Commutation test in action:
Establishing the English consonantal phonematic system*

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ABSTRACT: In functional phonology, the commutation test is the only theoretically justifiable analytic procedure that enables us to elicit, identify and establish the phonemes and the archiphonemes of a given language. The purpose of this paper is to demonstrate how, in my view, we can perform the commutation test in order to establish the consonant phonemes and archiphonemes of British English known as RP (Received Pronunciation). To conduct the commutation test, I will proceed with the analysis step by step in order to arrive at the complete system of consonant phonemes and archiphonemes of English. I provide tables of the phonological contents of all the phonemes and archiphonemes established as well as diagrams of the phonematic units so as to show the relationships into which the phonematic units mutually enter.

KEYWORDS: commutation test, commutative series, opposition, series, order, correlation, mark, prephoneme, (minimum or near-minimum) multiplet, phonematic unit, phoneme, archiphoneme, relevant feature, hiss, hush, fricative, spirant, phonological content, exclusive opposition, neutralizable opposition, neutralization.

PART I

1. PRELIMINARY REMARKS

1.1. The purpose of the present paper is to show in detail how, in my opinion, the commutation test may be performed in functional phonology, with a view to establishing the British English consonantal phonematic system.[1] The term 'phonematic' is associated with another term 'phonematics' which designates one of the areas of functional phonology, the other area being designated as 'prosody'. The term 'phonematic' is in no way associated with the term 'phoneme' only, the way the term 'phonemic' *is* employed by many writers. The term 'phonematic' is associated with not only the term 'phoneme' but also the term 'archipho-

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neme'. Both the phoneme and the archiphoneme are the minimum units of the second articulation of a language,[2] and the function of these units is primordially distinctive (oppositive). The commutation test, when fully carried out, will have established all phonematic units of a language under investigation, the phonemes first and the archiphonemes next. It is crucial to understand that, in functional phonology, the phonematic units of a given language are conceived and defined in terms of mutually different sums of (phonologically) relevant features or, as the case may be, single relevant features (see below). These relevant features are elicited and identified during the course of the commutation test. Phonematic units are either vocalic or consonantal. In the present paper, I am concerned with consonantal phonematic units of British English (BrE). Each consonantal phonematic unit is defined as a sum of relevant features, which sum differs from that of each of the other consonant phonematic units. For instance, as we shall see by the end of the commutation test, e.g. the phoneme /p/ is defined as "voiceless labial non-nasal plosive" and e.g. the archiphoneme /θ-ð/ is defined as "apical fricative". Some consonantal phonematic units in English are definable in terms of single relevant features. For example, the phoneme /l/ is defined as "lateral" and the archiphoneme /m-n-ŋ/ is defined as "nasal". It goes without saying that the phonemes together with the relevant features which characterize them are established, step by step, during the course of the commutation test.

1.2. That the phoneme and the archiphoneme are distinctive units of the second articulation is well known and accepted in functional phonology. In my view, the relevant feature is also a distinctive unit in its own right, though functionalists in general do not seem to say this as explicitly as I do.[3] As the phoneme and the archiphoneme fundamentally fulfil a distinctive function, so does the relevant feature. It is by virtue of the distinctive function which the relevant feature fulfils that the phoneme and the archiphoneme are elicited and identified during the course of the commutation test.

1.3. It is through the opposition between relevant features that phonemes are distinguished from each other. I will indicate a relevant feature by enclosing its designation by a pair of double inverted commas, thus e.g. "voiceless". Some of the English consonant phonemes (according to my analysis) can be shown as follows, which I shall have established during the commutation test.

> /p b/ [4] are distinguished from each other through the opposition between "voiceless" (of /p/) and "voiced" (of /b/);
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> /p t/ are distinguished from each other through the opposition between "labial" (of /p/) and "apical" (of /t/);

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2   For 'double articulation', 'first articulation' and 'second articulation' see Martinet (1960: I-8).
3   See e.g. Akamatsu (1992a: **4.2.1**) and Akamatsu (2000: **3.1**, **3.3.3**).
4   A notation like e.g. /p b/ which I occasionally employ here and elsewhere is to be understood in the sense of '/p/ and /b/', not 'the opposition between /p/ and /b/', or '/p/ vs /b/'.

/p f/ are distinguished from each other through the opposition between "plosive" (of /p/) and "fricative" (of /f/);

/p m/ are distinguished from each other through the opposition between "non-nasal" (of /p/) and "nasal" (of /m/); the same applies to /b m/;

/m n ŋ/ are distinguished from each other through the opposition between "labial" (of /m/), "apical" (of /n/) and "dorsal" (of /ŋ/). And so on.

I will henceforth express any such oppositions expediently by employing 'vs'; consequently, /p/ vs /b/; /p/ vs /t/; /p/ vs /f/; /p/ vs /m/; /b/ vs /m/; /m/ vs /n/ vs /ŋ/; "voiceless" vs "voiced"; "labial" vs "apical"; "plosive" vs "fricative"; "non-nasal" vs "nasal"; "labial" vs "apical" vs "dorsal". And so on.

1.4.   What I tried to do in **1.3** is to show the fact that relevant features distinctively function by taking the examples of a few group of phonemes of English some of which are in the same 'series' (e.g. /p t č k/, /m n ŋ/) while the others are in the same 'orders' (/p b/, /p m/, /b m/).[5] It is for the purpose of eliciting relevant features and thereby establishing the phonemes of a language (English in the present case) that we need to perform the commutation test.

1.5.   What is the relationship between the relevant feature and the phoneme? The concept of the phoneme (and by implication that of the archiphoneme as well) is clearly stated by Martinet (1956: 3-13) as follows.

> Un **phonème** peut être considéré comme un ensemble de traits pertinents qui se réalisent simultanément. [Martinet's boldfase]

And Martinet (1965: 66) says:

> … l'identification du phonème résulte de l'énumération de ses caractéristiques … l'identification se confond avec la définition.

1.6.   Two points about relevant features are explicit in the above quoted passages. First, the relevant feature is the *basic* distinctive entity of the phonematic unit. Second, the relevant features of the phoneme or the archiphoneme are realized *simultaneously*, not sequentially, while phonemes and/or archiphonemes occur sequentially. For example, as we shall see during the course of the commutation test later, when the English phoneme /p/ is realized, its four relevant features, i.e. "voiceless", "labial", "non-nasal" and "plosive", are realized simultaneously, and not sequentially even though we can only indicate the relevant features of a phonematic unit sequentially when, as I have just done, writing e.g. the above-mentioned four relevant features of /p/.

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[5]   For 'series' and 'order' see e.g. Martinet (1960: III-15).

2. A FEW MORE WORDS ABOUT 'RELEVANT FEATURE'

2.1.   It cannot be overemphasized that the concept of opposition fundamentally underpins that of the relevant feature and hence that of the phoneme as well. Martinet forcefully says that 'Ce n'est pas le phonème, mais le trait pertinent qui est l'unité de base de la phonologie.' (Martinet 1965: 69). This functionalist notion of 'relevant feature' is rarely emphasized in phonology. What one often reads in writings on phonology is that the phoneme is the basic unit of phonology. Indeed it is the relevant feature, not the phoneme which is a sum of relevant features, that is the basic unit of functional phonology. The concept of the relevant feature is founded on that of opposition. Without the prior concept of opposition there would not exist the concept of the relevant feature. The concept of the phoneme itself is in turn founded on that of opposition. The concept of the phoneme itself is logically preceded by the concept of opposition. Without the concept of opposition, the concept of the phoneme is inconceivable because phonemes are the terms of the opposition. Indeed Trubetzkoy (1939: 60) makes it clear that '… in der Phonologie die Hauptrolle nicht den Phonemen, sondern den distinktiven Oppositionen zukommt'.[6] The concept of opposition is fundamental and of prime importance in functional phonology.

2.2.   I have said in my past writings that a relevant feature is 'a complex of multiple indissociable distinctive phonic features' (Akamatsu 1988: 100; Akamatsu 1992a: 39, 41-42, 42) which is nothing but my summary in English of Martinet's (1965: 138) wording '… un trait pertinent est un *ensemble* [Martinet's italics] de caractéristiques phoniques distinctives qui ne se trouvent dissociées nulle part dans le système …'. The best and the clearest explanation of 'relevant feature' is found in Martinet (1965: 138). The reader may also wish to turn to e.g. Akamatsu (1988: Chap. 3 = 77-110) or Akamatsu (1992a: **4.2.1** = 35-43) where I treat of various aspects of the relevant feature. In particular, I attempt to explain in Akamatsu (1988: **3.3** = 69-103) the meaning of 'multiple distinctive phonic features' of the relevant feature being *non-dissociable*. Elsewhere, in Akamatsu (1988: 100), I describe a relevant feature as 'a functionally single entity, a phonologically global entity' which is what 'a complex of multiple distinctive phonic features' precisely is.

2.3.   Martinet (1965: 138) provides appropriate illustrations of the relevant feature with the example of relevant feature "bilabial" as in /p b m/ and in connection with the relevant feature "voice" (in French or English). They deserve to be quoted at some length.

> «Bilabialité» suppose non seulement une occlusion réalisée au moyen des deux lèvres, mais *tout un jeu de l'ensemble des organes buccaux et pharyngaux* [italics added]; «sonorité» … comporte non seulement des vibrations glottales, mais *un certain degré de vigueur articulatoire et probablement d'autres caractéristiques* [italics added] qui pourraient être décisives, au moins dans certains contextes. …

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6   Trubetzkoy (1969: 67): '… in phonology the major role is played, not the phonemes, but the distinctive oppositions'.

I believe that similar explanations apply *mutatis mutandis* to each of what I will refer to in **10.2.**ff as the differential phonetic feature 'apical', 'labiodental', 'dental', 'hiss', 'hush' or 'dorsal' of pre-phonemes,[7] even though each will be presented as if to suggest e.g. 'apical' were a *single* phonetic feature. In retrospect, 'apical' which is subsequently phonologically evaluated as the relevant feature "apical" would itself be a complex of multiple non-dissociable distinctive phonic features and not just one phonetic feature of apicality.

2.4.   A few words are in order about my use of the term 'hiss' and 'hush' in this paper. I use these terms in connection with the pre-phonemes $/[s]_n/$ and $/[z]_n/$ and the phonemes /s/ and /z/, and the pre-phonemes $/[ʃ]_n/$, $/[ʒ]_n/$, $/[tʃ]_n/$ and $/[dʒ_n]/$, and the phonemes /ʃ/, /ʒ/, /tʃ/ and /dʒ/. These terms refer specifically to *places* of articulation and *not manner* of articulation (such as fricativeness), just as the terms 'labial', 'apical' and 'dorsal' are used to indicate places of articulation. When used in connection with $/[s]_n/$, $/[z]_n/$, /s/ and /z/, the term 'hiss' is equivalent to 'blade-alveolar' (Jones 1964[9]: §§ 709 & 721). When used in connection with $/[ʃ]_n/$, $/[ʒ]_n/$, $/[tʃ]_n/$, $/[dʒ]_n/$, /ʃ/, /ʒ/, /tʃ/ and /dʒ/, the term 'hush' is equivalent to 'palato-alveolar' (Jones 1964[9]: §§ 727, 737, 602 & 609). It is just for convenience sake that I prefer to employ the terms 'hiss' and 'hush' rather than the longer terms "blade-alveolar" and 'palato-alveolar'.[8]

2.5.   As for what I described above in my own words, 'a functionally single entity, a phonologically global entity',[9] Martinet (1965: 138) himself writes as follows.

