halle, M. 1958. "On the bases of phonology". In Fodor and Katz 1964.
- 1959. *The sound pattern of Russian*. The Hague: Mouton.
- 1961. "On the role of simplicity in linguistic description". In Jakobson 1961.
- Hill, A. A. 1958. *Introduction to linguistic structures*. New York: Harcourt, Brace.
- Hultzén, L. S. 1962. "Voiceless lenis stops in prevocalic clusters". *Word* 18. 307-312.
- 1965. "Consonant clusters in English". *American Speech* 40. 5-19.
- Ivanov, V. V. 1962. "Teoriya fonologicheskix razlichitel'nykh priznakov". In: *Novoe v lingvistike*, 2. Moskva: Izd. Inostrannoy Literatury.
- Jakobson, R. (ed.). 1961. *Structure of language and its mathematical aspects*. Providence, R. I. American Mathematical Society.
- , C. G. M. Fant and M. Halle. 1952. *Preliminaries to speech analysis*. Cambridge, Mass.: MIT Press.
- and M. Halle. 1956. *Fundamentals of language*. The Hague: Mouton.
- Jones, L. G. 1956. "English consonantal distribution". In: *For Roman Jakobson*. The Hague: Mouton.
- Kučera, H. 1961. *The phonology of Czech*. The Hague: Mouton.
- Kuryłowicz, J. 1948. "Contribution à la théorie de la syllabe". In: *Esquisses linguistiques*. Wrocław 1960: Ossolineum 1960.
- 1949. "Linguistique et théorie du signe". In *Esquisses*.
- Moulton, W. G. 1956. "Syllable nuclei and final consonant clusters in German." In: *For Roman Jakobson*. The Hague: Mouton.
- O'Connor, J. D. and J. L. M. Trim. 1953. "Vowel, consonant and syllable—a phonological definition". *Word* 9. 103-122.
- Postal, P. 1968. *Aspects of phonological theory*. New York: Harper & Row.
- Scholes, R. J. 1966. *Phonotactic grammaticality*. The Hague: Mouton.
- Vogt, H. 1942. "The structure of the Norwegian monosyllables". *Norsk Tidsskrift for Sprogvidenskap* 12. 5-29.
- Whorf, B. L. 1940. "Linguistics as an exact science". In: *Language, thought and reality*. Cambridge, Mass. 1956.
- Yasui, M. 1962. *Consonant patterning in English*. Tokyo: Kenkyusha.