> … [the term] «bilabialité» désigne ce qu'il y a de commun dans le comportement de /p/, de /b/ et de /m/ dans les différents contextes où ils apparaissent et qui les distingue des non-bilabiales ; [the term] «sonorité» désigne ce qu'il y a de commun dans le comportement de /b/, /v/, /d/, etc., et qui les distingue des non-sonores correspondantes, et n'impliquent pas nécessairement, dans toutes les réalisations, des vibrations de la glotte.

As I understand the above quoted passages of Martinet, /p/ as "bilabial" is distinguished from, i.e. opposed to, /f t s ʃ k/, /b/ as "bilabial" is distinguished from, i.e. opposed

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[7]   'Pre-phoneme' will be explained in **8**.

[8]   The term 'hush' to designate one of the relevant features of /ʃ ʒ č ǰ/ and the term 'hiss' to designate one of the relevant features of /s z/ are English translations of the French terms 'chuintant' and 'sifflant' which one finds in Martinet's works (e.g. Martinet 1956: **2.25**; 1960: II-28) and Walter's works (e.g. Walter 1977: 32). I have freely employed the two terms 'hush' and 'hiss' in my past writings on English and French phonology and will continue to do so in the present paper as well. However, as I have already explained in **2.4.**, the specific denotation of the terms 'hiss' and 'hush' as I employ them is importantly different from that as employed by Martinet and Walter. I must mention that there exist excellent references to 'chuintants' and "sifflants' in Builles (1998: 155-156) including 6 figures showing the points of articulation of different kinds of 'chuintants' and 'sifflants'. This is preceded (*op cit*: 154) by a useful table 'Les articulations situées dans la région prédômale' showing 'organes supérieurs' and 'organes inférieurs' of various manners of consonants; for [s z] the point of articulation is 'alvéolaire' and 'apico- ou lamino-', and for [ʃ ʒ] 'postalvéolaire' and 'apico- ou lamino-'.

[9]   This corresponds to what Martinet (1965: 67) expresses as '… un trait phonétiquement complexe, mais phonologiquement unique …'.

to, /v d z ʒ g/, /m/ as "bilabial" is distinguished from, i.e. opposed to /n ɲ/ (in French) or as "labial" is distinguished from, i.e., opposed to, /n ŋ/ (in English). In other words, the oppositional behaviour of "bilabial" or "labial" in all these cases is comparable. This gives rise to the concept of 'series'.

Also, as I understand, /b/, /v/, /d/, /z/, /ʒ/ and /g/ as "voiced" are distinguished from, i.e. opposed to, /p/, /f/, /t/, /s/, /ʃ/ and /k/ as "voiceless", respectively. The oppositional behaviour of "voiced" is comparable in these cases. This gives rise to the concept 'order'.

The series and the orders are interlinked and form a correlation. For example, /p/ is part of the "voiceless" series, and at the same time as part of the "bilabial" order (in French) or the "labial" order (in English). This applies likewise to the other consonant phonemes as well.

2.6.   The well-known preoccupation, known particularly among writers of English phonetics, with the question of whether the English consonant phonemes /p t k/ are to be considered as 'fortis' or 'voiceless', and /b d g/ are to be considered as 'lenis' or 'voiced'[10] loses significance in functional phonology in that the concept of the relevant feature as we have seen above makes the question irrelevant, as 'fortis' and 'voiceless', along with other phonetic features that can be additionally mentioned, form part of 'a complex of multiple indissociable distinctive phonic features'. Likewise *mutatis mutandis* of 'lenis' and 'voiced'. To be fair to phoneticians, it should be pointed out that they are principally engaged to describe the speech sounds from a general phonetic viewpoint, articulatorily, acoustically (by resorting to instruments, if deemed necessary) or perceptually. They are not engaged in 'functional phonetics (= phonology)'. They are generally not interested to investigate the linguistic function of speech sounds.

2.7.   Phonologists customarily employ symbols like 'p', 't', 'k', 's', 'z', 'm', 'n', 'ŋ', etc. by enclosing them by pairs of oblique bars, e.g. /p/, /t/, /k/, /s-z/, /m-n-ŋ/, etc. to indicate the phonematic units of a language. Phonological notations like /p/, /t/, /k/ in English are shorthand representations for, and equivalent to, "voiceless labial non-nasal plosive", "voiceless apical non-nasal plosive" and "voiceless dorsal non-nasal", respectively, so that what is signified by /p/ and what is signified by "voiceless labial non-nasal plosive" are identical with each other. One customarily and succinctly resort to the phonological notation /p/, for instance, which consists of a group of multiple relevant features rather than enumerating "voiceless labial non-nasal plosive" which may be cumbersome. Such cumbersomeness does not arise for e.g. "lateral" which is /l/. At any rate, I will occasionally resort to both types, or

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[10]   Ashby (2011: 120): '… given the contradictory behaviour that is sometimes observed in speech concerning so-called voiceless and voiced sounds, fortis and lenis are convenient (and widely used) terms.' Ashby (*op. cit.*: 120-121): 'Labels that avoid mentioning voice overtly are therefore useful – fortis and lenis are two such terms.' Ashby (*op. cit.*: 123): 'Given such behaviour, the terms voiceless and voiced are not always the most appropriate way to describe these particular sounds, Accordingly, phoneticians often refer to them by the names of fortis and lenis instead.'

either type, of representation in referring to the phonematic units in this paper, if particular clarity is deemed necessary, as e.g. /p/ or ("voiceless labial non-nasal plosive"), /θ-ð/ or ("apical fricative"), /m-n-ŋ/ or ("nasal"), and so on.

2.8. By what analytical procedure are relevant features elicited and identified? In **1.3** I mentioned that, for example, /p b/ are distinguished from each other through "voiceless" vs "voiced". This should not be taken to suggest that the two relevant features "voiceless" and "voiced" are elicited and identified merely through considering /p/ vs /b/. Not at all. Yet this seems to be the normal procedure whereby attempts are made by some to elicit the relevant features of the phonemes of a language, a procedure I do not subscribe to.[11]

2.9. The establishment of the phoneme coincides with the elicitation and identification of its relevant features. This task is achieved during the commutation test. In my view a phoneme cannot be said to be established till after, not before, all its relevant features, i.e. its 'phonological content', have been elicited and identified. By phonological content I mean the sum of the relevant features of a phonematic unit. I said 'coincides' above, but the identification of a phoneme's relevant features is, in real time, progressively and step by step, elicited during the commutation test. The search for the relevant features and the search for the phonemes must be conducted hand in hand, so to speak, but they involve much 'back-and-forth' analytical operation throughout the commutation test, as will be amply shown in the present paper. The commutation comes to an end only when all the relevant features have been identified concomitant with the establishment of all the phonemes and archiphonemes which are definable as mutually different sums of the relevant features.

2.10. I wish to dwell next (**2.10**, **2.11**, **2.12**) on the point I made above (**2.9**) concerning a certain aspect of the procedure of the commutation test. Martinet (1965: 63) writes as follows.

> Le premier problème phonologique est celui de l'analyse du texte qui doit nous livrer les unités différenciatives. La façon dont on doit procéder a été plusieurs fois décrite dans la littérature phonologique.

> By 'les unités différenciatives' are of course meant the phonemes.

The analytical procedure that Martinet speaks of is, of course, the commutation test. Martinet's lines quoted just above first appeared in Martinet (1947: 41) and reprinted in Martinet (1965: 63). These lines originally, that is, in Martinet (1947: 41), end with a footnote where Martinet refers to some works which, according to him, show how the commutation

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[11] Precisely this procedure is resorted to by e.g. Rothe (1978[2]: 72ff) in connection with the French consonant phonemes. For my critique of Rothe's procedure whereby to elicit the relevant features — if not all of them — of the French consonant phonemes, see Akamatsu (2017b: 19.1.-19.21. = 516-523), One further objection I have to Rothe's analysis is that he has recourse entirely to what are known as 'minimal pairs'.

test is conducted.[12] These works, in fact, expound the general principles for performing the commutation test, but they do not give detailed analytical operation of the commutation test such as I will show in this paper.

2.11.   I continue to quote further lines from Martinet (1965: 63-64).

> … par la commutation, nous arrivons à isoler des unités distinctives dans des positions bien déterminées ; en français, le rapprochement des mots *ban, pan, van, faon, dent, temps, zan, sang, gens, champ, gant, camp, lent, rang, ment*, permet de distinguer 15 unités que nous sommes tentés de noter au moyen des lettre *b, p, v, f*, etc. Si nous rapprochons maintenant *bout, pou, vous, fou, doux, toux, zou, sou, joue, chou, goût, cou, loup, roue, mou*, nous pouvons dégager de nouveau 15 unités que nous serons de nouveau tentés de noter au moyen de *b, p, v, f*, etc. … l'identité du premier élément de *banc* et de celui de *bout* qu'on appellera le phonème /b/.

In the second quote above, the expression 'unités distinctives' occurs once and the word 'unités' (short for 'unités distinctives') occurs twice. That 'unités (distinctives)' refer to phonemes is obvious and is confirmed when Martinet ends the quoted passage with the expression 'le phonème/b/'.

We thus understand that, according to Martinet, the product of performing the commutation test is phonemes.

2.12.   Another line I wish to quote from Martinet (1965: 63) is this.

> … la question de savoir si l'on doit interrompre la commutation après avoir dégagé les phonèmes.

This seems to raise the question of whether the commutation test should or should not continue forward once the phonemes have been established. Why and what for? Martinet (1965: 67) supplies the answer when he writes as follows.

> … il nous faudra pousser la commtation assez loin pour pouvoir dégager non plus seulement les phonèmes, mais les traits pertinents eux-mêmes. … il faut aller au-delà et procéder à l'analyse des complexes d'articulations simultanées.

The passage quoted from Martinet (1965: 67) seems to me to suggest that the commutation test should be conducted in two stages, the first stage is the one at which the phonemes are established (necessary but not sufficient) and the second stage at which the relevant features of the pre-established phonemes are identified.[13] My understanding is that 'com-

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[12]   The works that Martinet mentions in this footnote (which is dispensed with in Martinet 1965) are as follows: Trubetzkoy (1939: 33 ff), Martinet (1939: 34) (= Martinet 1947: 34)) and Martinet (1949). Note that what I indicate as Martinet (1947) is in reality to be understood as Martinet (1939) since 1939 is the date of its actual publication while 1947 is the publication date of Volume 1 of *Lingua* which bears this date.

[13]   I wonder if Rothe's procedure shown in Rothe (1978[2]: 72ff) may well have been influenced by what Martinet says in his passages quoted above.

plexes d'articulations simultanées' refer to relevant features. If my interpretation of Martinet's stance as gathered from the above quoted lines is correct, I am obliged to say that the view I take differs from Martinet's in that I believe that a phoneme cannot be considered established till after its relevant features (its phonological content) have been identified. My stance is that conducting the commutation test is continuous without interruption and the relevant features and the phonemes are identified hand in hand and established progressively. When all the phonemes together with their relevant features have been established, the analyst can commence his search for possible instances of neutralization and identify the associated archiphonemes and also search for possible instances of systematic non-occurrence of phonemes in some contexts.

2.13. It is important to stress that, in functional phonology, the elicitation and identification of the relevant features, the phonemes and the archiphonemes are accomplished in respect of individual languages. There is no pre-established universal set of a fixed number of relevant features out of which languages choose some or others. The identity and the functional value of any relevant feature are determined within the phonological system of the phonematic units of an individual language. In this paper we are concerned with the consonantal phonematic system of (British) English. This means that, for example, the relevant feature which I designate as "dorsal" in English (in /k/, /g/, /ŋ/) is opposed to the relevant features which I designate as "labial" (in /p b f v m/), "apical" (in /t d θ ð n/) and "hush" (in /ʃ ʒ č ǰ/), whereas in French (see Akamatsu 2017b: **13.1**) the relevant feature which I designate as "dorsal" is opposed to the relevant features which I designate as "bilabial" (in /p b m/), "labiodental" (in /f v/), "dental" (in /t d/), "hiss" (in /s z/) and "hush" (in /ʃ ʒ/). Clearly, the opposabilities of "dorsal" in English and those of "dorsal" in French differ from each other and consequently, the functional, i.e. phonological, value of "dorsal" in English and that of "dorsal" in French are not identical even if the two relevant features happen to be designated by an identical nomenclature. The two relevant features, the one in English and the other in French, should never be identified with each other. It is important to understand that a relevant feature in a given language is conceived as being opposed to the other relevant feature(s) in the phonological system of the *same* language.[14]

2.14. The relevant feature I operate with throughout in this paper should never be confused with the 'distinctive feature' operated with in generative phonology. I have already mentioned just above (**2.13**) that there is no pre-established universal set of a fixed number of relevant features. This is unlike the distinctive features which *are* pre-established and *are* said to be universally applicable to all languages. This means that a certain chosen distinctive features applies to any and all languages in which this particular distinctive feature is found. Another characteristic of distinctive features with regard to which relevant features are seen

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[14] Martinet (1965/1968[2]: 55): 'Chaque phonème contribue à déterminer la nature phonologique de ses voisins, et voit la sienne propre déterminée par eux.' If *phonème* in this passage of Martinet is replaced by *trait pertinent* (i.e. *relevant feature*), this passages stands to signify basically the same functionalist point of view.

to fundamentally differ from is that distinctive features are binary, i.e. [+F], [–F], where F is a given distinctive feature (e.g. [+voice], [–voice]) so that a given distinctive feature (e.g. [voice]) is present (hence [+]) or absent (hence [–]) in a segment. Total binarism does not characterize relevant features.

2.15.   'Opposition' which is not to be confused either conceptually or terminologically with that of 'contrast' — see below — is incontrovertibly Saussurean. One is reminded of Saussure's famous dictum (1916[1]: 172) '… dans la langue il n'y a que des différences … *sans termes positifs* [Saussure's italics]'. The absolute importance of the concept of 'opposition' cannot be overemphasized in functional phonology. The concept of 'opposition' firmly upholds not only all distinctive units such as the relevant feature, the phoneme and the archiphoneme but crucially also the commutation test itself which elicits and establishes distinctive units. For my view of various aspects of 'opposition' in phonology, see Akamatsu (2013a: 137-170).

2.16.   Of paramount importance in linguistics is the distinction between 'paradigmatic relation' and *'*syntagmatic relation' between linguistic units, another Saussurean distinction, which is inalienably and directly associated with the distinction between the concept of 'opposition' and that of 'contrast'. This distinction applies to functional phonology (as well as in other domains of functional linguistics) in that phonematic units susceptible of occurring in mutual exclusiveness in the same context entertain paradigmatic relation in that these phonematic units are in opposition to each other, while phonematic units occurring sequentially are in contrast with each other and entertain syntagmatic relation to each other (see Martinet 1960: I-20). For example, in English, the phoneme /p/ occurring in e.g. *cup* /kʌp/ is in opposition to e.g. /b/ in /kʌb/ *cub*, /f/ in /kʌf/ *cuff*, /m/ in /kʌm/ *come*, and so on. In fact, /p/, /b/, /f/, /m/, etc. are in opposition to each other in the context /kʌ-/. Each of these phonemes occurs in the same context /kʌ-/ in mutual exclusiveness of the other phonemes, so that when one of them occurs, the other phonemes are only covertly available to be in opposition with the phonemes that actually occurs in /kʌ-/. On the other hand, the relationship between e.g. /k/, /ʌ/ and /b/ in *cub* is syntagmatic and these phonemes are directly observable and overtly available, and they are in contrast with each other. Thus, each phoneme (taken /p/, /b/, /f/, /m/ individually) contracts both paradigmatic and syntagmatic relationship and either in opposition or in contrast with other phonemes.

2.17.   It is a matter of observation that the majority of phoneticians/phonologists, contemporary or otherwise, who write in English customarily employ the term 'contrast' and its derivative terms in the sense of 'opposition' as the functionalist understands, and they fail to distinguish between the concept of 'opposition' and that of 'contrast' altogether. On rare occasions on which they may use the term 'opposition' they understand that the two terms are synonymous alternatives. These phoneticians/phonologists never mention 'paradigmatic re-

lation' or 'syntagmatic relation' and consequently miss out completely the essential link between opposition and paradigmatic relation on the one hand and contrast and syntagmatic relation on the other.

2.18. It is interesting to notice that phoneticians/phonologists (who themselves may or may not be anglophones) who write in languages other than English tend not to use a term corresponding to 'contrast' in the sense of 'opposition'. For example, Scherer and Wollmann (1977²), in the subject index, do not provide the term 'Kontrast' but do use the term 'Opposition'. We are all aware that Trubetzkoy employs the term 'Opposition' in abundance. On the contrary, throughout in Trubetzkoy (1939) the term 'Kontrast' occurs only once (save oversight on my part), not as such but only as part of the term 'Kontrastkorrelation' (Trubetzkoy 1939: 138). This can be said to be only natural as most parts of 'Die Unterscheidungslehre' (*op. cit.*: 30-217) are devoted to the question of phonological oppositions (paradigmatics), leaving the rest (*op. cit.*: 218-261) to the question of phoneme combinations (syntagmatics). Nevertheless it is clear that Trubetzkoy uses the term 'Opposition' correctly without ever confusing it with the term 'Kontrast'.[15]

2.19. The consistent misuse of the term 'contrast' instead of 'opposition' among many contemporary writers on phonology needs to be specifically pointed out. It would be apposite to quote here in fair length a passage written by a European linguist. Veiga (2006: 61-62) writes as follows.

> Dans la terminologie phonologique la plus répandue dans le cadre théorique de la linguistique structurelle européenne on nomme *contraste* le rapport syntagmatique que tout unité effectivement présente dans un texte établit avec d'autres unités présentes aussi dans ce même text. … Contrairement à la relation d'opposition, la relation de contraste est une relation *in praesentia* et, de ce fait, elle exige la co-apparition des termes entre lesquels elle s'établit dans la même séquence. Si dans la tradition phonologique européenne … la différenciation entre les concepts *d'opposition* et de *contraste* est bien connue en tant que relations paradigmatique et syntagmatique, respectivement, d'autres courants linguistiques se sont également préoccupés d'établir cette distinction, l'emploi général du terme *contraste* étant spécialement remarquable parmi les linguistes américains,[16] ce qui implique la non différenciation … entre les deux concepts …

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[15] It is of some interest to note, for example, that Trubetzkoy (1939: 71) writes: "… und eine solche *Gegenüberstellung* [my emphasis] ist ja die Grundbedingung der phonologischen Existenz überhaupt.". This is translated in Trubetzkoy (1949: 82) as "… une telle faculté de *s'opposer* [my emphasis] est la condition fondamentale de l'existence phonologique en général", but in Trubetzkoy (1969: 79) as "…this *contrastive* [my emphasis] capacity that is the basic prerequisite for phonological existence in general." This is just one pertinent example of the difference between French translator, Jean Cantineau, and the American translator, Christiane Ann Marie Baltaxe.

[16] I am inclined to add 'linguists who write in English'. It is true that the practice of using the term 'contrast' in the sense of 'opposition' began with Bloomfieldians but it has spread and become pretty pandemic well beyond the American borders.

Fischer-Jørgensen (1975: **6.18**) similarly but briefly writes:

> The phenomenon which in European phonology is most often termed "distinctive opposition" is usually called "CONTRAST" in the Bloomfield School …

For a few examples of the correct use of the term and notion of 'contrast', see e.g. Coleman (1914: 6-26), Jones (1922² … 1964⁹: §§ 1049-1059) and Martinet (1965: 148-150), and also Akamatsu (2019) where I discuss the use of the notion and term of 'contrast'.

2.20.   In my own terminological usage in this paper, 'opposition' refers to an opposition between phonologically distinctive units, i.e. between relevant features, between phonemes, between phonemes and archiphonemes, or between archiphonemes. In other words, *A* and *B* are opposed to each other. For instance, in English, "voiced" vs "voiceless", /p/ vs /b/, /m/ vs /p-b/, and /p-b/ vs /k-g/ are examples of oppositions. These examples happen to represent oppositions between *two* distinctive units, but they need not necessarily be so. Some examples of oppositions between three or more distinctive units from English are: /m/ vs /n/ vs /ŋ/; "labial" vs "apical" vs "hiss" vs "hush" vs "dorsal"; /p/ vs /b/ vs /m/; /p-b/ vs /t-d/ vs /č-ǰ/ vs /k-g/.[17] On the other hand, I employ the term 'differentiation', not 'opposition', to mean a difference between *phonetic* entities. Some examples of differentiation in English are [f] vs [v], [k] vs. [g] vs [ŋ], [p] vs [t] vs [tʃ] vs [k], etc., as they represent phonetic differences, hence a (phonetic) *differentiation*.

2.21.   An opposition between *two* relevant features or between *two* phonematic units may conveniently be referred to as 'simple opposition' (Akamatsu 1988: 51, 1992a: 51, 2000: **5.3** = 28) while an opposition between more than three or more relevant features or phonematic units may conveniently be referred to as 'multiple opposition' (Akamatsu 1988: 43, 1992a: 51, 2000: **5.3** = 28). 'Multiple opposition' should not be confused with 'multilateral opposition' (Trubetzkoy 1939: 61; 1949: 70; 1969: 68). A multiple opposition is opposed to a simple opposition, whereas a multilateral opposition is opposed to a bilateral opposition.

3. SOME REMARKS PRIOR TO SETTING UP COMMUTATIVE SERIES

3.1.   The commutation test is the analytical procedure, in my opinion the only theoretically justified procedure available to the functionalist phonologist, whereby he can accomplish the task of eliciting, identifying and establishing both the relevant features and the phonematic units (the phonemes and the archiphonemes) of a language which are definable in terms of the relevant features. In this paper I am only concerned with, first (in Part I), the

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[17]   By phonological notations /p-b/, /t-d/, /č-ǰ/ and /k-g/ I mean the archiphonemes which are the products of the neutralization of /p/ vs /b/, /t/ vs /d/, /č/ vs /ǰ/ and /k/ vs /g/, respectively, in English. See *infra* **23**. where I will have a few things to say about my customary way of notating archiphonemes.

consonant phonemes and then (in Part II), the consonant archiphonemes of English. We first need to set up a number of commutative series.

3.2.   The phonic material on the basis of which I will conduct the commutation test in this paper comes from RP (Received Pronunciation). This choice is deliberate on my part for a few reasons. First, among a variety of diverse types of current English pronunciation, RP is the one I am best acquainted with.[18] Secondly, as English phoneticians unanimously agree, RP is the most appropriate choice not only in their description of current English pronunciation for foreign learners of English but also the most intelligible to the foreign learners as well as native speakers of English in various parts of the world. I am assuming that RP is the easiest to comprehend to the readers of this paper as well.

3.3.   RP, a term widely credited to Daniel Jones whereby to designate a certain type of English pronunciation[19] has come under fire, rather viciously, in recent times in particular, by English phoneticians, who criticize the term as 'archaic', 'quaint', 'old-fashioned' or 'misleading' and propose alternative terms like 'BBC pronunciation' (Roach 2000[3]: 3; Roach 2009[4]: 3)[20] or 'General British'[21] (Windsor Lewis 1972: xiv-xv).

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[18]   While still resident in my home country, Japan, I was a long-time regular listener to the BBC's General Overseas Service, particularly the news bulletins and daily surveys of the British newspaper editorials. I also had personal contact in London with a fair number of newsreaders working for the General Overseas Service. They were clearly users of RP. I was also lucky to have an encounter at University College London in 1960 with Daniel Jones, whose RP still remains an ineffaceable memory to me.

[19]   Jones (1922[2]: ix) writes: 'In what follows I call it Received Pronunciation, for want of a better term.' The term was actually used much earlier by other writers.

[20]   In my considered view, the term 'BBC pronunciation' which Roach suggests should supplant the term RP is a misnomer and misleading. The Englishes heard nowadays on the BBC radio, in both domestic and external services, are a different 'kettle of fish' from those which used to be regularly heard years ago (till about 1960 or thereabouts) when the newsreaders invariably spoke with RP in the BBC General Overseas Service. Those were the times when the likes of Michael Ashbee, Chris Chaplin, Roger Collinge, Pam Creighton, George Eason, Brian Empringham, Ann Every, Elizabeth Francis, Peter Lewis, Barry Moss, Meryl O'Keefe, Lawrence Reeve-Jones, Peter Shoesmith, George Stone, Morris Turner, James Vowden, et al. regularly read the news, but those days were gone. Nowadays the format of news presentation every hour on the hour on BBC World Service has completely changed (only 5 minutes' duration instead of a good 10 minutes in the past). Besides, the type of the newsreaders' spoken English, even on the BBC World Service, to say nothing of that in the domestic services (even on Radio 3), allows for various types of spoken English, including regional English. But this is what the 'inclusive' and 'populist' policy adopted by the BBC of nowadays has brought about. The like of Harriet Cass, now retired, as a newsreader on Radio 4 would not be easily available. As for the BBC Television service, one hears all sorts of spoken English. What Roach refers to 'BBC pronunciation' is actually too heterogenous to help listeners to identify RP.'

[21]   This is not a felicitous substitute for 'RP', either, in my view, since it largely implies areas other than England, the part of the UK which is basically affiliated with RP.

3.4.   What seems to me personally a satisfactory reference to RP whilst retaining this term comes not from phoneticians themselves but from someone who, if not specifically known as a phonetician (though no doubt competent in phonetics) nor working specifically in phonetics proper as his specialist area. This is because RP is an entity which is definable not so much from a purely linguistic point of view as in terms of social and geographical implications. This is explained below, in **3.5** and **3.6**.

3.5.   First, RP refers to the pronunciation of standard British English. Standard British English which is concerned with grammar, vocabulary, style, etc. and also with pronunciation, is typically acquired by those who have been well educated at e.g. public schools or grammar schools. It is considered as the national British norm in written English. RP which is the pronunciation of Standard British English carries the status of prestige in anglophone communities in various parts of the world.

> Crystal (1980: 296-297) writes:
>
> The name given to the regionally neutral ACCENT in British English, historically deriving from the prestige speech of the Court and the public schools. The term indicates that its prestige is the result of social factors, not linguistic ones. RP is in no sense linguistically superior or inferior to other accents; but it is the accent which tends to be associated with the more well-educated parts of society, and is the one most often cited as a norm for the description of British English, or in teaching that DIALECT to foreigners …

3.6.   Second, RP has a unique characteristic such that the provenance of individual RP speakers, be it English, Welsh, Scottish or Irish, is not (easily) known to people who listen to them. In other words, RP is non-regional or regionally neutral. Trudgill (2000[4]: 7-8) writes:

> … RP is unusual in that the relatively very small numbers of speakers who use it do *not identify themselves as coming from any particular geographical region* [my emphasis]. RP is largely confined to England, although it also has prestige in the rest of the British Isles … As far as England is concerned, though, RP is a *non-localized* accent [Trudgill's italics].

3.7.   Another unique characteristic of RP is that only a tiny part of native English speakers are known to use RP. Various percentages have been suggested of the probable number of users of RP, anything from 3% to 10% or thereabouts, but these figures are obtained from guesstimates. Be that as it may, it is conceivable that the number of RP users are gradually on the wane in our days.

3.8.   My choice of RP as a basis of phonic material for the commutation test may be contested in that RP represents the speech of only a tiny minority of the British population. The justification I offer about my choice of RP consists in the fact that my present paper is intended to be a basic *methodological illustration* of the commutation test and, to me personally, RP is the optimum choice for this purpose, at least so far as I am concerned.

3.9.   For the purpose of setting up the commutative series, it is essential for the analyst to be sufficiently acquainted with the lexis of the language under investigation, (British) English in the present case, in terms of both the pronunciations and the meanings of a fair number of words.

3.10.   It is recommended for the analyst to seek as linguistic items which are to appear in the commutative series monosyllabic words which by nature contain no potential pauses. Disyllabic words may be allowed provided that they contain no potential pauses. This recommendation for expediency's sake seems perfectly legitimate. Among the linguistic items which constitute the 10 commutative series to be presented in **4.1**, several of them are polysyllabic (disyllabic or trisyllabic). However, each such linguistic items with the parenthesized parts (e.g. *Hiff(er)*) contains no potential pauses, so that such linguistic items are accepted for inclusion. The linguistic items in question are as follows: *voo(doo)*, *vitt(a)*, *ju(pon)*, *Zi(on)*, *Kier(an/on)*, *Hibb(ert)*, *Hiff(er)*, *hith(er)*, *Cav(an)*, *Cath(er)*, *cas(bah)*, *cack(le)*, *Cag(ney)*, *maff(ia)*, *mav(erick)*, *Math(er)*, *Maz(da)*, *Mag(inot)* and *man(go)*.

3.11.   One practical reason for this recommendation is the fact that polysyllabic words tend to contain potential pauses as polysyllabic words tend to be compounds, derivatives (words formed by derivation) or syntagms. Choosing e.g. **beehive** (a compound which is polysyllabic and which has a potential pause between **bee** and **hive**) instead of **bee** (which is monosyllabic and contains no potential pause) gains nothing in addition.

3.12.   Yet another, and a more important, reason why polysyllabic words are not recommended is that the analyst may be led to wrongly postulate some phonemes. Jones (1931: 60) talks about 'word-division' and says: "Word-division involving differences of sound are … found in English quite frequently" and cites examples *blacked eye* [blækt aɪ] and *black tie* [blæk tʰaɪ] (the phonetic notations are mine) which Jones (1931: 60) says were originally suggested by E[dith] Quick (c. 1902-1947). If we analyze [blæktaɪ] (*blacked eye*) and [blæktʰaɪ] (*black tie*) by ignoring the word-division, we risk postulating two phonemes /t/ and /tʰ/, which is unacceptable.[22] Jones's taking into account word-division (spaces between words when written) is tantamount to taking potential pause(s) into account. This is why I would in principle advise against choosing polysyllabic words as linguistic items constituting commutative series.

Advice along the same line is given by Martinet (1965: 50) when he says:

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[22]   Cruttenden, as a reviser of Gimson (1962[1], 1970[2], 1980[3], 1989[4]) in the form of Gimson (1994[5], 2001[6], 2008[7] and 2014[8]), infelicitously (in my view) deleted Jones (1931) from the 'Bibliography' and any references to it which were originally in Gimson (1962[1], 1970[2], 1980[3], 1989[4]) in **5.37** entitled *The Word as Basis for Phonemic Analysis*. In doing so, Cruttenden misrepresents Gimson's view on this important matter in the original.

> … il faut s'abstenir de rapprocher des segments d'énoncé où les frontières entre les mots ne coïncident pas et où, en conséquence, la distinction entre deux segments peut être assurée par des pauses dans des positions différentes.

3.13.   Care should be taken so that linguistic items chosen to make up each commutative series are those which exhibit the same prosodic behaviour. The prosodic behaviour in question, in the case of English, largely concerns accent, which is a free accent in English, hence different accentual patterns. It will be seen that all linguistic items I choose are in principle monosyllabic English words (e.g. *cat*) or pseudo-monosyllabic parts (e.g. *Cag* of *Cag(ney)*) all of which are accented. The accentual pattern of *cat* is ['–], *Cag* is also ['–], and *Cagney* is ['– –] not [– '–]. Such a linguistic item as e.g. *cagoule* [– '–] in which *cag* is unaccented cannot be placed in the same commutative series with either *cat* ['–] or *Cag* ['–] or *Cagney* ['– –] since *cagoule* is prosodically (in terms of the place of accent) is different.[23] Incidentally, it is well to remember that monosyllabics standing alone are always accented,[24] hence my notation ['–] above for *cat* and *Cag*. Martinet (1960: III-31) writes: 'Lorsque le mot est isolé, la mise en valeur accentuelle est toujours réalisée.' I take it that this applies to monosyllabics.

3.14.   The importance of linguistic items to be compared in the same commutative series should be those which exhibit the same prosodic features will be tellingly seen when, further down in **19.17** and **19.18** when we say that, for example, *di'sperse* [– ˈs –], *dis'burse* [– sˈ –] should not be accepted as two linguistic items in the same commutative series because they are characterized by different accentual patterns, i.e. accent does not fall at the same location.

4. TEN COMMUTATIVE SERIES ARE SET UP

4.1.   Here are the 10 commutative series I have set up (CS = commutative series). The number of commutative series to be set up is actually open-ended and depends on the analyst's decision. The analyst will find diminishing returns at some point.

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[23]   The insoluble problem in the example adduced, *cagoule*, is additionally that the syllable boundary between the first and second syllables lies between [kə] and [guːl], not between [kəg] and [uːl].
[24]   The only dictionary I know of that indicates monosyllabic English words with accent mark is *Kenkysha's English-Japanese dictionary for the general reader* (1984[1], 1999[2]).

	CS 1	CS 2	CS 3	CS 4	CS 5
	[♯ – iː]	[♯ – uː]	[♯ – ɪt]	[♯ – ɔːn]	[♯ – aɪ]
[p]$_n$	*pea*	*poo*	*pit*	*pawn*	*pie*
[b]$_n$	*bee*	*boo*	*bit*	*born*	*buy*
[f]$_n$	*fee*	*foo(d)*	*fit*	*fawn*	*fie*
[v]$_n$	*vee*	*voo(doo)*	*vitt(a)*	*Vaughan*	*vie*
[t]$_n$	*tea*	*two*	*tit*	*torn*	*tie*
[d]$_n$	*Dee*	*do*	*dit*	*dawn*	*die*
[θ]$_n$	*thie(f)*	*Thu(le)*[25]	——	*thorn*	*thigh*
[ð]$_n$	*thee*	——	——	——	*thy*
[s]$_n$	*see*	*sue*	*sit*	*sawn*	*sigh*
[z]$_n$	*zea(l)*[26]	*zoo*	*zit*	——	*Zi(on)*
[ʃ]$_n$	*she*	*shoe*	*shit*	*shorn*	*shy*
[ʒ]$_n$	*gi(gue)*	*ju(pon)*	——[27]	——	——
[tʃ]$_n$	*Chee*	*chew*	*chit*	——	*chi(de)*
[dʒ]$_n$	*gee*	*Jew*	*jit*[28]	——	*ji(be)*
[k]$_n$	*key*	*coo*	*kit*	*corn*	*Ky(le)*
[g]$_n$	*ghee*	*goo*	*git*	*gaun(t)*	*guy*
[m]$_n$	*me*	*moo*	*mitt*	*mourn*	*my*
[n]$_n$	*knee*	*noo(se)*	*knit*	*Norn*	*Nye*
[ŋ]$_n$	——	——	——	——	——
[l]$_n$	*lea*	*loo*	*lit*	*lawn*	*lie*
[r]$_n$	*Rhee*	*roo*	*writ*	*Rawn*[29]	*rye*
[h]$_n$	*he*	*who*	*hit*	*horn*	*high*
[j]$_n$	*ye*	*you*	——[30]	*yawn*	——
[w]$_n$	*we*	*woo*	*wit*	*warn*	*why*

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[25]   The word *Thule* has a few variant pronunciations, [θjuːl] and [θuːl], among others. I have chosen [θuːl].

[26]   If we were concerned with AmE, ze*e* 'the letter z or *Z*' would be acceptable here.

[27]   The reason why the word *gîte* cannot be cited here, contrary to what some might think, is that *gîte* (alternatively spelled *gite* in BrE) as a French loanword is pronounced [ʒiːt], not [[ʒɪt], in English.

[28]   Popular Zimbabwean dance music.

[29]   A surname.

[30]   There exists *yid* [jɪd] but not **yit* [jɪt] in English.

[X]$_n$	CS 6 [♯ – ɪə]	CS 7 [♯ hɪ –]	CS 8 [♯ kæ –]	CS 9 [♯ mæ –]	C S 10 [rɪ – ♯]
[p]$_n$	*pier*	*hip*	*cap*	*map*	*rip*
[b]$_n$	*beer*	*Hibb(ert)*	*cab*	*mab*	*rib*
[f]$_n$	*fear*	*Hiff(er)*[31]	*caff*	*maff(ia)*	*riff/Riff*
[v]$_n$	*veer*	——	*Cav(an)*	*mav(erick)*	——
[t]$_n$	*tear*	*hit*	*cat*	*mat*	*writ*
[d]$_n$	*dear*	*hid*	*cad*	*mad*	*rid*
[θ]$_n$	*Thea*	——	*Cath*	*math*	*(F)rith*[32]
[ð]$_n$	——	*hith(er)*	*Cath(er)*	*Math(er)*[33]	——
[s]$_n$	seer	*hiss*	*Cass*	*mass*	*Riss*
[z]$_n$	——	*his*	*cas(bah)*	*Maz(da)*	——
[ʃ]$_n$	*sheer*	*Hish*[34]	*cash*	*mash*	*(T)rish*
[ʒ]$_n$	——	——	——	*Mag(inot)*	——
[tʃ]$_n$	*cheer*	*hitch*	*catch*	*match*	*rich*
[dʒ]$_n$	*jeer*	——	*cadge*	*Madge*	*ridge*
[k]$_n$	*Kier(an/on)*[35]	*hic*	*cack(le)*	*mack*	*rick/Rick*
[g]$_n$	*gear*	*Higg(s)*	*Cag(ney)*	*mag*	*rig*
[m]$_n$	*mere*	*him*	*cam*	*mam*	*rim*
[n]$_n$	*near*	*hin(t)*	*can*	*man*	*(g)rin*[36]
[ŋ]$_n$	——	*Hing*[37]	*cang*[38]	*man(go)*	*ring*
[l]$_n$	*leer*	*hill*	*CAL*	*mall*	*rill*
[r]$_n$	*rear*	——	——	——	——
[h]$_n$	*here*	——	——	——	——
[j]$_n$	*year*	——	——	——	——
[w]$_n$	*wier*	——	——	——	——

Table 1

4.2. Although all the linguistic items that make up each commutative series are custom-arily presented in their orthographic form, main attention should be paid to their phonetic form in performing the commutation test. Nevertheless, it goes without saying that their se-mantic content should not be disregarded, as the different linguistic items are distinguished

31   A surname in the UK, the USA and Canada, especially 1840 – 1920.
32   The item *(F)rith* is accepted as a near-minimal multiplet. On the other hand, an item like *Penrith* ['penrɪθ] is not accepted for inclusion here as [rɪθ] occurs in unaccented syllables in this word.
33   There are three variant pronunciations for this surname, ['meɪðə], ['mæ-] and ['meɪθ-]. I have chosen the second variant to be included here in CS 9.
34   A surname (in America).
35   This is an interesting item in that *EPD*18 shows the syllable boundary as ['kɪə.rᵊn] (i.e. between [ə] and [r]) while *LPD*3 puts it as ['kɪər ən] (i.e. between [r] and [ə]). I have chosen the syllable boundary as indicated in *EPD*18.
36   The item *grin* [grɪn] is perfectly acceptable as [rɪn] is in an accented syllable. That [g] additionally precedes [r] is not incompatible with the phonetic context [rɪ ♯] with which CS 10 is associated.
37   An English surname.
38   There is an alternative spelling *cangue* which is pronounced the same way as *cang*.

from each other with respect to both their phonetic forms and semantic contents. For example, *tea* and *tee*, in spite of their identical phonetic form [tiː], are different linguistic items as their semantic contents are different from each other.

4.3. In Table 1 above, listed vertically in the left-most column are 24 consonantal segments, [p]ₙ … [w]ₙ. (Note that [j w] are regarded as consonantal segments.) The sequential order in which the 24 consonantal segments are vertically arranged applies identically to each of the 10 commutative series. In other words, there is proportionality in the sequential order of the consonantal segments listed. The sequential order adopted above is likely to be optimal, though different sequential orders from the one I have chosen may be preferred by some and are theoretically possible and justifiable. However, the order I have chosen lends itself better to understanding mutual phonetic relationship between the consonantal segments. For instance, listing close together [p]ₙ, [b]ₙ, [f]ₙ, [v]ₙ as I do makes more sense than listing close together, say, [p]ₙ, [ð]ₙ, [n]ₙ, [r]ₙ. There are parallelism and proportionality in the sequential order in which the 24 consonantal segments are placed, across all the commutative series. CS 1 is made up by 23 linguistic items (*pea … we*), CS 2 by 22 linguistic items (*poo … woo*), CS 3 by 19 linguistic items (*pit … wit*), and so on. The number of linguistic items differs from one commutative series to another because some linguistic items are unattested (for one reason or another) in some commutative series whereas they are attested in another commutative series.

4.4. The 10 commutative series that have been set up are such that each commutative series is associated with a specific phonetic context which is different from each of the other mutually different specific phonetic contexts with which the other commutative series are associated. The different phonetic contexts were randomly chosen. Thus, CS 1 is associated with the phonetic context [♯ – iː], CS 4 with [♯ – ɔːn], CS 7 with [♯ hɪ –], and so forth. The dash '–' shows where, in the phonetic context, a given consonantal segment occurs. The double cross symbol '♯' signifies that a pause occurs at the place where this symbol appears. Therefore, for instance, [♯ – iː] (CS 1) means that a given consonantal segment occurs postpausally, i.e. word-initially. If the symbol '♯' occurs at the end as in [rɪ – ♯] (CS 10), a given consonantal segment, e.g. [p], occurs prepausally, i.e. word-finally, thus [rɪp ♯].

4.5. I intentionally do not place '♯' *at the end* in e.g. [♯ – iː] (CS 1) (not [♯ – iː ♯]) because, while e.g. *pea* is cited (in CS 1), another word e.g. *thie(f)* is cited (also in CS 1), so that [♯ – iː] can be followed by another consonantal segment, [f] in this case. This is why the notation [♯ – iː ♯] would not be appropriate for CS 1. Similarly I do not place '♯' at the end in [♯ – uː] (CS 2) (not [♯ – uː ♯]), in [♯ – ɪt] (CS 3) (not [♯ – ɪt ♯]), [♯ – ɔːn] (CS 4) (not [♯ – ɔːn ♯]), [♯ – aɪ] (CS 5) (not [♯ – aɪ ♯]), [♯ – ɪə] (CS 6) (not [♯ – ɪə ♯]), [♯ hɪ –] (CS 7) (not [♯ hɪ – ♯]), [♯ kæ –] (CS 8) (not [♯ kæ – ♯]), and [♯ mæ –] (CS 9) (not [♯ mæ – ♯]). All this is because, if I additionally placed '♯' at the end of these phonetic contexts, this would block the occurrence of an additional consonantal segment(s): consider *thie(f)*, *zea(l) and gi(gue)*

in CS 1; *foo(d)*, *voo(doo)*, ***Thu**(le)*, *ju(pon)* and ***noo**(se)* in CS 2; *vitt(a)* in CS 3; ***Zi**(on)*, ***chi**(de)* and ***Ky**(le)* in CS 5. This likewise applies to the relevant linguistic items in CS 6, CS 7, CS 8, CS 9 and CS 10 as well. Notice that the phonetic context [rɪ – ♯] with which CS 10 is associated differs from all the other 9 phonetic contexts in that single consonantal segments [f] *F*, [t] *T* and [g] *g* can occur *in front of* [r] *r/R* in *(F)rith)*, *(T)rish* and *(g)rin* in prepausal position as '♯' is not placed in front of [rɪ – ♯]. It goes without saying that no consonantal segments are to occur after '♯' at the end of the phonetic context.

4.6.   The long dash '——' indicates a lacuna, i.e. that no linguistic item can be found because it is unattested. For example, the long dash in CS 1 ([♯ – iː]) for [ŋ]ₙ indicates that [♯ ŋiː], i.e. [iː] preceded by [ŋ], does not occur in English. There are several different types of unattested cases as will be shown next.

1) Thus, words beginning with [ŋ]ₙ in CS 1 ([♯ – iː]) to CS 6 are unattested because no English word begins with [ŋ]. This is patently a case of unavailability of expected words.

2) In CS 3 ([♯ – ɪt]), a word that could be [θɪt] which is followed by one or more (vocalic or consonantal) segment(s) is/are unattested. This is so in present-day English. Such cases can be regarded as accidental gaps. There is nothing in native English speaker's articulatory capability not to be able to pronounce [θɪt], [θɪtə], [θɪtl], [θɪtmən], etc. All such segmental sequences which are pronounceable are unattested in present-day English.

3) Word-initial [ð] occurs in deictic words only such as *that, thee, there, this, thither, thy*, etc. CS 2 ([♯ – uː]), CS 3 ([♯ – ɪt]), CS 4 ([♯ – ɔːn]) and CS 6 ([♯ – ɪə]) have no pertinent words as there are no English deictic words that begin or end with [ðuː], [ðɪt], [ðɔːn] and [ðɪə], etc. whereas CS 1 ([♯ – iː]) and CS 5 ([♯ – aɪ]) have each ***thee*** [ðiː] and ***thy*** [ðaɪ], respectively. If a commutative series is alternatively chosen with which the phonetic context [♯ – æt] instead of [♯ – ɪt] is associated, we shall unproblematically have ***that***. If another commutative series is chosen with which [♯ – ɪs] instead of [♯ – ɪt] is associated, this commutative series will, again unproblematically, have ***this***. All this suggests that availability or otherwise of linguistic items with word-initial [ð] is a less crucial question than might be thought. It is more important to see that [ð] occurs word-initially and followed by vocalic segments. This understanding will apply to deictic words and also to a few non-deictic words like ***than**, **though**, **thus**, **there**fore* and ***there**for*.

4) [ʒ] occurring word-initially or word-finally is attested in French loanwords only. This fact considerably reduces the chance of finding examples with word-initial [ʒ], but not so much with word-final [ʒ] since not a few such French loanwords exist (e.g. *dressage, massage, montage*, etc.). We have ***gi***(*gue*) in CS 1 and *ju(pon)* in CS 2, but none in CSs 3, 4, 5, 6, 7, 8 and 10. Rare occurrence of [ʒ] word-medially in a French loanword is attested *Mag(inot)* in CS 9 ([♯ mæ –]). On the other hand, the occurrence of [ʒ] word-medially is found in a fair number of English words, e.g. *closure, leisure, measure, pleasure*, etc.

5) Unavailability of words such as the following seems to be due to their being accidental gaps: [ðuː] (CS 2), [θɪt] (CS 3), [ðɪt] (CS 3), [ʒɪt] (CS 3), [jɪt] (CS 3), [ðɔːn] (CS 4), [zɔːn] (CS 4), [ʒɔːn] (CS 4), [tʃɔːn] (CS 4), [dʒɔːn] (CS 4), [ʒaɪ] (CS 5), [ðɪə] (CS 6),

[zɪə] (CS 6), [ʒɪə] (CS 6), [hɪv] (CS 7), [hɪθ] (CS 7), [hɪʒ] (CS 7), [hɪdʒ] (CS 7), [kæʒ] (CS 8), [rɪv] (CS 10), [rɪð] (CS 10), [rɪz] (CS 10) and [rɪʒ] (CS 10).

6) No English words end with [h] or [r][39], nor with [j] or [w][40]; see CS 7, CS 8 and CS 9 and CS 10, hence the unavailability of any such words in these commutative series. This has nothing to do with accidental gaps. On the other hand, a good number of English words begin with [h], [r], [j] or [w]; see CS 1, CS 2, CS 4 and CS 6; also CS 3 and CS 5 in which words beginning with [j] cannot be found.

7) Unavailability of words with initial [ŋ] in the following cases has nothing to do with accidental gaps, either: *[ŋiː] (CS 1), *[ŋuː] (CS 2), *[ŋɪt] (CS 3), *[ŋɔːn] (CS 4), *[ŋaɪ] (CS 5), *[ŋɪə] (CS 6). Those phonetic forms which I prefixed with single asterisks are those which never occur in English and consequently the native speaker of English will have no little articulatory difficulty pronouncing them. The non-occurrence of word-initial [ŋ] is one of those cases that are often described as 'phonotactically disallowed'. In *Hi**ng*** [hɪŋ] (CS 7), *cang* [kæŋ] (CS 8) and *ring* [rɪŋ] (CS 10), [ŋ] occurs word-finally. In a case like *mango* [mæŋɡəʊ] (CS 9), which is syllabified [mæŋ| ɡəʊ], it would be more appropriate to consider [ŋ] as occurring syllable-finally rather than word-medially. In the same vein, it would be better after all to consider that [ŋ] occurs syllable-finally in *Hi**ng*** [hɪŋ] (CS 7), *cang* [kæŋ] (CS 8) and *ring* [rɪŋ] (CS 10) as well. [41]

4.7.   It will have been seen that all the words in CS 1 to CS 10 are predominantly mono-syllabic. Failing which, they are disyllabic or trisyllabic, as are ***voo(doo)*** and ***ju(pon)*** (CS 2); ***vitt(a)*** (CS 3); ***Zi(on)*** (CS 5); ***Hibb(ert)***, ***Hiff(er)*** and ***hith(er)*** (CS 7); ***Cav(an), Cath(er)***, ***cas(bah)*** and ***Cag(ney)*** (CS 8); ***maff(ia)***, ***mav(erick)***, ***Math(er)***, ***Maz(da)***, ***Mag(inot)*** and ***man(go)*** (CS 9).

5. MINIMAL MULTIPLETS AND NEAR-MINIMAL MULTIPLETS

5.1.   I have so far referred globally as 'linguistic items' or sometimes 'words' all the in-dividual constituents that make up the individual commutative series. We now need to see the difference among these constituents by bringing in a few technical terms, viz. 'multiplet', 'minimal multiplet' and 'near-minimal multiplet'.

5.2.   The term 'multiplet' is my own derivative use of the pre-existing term 'multiplet' in physics. Each commutative series consists of a set number of constituents, whose number

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[39]   *Sartre* can be pronounced [sɑːtr] or [sɑːtrə], but this is of course not an English word.
[40]   We are concerned in this paper essentially with BrE, in particular, RP, not AmE, hence the non-occurence of [j] and [w] word-finally. In this paper, we are not concerned with [aj] and [aw] as Bloomfieldians would notate.
[41]   Some phoneticians mention 'word-finally' rather than 'syllable-finally.

varies from one commutative series to another. These constituents are multiplets. Thus, CS 1 consists of 23 multiplets, CS 2 of 22 multiplets, CS 3 of 19 multiplets, and so on.

5.3. Mutiplets are either 'minimal multiplets' or 'near-minimal multiplets'. 'Minimal multilplets' are those multiplets whose phonetic structures are distinguished from one another through minimal differences of phonetic segments at corresponding points, the rest of the phonetic structure being identical. For example, in CS 1, the following multiplets are minimal multiplets: *pea, bee, fee, vee, tea, Dee, thee, see, she, Chee, gee, key, ghee, me, knee, lea, Rhe, he, ye* and *we*. The minimal differences among these multiplets occurs word-initially. The differences among the minimum multiplets concern the phonetic segments (consonantal segments here), e.g. [p] vs [b], not the minimal orthographic difference, e.g. *p* vs *b*. In other words, in the examples given above, the minimal differences we are talking about in connection with CS 1 relates to differences formed by [p], [b], [f], [v], [t], [d], [ð], [s], [ʃ], [tʃ], [dʒ], [k], [g], [m], [n], [l], [r], [h], [j] and [w]. The phonetic structure of these minimal multiplets when the initial consonantal segments are set aside is identical, i.e. [iː]. As will have been seen from the examples above, minimal multiplets are necessarily monosyllabic.

5.4. 'Near-minimal multiplets' are those multiplets whose phonetic structures consist of the phonetic structures of minimal multiplets plus further phonetic structures. For example, again in CS 1, *thie(f), zea(l),* and *gi(gue)* are near-minimal multiplets as the presumed minimal multiplets [θiː] (*thie) is additionally followed by [f] (*f*), [ziː] (*zea) by [l] (*l*), and [ʒiː] (*gi) by [g] (*gue*). The general practice would be to accept [θiːf] (*thief*), which is an attested form, as a near-minimal multiplet. Thus *thie(f)* which consists of the presumed minimal multiplet [θiː] plus [f] is a near-minimal multiplet. Likewise, *mutatis mutandis,* for *zea(l),* and *gi(gue).* Near-minimal multiplets may be monosyllabic like *thie(f), zea(l)* and *gi(gue)* in CS 1, *foo(d), Thu(le),* and *noo(se)* in CS 2; *gaun(t)* in CS 4; and *chi(de), ji(be)* and *Ky(le)* in CS 5, and certain of the linguistic items in CS 7 and CS 10. Near-minimal multiplets may be polysyllabic, as can be seen in the following complete list of polysyllabic near-minimal multiplets: *voo(doo), ju(pon)* in CS 2; *vitt(a)* in CS 3; *Zi(on)* in CS 5; *Kier(an/on)* in CS 6; *Hibb(ert), Hiff(er), hith(er)* in CS 7; *Cav(an), Cath(er), cas(bah), cack(le)* and *Cag(ney)* in CS 8; and *maff(ia), mav(erick), Math(er), Maz(da), Mag(inot), man(go)* in CS 9.

5.5. What Martinet (1965: 63-64) presents (see *supra* **2.11**) in terms of two commutative series is such that both commutative series consist entirely of minimal multiplets; no near-minimal multiplets are found in either commutative series. That a commutative series consists of only minimal multiplets may be ideal but this is an exception rather than the rule. In performing the commutation test, the analyst should be realistically prepared to meet with commutative series which consist of near-minimal multiplets as well as minimal multiplets. CS 1 consists of minimal multiplets except for *thie(f), zea(l), gi(gue)*; CS 2 except for *foo(d), voo(doo), Thu(le), ju(pon), noo(se)*; CS 3 except for *vitt(a)*; CS 4 except for *gaun(t)*; and CS 5 except for *Zi(on), chi(de), ji(be)* and *Ky(le)*.

6. JUSTIFYING THE INCLUSION OF NEAR-MINIMAL MULTIPLETS IN COMMUTATIVE SERIES

6.1. What behoves the analyst to do at this stage is to justify the inclusion of all near-minimal multiplets in CS 1 to CS 10. This is what I propose to do next. The crucial reasons for which the said near-minimal multiplets are acceptable or not are strictly of phonetic order. The analyst is assumed to have a good knowledge of articulatory phonetics.

In CS 1

thie(f). The presumed minimal multiplet would be **thie* [θiː] which is unattested. The addition of [f] after [θiː] is not thought to change [θ] to some other consonantal segment. Therefore *thief* which is attested is accepted as a near-minimal multiplet.

zea(l). The presumed minimal multiplet would be **zea* [ziː] (but see *supra* fn 26) which is unattested. The addition of [l] after [ziː] is not thought to influence the occurrence of [z] in such a way that another consonantal segment replaces [z]. Consequently, *zeal* which is attested can be considered as a near-minimal multiplet.

gi(gue). The presumed minimal multiplet would be **gi* [ʒiː] which is unattested. The addition of [g] after [ʒiː] is certainly not thought to change [ʒ] to some other consonantal segment in this French loanword. (*André*) *Gide* [ʒiːd][42] might have alternatively been chosen instead of *gigue* in CS 1 as another near-minimal multiplet, in which case the addition of [d] after [ʒiː] is not thought to change [ʒ] to another consonantal segment. Such being the case, *gigue* (or *Gide*, if it is chosen in CS 1), can be regarded as a near-minimal multiplet.

In CS 2

foo(d). The presumed minimal multiplet would be **foo* [fuː] which is unattested. The addition of [d] after [fuː] is not thought to change [f] to another consonantal segment. It is unproblematic to accept *food* as a near-minimal multiplet. I could have alternatively chosen *phooey* ['fuːɪ] instead of *food*, in which case too, *phooey* can be considered as another near-minimal multiplet since the addition of [ɪ] after [fuː] is not likely to change the occurrence of [f] to that of another consonantal segment.

voo(doo). The presumed minimal multiplet would be **voo* [vuː] which is unattested. The addition of [duː] after [vuː] is unlikely to change [v] to some other consonantal segment. Therefore *voodoo* can be accepted as a near-minimal multiplet. Note that *voodoo* is disyllabic and the first syllable bears accent, thus ['vuːduː], so that considering **voo* [vuː] as the presumed minimal multiplet (in the near-minimal multiplet *voodoo*) is correct. Such would not

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[42]   This is not a French loanword in the sense that e.g. *dressage, massage, montage*, etc. are French loanwords, but is appropriate to be cited here. Both *LPD* and *EPD* enter *Gide* for which they record as [ʒiːd] without a potential anglicized pronunciation [dʒiːd] as well. This reinforces the view that *Gide* can effectively be regarded as a French loanword.

be the case if *voodoo* were pronounced [vuːˈduː] in which the first syllable is unaccented. **voo* standing on its own in a spoken chain would always be accented, i.e. [ˈvuː]. I am assuming that *voodoo* [ˈvuːduː] is syllabified in such a way that the syllable boundary occurs between [ˈuː] and [d], thus [ˈvuː ǀ duː].[43] However, I am aware that a different syllabification is also suggested, i.e. [ˈvuːd ǀ uː].[44] Do the different placements of the syllable boundary affect my statement above that *voodoo* is accepted as a near-minimal multiplet? I think not. [ˈvuː ǀ duː] and [ˈvuːd ǀ uː] would phonetically be substantially the same. The length of [uː] of [ˈvuː] in [ˈvuː ǀ duː] (occurring in open-syllable-finally) would be longer that [uː] of [ˈvuːd ǀ uː] (occurring in closed-syllable finally). In either case, *voodoo* can be accepted as a near-minimal multiplet.

      Thu(le). The presumed minimal multiplet would be **Thu* [θuː] which is unattested. The addition of [l] after [θuː] is not thought to change [θ] to some other consonantal segment. Consequently, *Thule* can be accepted as a near-minimal multiplet. It must be mentioned that *Thule* is pronounced [θjuːl] (primary variant) or [θuːl] (secondary variant) and that I deliberately chose [θuːl] for the present purpose. I should perhaps add that [l] in *Thule*, to be precise [ɫ] (velarized lateral), does not form a syllable on its own in English, so that *Thule* is monosyllabic. This case is different from the pronunciation of *bottle* [ˈbɒtɫ] or *awful* [ˈɔːfɫ] where [ɫ] on its own forms a syllable, that is, it is syllabic [ɫ̩] (the diacritic ‘ ̩’ signifies ‘syllabic’).

      ju(pon).[45] The presumed minimal multiplet would be **ju* [ʒuː] which is unattested. The addition of [pɒn] after [ʒuː] is not thought to change [ʒ] to some other consonantal segment, say, to e.g. [ʃ] which is the voiceless counterpart of [ʒ]. Therefore *jupon* can be accepted as a near-minimal multiplet.

      noo(se). The presumed minimal multiplet would be **noo* [nuː] which is unattested. The addition of [s] after [nuː] is unlikely to change [n] to some other consonantal segment. Consequently, *noose* can be accepted as a near-multiple multiplet.

    In CS 3

      vitt(a).[46] The presumed minimal multiplet would be **vitt* [vɪt] which is unattested. The additional of *a* [ə] after [vɪt] is not thought to change [v] to any other consonantal segment. Therefore, *vitta* can be accepted as a near-minimal multiplet.

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[43]   This is what *EPD* indicates.
[44]   This is what *LPD* indicates.
[45]   Oddly, this French loanword is not entered in *LPD*1-3, unlike it is in *EPD*1-17.
[46]   The word *vitta* is entered in *RHDEL* but in neither *LPD* nor *EPD*. *Vitter* is entered in *EPD* but not in either *RHDEL* or *LPD*. The syllable boundary shown in *Vitter* is shown as [ˈvɪt ǀ ə] in *EPD*. Therefore either *vitta* or (if chosen) *Vitter* will be accepted as a near-minimal multiplet.

In CS 4

gaun(t). The presumed minimal multiplet would be **gaun* [gɔːn] which is unattested. The addition of [t] after [gɔːn] is not thought to change [g] to another consonantal segment, say [k]. Therefore, ***gaunt*** can be accepted as a near-minimal multiplet.

In CS 5

Z*i(on)*. The presumed minimal multiplet would be **Zi/*Zy* [zaɪ] which is unattested. *Zion* is always pronounced [zaɪən]. Removal of [ən] after [zaɪ] is not thought to change [z] to some other consonantal segment. I mention this because *Sion* which is an alternative spelling of *Zion* exists and is pronounced either [saɪən] which is the primary variant or [zaɪən] which is the secondary variant. The occurrence of either [s] or [z] in this case has nothing to do with the presence or absence of [ən] following [s] or [z]. Therefore ***Zion*** can be accepted as a near-minimal multiplet.

chi(de). The presumed minimal multiplet would be **chi* [tʃaɪ] which is unattested. The addition of [d] after [tʃaɪ] is not thought to change [tʃ] to some other consonantal segment, say [dʒ]. So ***chide*** can be accepted as a near-minimal multiplet.

The presumed minimal multiplet would be **ji* [dʒaɪ] which is unattested. I have chosen ***ji(be)*** [dʒaɪ(b)] from among other appropriate linguistic items. The addition of [b] at the end of [dʒaɪ] is not thought to change [dʒ] to some other consonantal segment. Therefore, ***jibe*** can be accepted as a near-minimum multiplet. *LPD*1-3 enters 'jai dʒaɪ – *Hindi* [dʒæ]'. (*EPD*, however, has never entered *jai* in any of its editions.) As, it seems to me, the status of *jai* as a Hindi loanword in English is reasonably doubtful, I do not accept *jai* as a minimum multiplet in CS 5 associated with [♯ –aɪ].

K*y(le)*. The presumed minimal multiplet would be **k/Ky(e)* [kaɪ] which is unattested. The addition of [l] after [kaɪ] is not thought to change [k] to some other consonantal segment, so ***Kyle*** is accepted as a near-minimal multiplet. It will be seen that this case is similar to that of ***Thule*** which we have seen above. One could alternatively choose e.g. *kite* [kaɪt] which would be just as good a near-minimal multiplet as **Kyle* [kaɪl].

In CS 6

K*ier(an/on)*. The prersumed minimal multiplet would be **Kier* [kɪə] which is unattested. The addition of [r(ə)n] after [kɪə] is not thought to change [k] to some other consonantal segment. So ***Kier(an/on)*** can be accepted as a near-minimal multiplet.

In CS 7

H*ibb(ert)*. The presumed minimal multiplet would be **H/hibb* [hɪb] which is unattested. The addition of [ət] after [hɪb] is not thought to change [b] to another consonantal

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segment. Consequently, *Hibbert* can be accepted as a near-minimal multiplet. Notice that *Hibbert* is disyllabic with accent on the first syllable, i.e. ['hɪbət], and syllabified ['hɪb ǀ ət].[47] If I had alternatively chosen *Hibberd*,[48] this would also be accepted as a near-minimal multiplet.

Hiff(er).[49] The presumed minimal multiplet would be **Hiff* [hɪf] which is unattested. The addition of [ə] after [hɪf] is not at all likely to change [f] to some other consonantal segment. *Hiffer* is disyllabic with accent on the first syllable. It may reasonably be conjectured that *Hiffer* is syllabified ['hɪf ǀ ə] like *hitter* ['hɪt ǀ ə].[50] *Hiffer* can be unproblematically accepted as a near-minimal multiplet.

hith(er). The presumed minimal multiple would be **hith* [hɪð] which is unattested. The addition of [ə] after [hɪð] is not likely to change [ð] to some other consonantal segment. The word *hither* is disyllabic, with accent on the first syllable and syllabified ['hɪð ǀ ə], so that *hither* can be accepted as a near-minimal multiplet.

Higg(s).[51] The presumed minimal multiplet would be **Hig/Higg* [hɪg] which is unattested. The addition of [z] after [hɪg] is not thought to change [g] to another consonantal segment. Hence, *Higgs* can be accepted as a near-minimal multiplet.

In CS 8

Cav(an). The presumed minimal miultiplet would be **Cav* [kæv] which is unattested. The addition of [(ə)n] after [kæv] is not thought to change [v] to any other consonantal segment. *Cavan* can be regarded as a near-minimal multiplet.

Cath(er). the presumed minimal multiplet would be **Cath*[52] [kæð] which is unattested. The addition of [ə] after [kæð] is not thought to change [θ] to some other consonantal segment. Therefore *Cather* can be accepted as a near-minimal multiplet.

cas(bah).[53] The presumed minimal multiplet would be **cas* pronounced [kæz] which is unattested. The addition of [bɑː]/[bə] after [kæz] is not likely to change [z] to some other consonantal segment. In fact, [b] is thought to sustain the voicedness of [z]. A change [z] > [s] caused by [b] which follows [z] is quite unlikely. Consequently, *casbah* can safely be considered as a near-minimal multiplet. It is interesting to compare *casbar* [-zb-] with *Caspar*[54] [-sp-]. Both *casbah* and *Caspar* can alternatively be pronounced with [ɑː] instead of [ə]

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47 According to both *EPD* and *LPD*.
48 As entered in *LPD* but not in *EPD*.
49 A family name. Neither *EPD* nor *LPD* enters *Hiffer*.
50 As shown in *LPD*. This word is not entered in *EPD*.
51 A surname. Witness e.g. Peter Ware Higgs, a British theoretical physicist.
52 The name which is also spelled *Cath* but pronounced [kæθ] has nothing to do with this item which is pronounced [kæð].
53 This item is pronounced ['kæzbɑː] (primary variant) or ['kæzbə] (secondary variant).
54 This item is pronounced ['kæspə] (primary variant) or ['kæspɑː] (secondary variant).

in the second syllable, in which case these two items will still fit in with the phonetic context [ǂ kæ –] with which CS 8 is associated.

cack(le). The presumed minimal multiplet would be **cack* [kæk] which is unattested.[55] The addition of [l] after [kæk] is not thought to change [k] to some other consonantal segment. Therefore, *cackle* can be considered as a near-minimal multiplet. Note that *cackle* which is pronounced ['kækl̩] is disyllabic.

Cag(ney). The presumed minimal multiplet would be **Cag* [kæg] which is unattested. The addition of [nɪ] after [kæg] is not thought to change [g] to another consonantal segment. Consequently, *Cagney* is regarded as a near-minimal multiplet.

In CS 9

maff(ia). The presumed minimal multiplet would be **maff* [mæf] which is unattested. The addition of [ɪə] after [mæf] is not thought to change [f] to some other consonantal segment. Being disyllabic, and with accent on the first syllable, and syllabified ['mæf ǀ ɪə],[56] *maffia* is accepted as a near-minimal multiplet.

mav(erick). The presumed minimal multiplet would be **mav* [mæv] which is unattested. The addition of [(ə)rɪk] after [mæv] is not thought to change [v] to some other consonantal segment. Being disyllabic or trisyllabic, with accent on the first syllable, and syllabified ['mæv ǀ rɪk] or ['mæv ǀ ər ǀ ɪk], *maverick* can be considered as a near-minimal multiplet.

Math(er).[57] The presumed minimal multiplet would be **Math* [mæð][58] which is unattested. The addition of [ə] after [mæð] is not thought to change [ð] to some other consonantal segment. Being disyllabic, with accent on the first syllable, and syllabified ['mæð ǀ ə], *Mather* can be accepted as a near-minimal multiplet.

Maz(da). The presumed minimal multiplet would **Maz* [mæz] which is unattested. The addition of [də] after [mæz] is not thought to change [z] to some other consonantal segment. *Mazda* is pronounced disyllabically with accent on the first syllable, thus ['mæzdə]. Therefore, *Mazda* can be accepted as a near-minimal multiplet.

Mag(inot). The presumed minimal multiplet would be **Mag* [mæʒ] which is unattested. Both *LPD* and *EPD* indicate *Maginot* as pronounced ['mæʒ ǀ ɪ ǀ nəʊ] (primary variant) or ['mædʒ ǀ ɪ ǀ nəʊ] (secondary variant), i.e. trisyllabically with accent falling on the first syllable. ([ɪ] can vary with [ə].) It is thought that the addition of [ɪ/ə ǀ nəʊ] after [mæʒ] or

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[55]   Unattested in the sense that *cack* is used in dialects, not in standard British English. This item is found in neither in *EPD* nor in *LPD*.
[56]   There exists a variant pronunciation ['mæf ǀ jə]. This is of course also disyllabic.
[57]   *Mather* has 3 variant pronunciations, viz. ['meɪðə], ['mæðə] and ['meɪθə]. In setting up CS 9, I chose ['mæðə].
[58]   Note that the presumed minimal multiplet is not *math* [mæθ] with [θ] as the final consonantal segment.

[mædʒ] is not likely to change [ʒ] to another consonantal segment. Therefore, *Maginot* pronounced ['mæʒ | ı | nəʊ] or ['mædʒ | ı | nəʊ] can be considered as a near-minimal multiplet.

man(go). This item is pronounced ['mæŋ | gəʊ] not ['mæn | gəʊ] (not like *man go(es)*). The presumed minimal multiplet would be *man [mæŋ] which is unattested[59]. The addition of [gəʊ] after [mæŋ] is not thought to change [ŋ] to some other consonantal segment including [m] or [n]. In fact, the occurrence of [ŋ] rather than [n] is determined by that of intraword [g] which follows it.[60] (The analyst need not know this at this stage while working on CS 1 to CS 10 anyway.) Therefore, the addition (or rather the occurrence) of [g] in ['mæŋ | gəʊ] assures the occurrence of no other consonantal segment than [ŋ] in front of it. The word *mango* is accepted as a near-minimal multiplet.

In CS 10

(F)rith. The presumed minimal multiplet would be *rith [rɪθ] which is unattested. The addition of [f] in front of [rɪθ] is not thought to change [θ] to some other consonantal segment. The item *Frith* can be accepted as a near-minimal multiplet.

(T)rish. The presumed minimal multiplet would be *rish [rɪʃ] which is unattested. The addition of [t] in front of [rɪʃ] is not thought to change [ʃ] to some other consonantal segment. Hence, *Trish* is accepted as a near-minimal multiplet.

(g)rin. The presumed minimal multiplet would be *rin [rɪn] which is unattested. The addition of [g] in front of [rɪn] is not thought to change [r] to some other consonantal segment. Hence, *grin* can be accepted as a near-minimal multiplet.

6.2. All the presumed unattested minimal multiplets we have seen above are, without exception, accidental gaps, which are linguistic items which are pronounceable to the native English speaker but are not included in the lexis at the moment. If, in the future, any one of these linguistic items becomes available as an attested linguistic item by entering into the English lexis, such an unattested item will be recognized and treated as a minimal multiplet and the number of minimal multiplets will as a result increase by one. However, as I write these lines, it would be altogether unacceptable to consider the presumed minimal multiplets already as minimal multiplets proper.

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[59]   *Mang*, written with the upper-case *M* exists as the name of an Austroasiatic language spoken in Vietnam, China, and Laos. *Mang* is probably pronounced [mæŋ] by speakers of English.
[60]   By regressive assimilation. We shall find out further below that the phonological status of [ŋ] in ['mæŋ | gəʊ] is different from that of [ŋ] in CS 7, CS 8 and CS 10.

7. THE DOWNSIZED SUBSCRIPTED SYMBOL '$_n$'

7.1. It is patently fallacious to assume that each of the 24 consonantal segments retains a fixed phonetic quality of its own in mutually different phonetic contexts with which the 10 different commutative series, CS 1 to CS 10, are associated. The fact is that the phonetic quality of any one of the consonantal segments varies depending on each of the different phonetic contexts it occurs in.

7.2. It may be remembered that, in listing the 24 consonantal segments in the leftmost column while showing the 10 commutative series (Table 1 in **4.1**), I presented them not as [p] … [w] but deliberately as $[p]_n$ … $[w]_n$. I now explain what I mean by the downsized subscripted symbol ' $_n$' attached to the lower righthand corner of each phonetic notation of a consonantal segment. The symbol ' $_n$' signifies 'undetermined variable number (from 1 up-wards)', i.e. $n \geqq 1$.

I will give just a few examples below; the rest can easily be inferred.

The initial consonantal segment that occurs in *pea* (CS 1) can be indicated as $[p]_1$, the one that occurs in *poo* (CS 2) as $[p]_2$, the one that occurs in *pit* (CS 3) as $[p]_3$, … the one that occurs in *cap* (CS 8) as $[p]_8$, the one that occurs in *map* (CS 9) as $[p]_9$, and the one that occurs in *rip* (CS 10) as $[p]_{10}$. In other words, $[p]_n$ = the aggregate of $[p]_1$, $[p]_2$, $[p]_3$, $[p]_4$, $[p]_5$, $[p]_6$, $[p]_7$, $[p]_8$, $[p]_9$ and $[p]_{10}$.

Another initial consonantal segment that occurs in *thee* (CS 1) can be indicated as $[ð]_1$, the one that occurs in *thy* (CS 5) as $[ð]_5$, the one that occurs in *hith(er)* (CS 7) as $[ð]_7$, the one that occurs in *Cath(er)* (CS 8) as $[ð]_8$, and the one that occurs in *Math(er)* (CS 9) as $[ð]_9$. In other words, $[ð]_n$ = the aggregate of $[ð]_1$, $[ð]_5$, $[ð]_7$, $[ð]_8$ and $[ð]_9$. This consonantal segment does not occur in CS 2, CS 3, CS 4, CS 6 and CS 10, so we do not have what might be $[ð]_2$, $[ð]_3$, $[ð]_4$, $[ð]_6$ and $[ð]_{10}$.

The final consonant that occurs in *Hing* (CS 7) can be indicated as $[ŋ]_7$, the one that occurs in *cang* (CS 8) as $[ŋ]_8$, the one that occurs in *man(go)* (CS 9) as $[ŋ]_9$, and the one that occurs in *ring* (CS 10) as $[ŋ]_{10}$. Therefore $[ŋ]_n$ = the aggregate of $[ŋ]_7$, $[ŋ]_8$, $[ŋ]_9$ and $[ŋ]_{10}$. This consonantal segment does not occur in CS 1, CS 2, CS 3, CS 4, CS 5 and CS 6, so we do not have what might be $[ŋ]_1$, $[ŋ]_2$, $[ŋ]_3$, $[ŋ]_4$, $[ŋ]_5$ and $[ŋ]_6$.

No serious importance need be attached to the actual value of $_n$ after all, as it varies depending on the number of commutative series set up and also whether or not multiplets, be they minimal or near-minimal, are actually found in the commutative series in question. What is important is to make sure that what could otherwise be indicated as e.g. [p] is not a single sound of a fixed quality but should be taken in the sense of the aggregate of $[p]_1$, $[p]_2$, $[p]_3$, $[p]_4$, $[p]_5$, $[p]_6$, $[p]_7$, $[p]_8$, $[p]_9$ and $[p]_{10}$.

8. PRE-PHONEME

8.1. In the mid-1970's, the term 'pré-phonème' was tentatively proposed within the fold of functional phonology along with a few other alternative terms like 'hypo-phonème' and 'phonémoïde'.[61] The term 'pré-phonème' did not catch on and has been forgotten. I am reviving this term.[62] The term 'pré-phonème' as I employ it in what follows has nothing to do with the same term employed in historical linguistics (e.g. Fox 1995: 150). The consonantal segments which are meant to be pre-phonemes correspond precisely to what I have so far indicated as e.g. $[p]_n$, $[b]_n$, $[f]_n$, $[v]_n$, $[m]_n$, etc. From this point on, I will notate the pre-phonemes as e.g. $/[p]_n/$, $/[b]_n/$, $/[f]_n/$, $/[v]_n/$, $/[m]_n/$, etc. with additional pairs of diagonal bars. The combined use of pairs of square brackets and of pairs of diagonal bars may be surprising. The use of square brackets implies that pre-phonemes are consonantal segments themselves but the use of diagonal bars implies that pre-phonemes are potentially conceived in differential phonological relationship between each other. The pre-phoneme is, as it were, a janus-faced entity.

8.2. The pre-phonemes are not regarded separately from each other but in terms of their *mutually differentiative relationship*, or what I call a 'multiple oppositive relation', i.e. $/[p]_n/$ vs $/[b]_n/$ vs $/[f]_n/$ vs $/[v]_n/$ vs $/[m]_n/$ vs $/[t]_n/$ vs $/[d]_n/$ vs $/[\theta]_n/$ vs $/[\eth]_n/$ vs $/[n]_n/$ vs $/[s]_n/$ vs $/[z]_n/$ vs $/[t\int]_n/$ vs $/[d_3]_n/$ vs $/[\int]_n/$ vs $/[_3]_n/$ vs $/[k]_n/$ vs $/[g]_n/$ vs $/[\eta]_n/$ vs $[l]_n/$ vs $/[r]_n/$ vs $/[h]_n/$ vs $/[j]_n/$ vs $/[w]_n/$.

8.3. Each pre-phoneme, e.g. $/[p]_n/$, possesses multiple phonetic features, some of which are common to all its members, i.e. $[p]_1$, $[p]_2$ … $[p]_9$, $[p]_{10}$, irrespective of multiple phonetic contexts where $/[p]_n/$ appears, and other multiple phonetic features which are varied and whose occurrence is linked to specific phonetic contexts in which $/[p]_n/$ appears. Examination of the phonetic features of e.g. $/[p]_n/$ reveals that bilabiality is shared by all the members while phonetic features like various degrees of aspiration, degrees of raising or lowering of the anterodorsum in the articulation of various vocalic segments that follow $/[p]_n/$, and so forth. My specification above of bilabiality stands valid despite occasional labiodental articulation (instead of bilabial articulation) before inherently labiodental articulation of e.g. [f] (*cupful*), as this is linked to a certain phonetic context. When the search for the context-linked phonetic feature common to all the members of each pre-phoneme has been completed, we are in a position to confirm in what way the pre-phonemes in the afore-mentioned multiple oppositive relation are distinguished from each other.

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[61]   See *Actes du deuxième colloque de linguistique fonctionnelle* (1975: 9-10).
[62]   It was in Akamatsu (2017b: 472) that I actually revived this term in writing.

8.4.   Two points I wish to stress in particular in what I said in **8.3** is that the commonly shared phonetic feature, bilabiality in the case of /[p]$_n$/, is *at the same time* the phonetic feature by virtue of which /[p]$_n$/ is differentiated from those other pre-phonemes which are its direct neighbours in the system, i.e. those pre-phonemes that are in the same series or orders in the system of pre-phonemes. In other words, the commonly held phonetic feature looks inward and outward at the same time, hence the janus-faced nature of pre-phonemes.

8.5.   The two types of phonetic features whose presence is automatically determined or otherwise can be re-expressed as '(context-determined) phonologically irrelevant features' and '(not context-determined) phonologically relevant features'. The first-mentioned type of phonetic features eludes the speaker's choice, that is, beyond the speaker's control. In other words, the choice between e.g. [p]$_1$, [p]$_2$ … [p]$_9$, [p]$_{10}$ is not at the disposal of the speaker. The second-mentioned type of phonetic features is well within the speaker's choice. This happens when the speaker chooses e.g. either the phoneme /p/ (*pea* [piː]) or the phoneme /m/ (*me* [miː]), whichever the speaker intends to choose.

8.6.   Phonemes consist of phonologically relevant features only. It is through the process of the commutation test applied to pre-phonemes that the phonologically relevant features of the 24 respective consonant phonemes of English can be elicited. Working on the pre-phonemes in their mutually differential relationship leads to finding out the relevant features and thereby ultimately establishing the phonemes. It is in this sense that the concept and designation of 'pre-phoneme' may be useful.

8.7.   What has been said in **8.3**, **8.4** and **8.5** is in fact merely a demonstration of what Martinet (1960: II-6) writes as follows.

> Linguistiquement sont donc seuls pertinents les éléments de la chaîne parlée dont la présence n'est pas automatiquement entraînée par le contexte où ils apparaissent, ce qui leur confère une fonction d'information.

8.8.   It is true that, for example, [p]$_1$, [p]$_2$ … [p]$_9$, [p]$_{10}$ are consonantal segments which will eventually, that is, *in the course of the commutation test* (not yet at this stage) be identified as *realizations* of what we shall establish as the phoneme /p/ defined in terms of phonologically relevant features. These realizations are customarily known as 'combinatory variants' as each of [p]$_1$, [p]$_2$ …[p]$_9$, [p]$_{10}$ occurs in company with (preceded and/or followed by) other vocalic or consonantal segments. Combinatory variants are at the mercy of the phonetic

contexts in which they occur. Martinet (1949: 7) says that 'the so-called combinatory variants … are deprived of all function, unless we agree with Trubetzkoy in recognizing for what he terms an associative function (Trubetzkoy 1949: 53 fn 1).[63]

8.9.   Combinatory variants, e.g. $[p]_1$, $[p]_2$ … $[p]_9$, $[p]_{10}$, hence $[p]_n$, together directly relate to the phoneme /p/ itself. Caution must be sounded straight away that $[p]_n$ is *not* to be identified as /p/ as $[p]_n$ includes those phonetic features that are phonologically irrelevant, while the phoneme /p/ consists of *phonologically relevant features only*. It is not at all the case that the sum of $[p]_1$, $[p]_2$ … $[p]_{10}$ *as such*, form /p/ and that $[p]_1$, $[p]_2$ … $[p]_9$, $[p]_{10}$ are regarded as the 'allophones' of /p/, a notion of the phoneme that would be sustained by e.g. Bloomfieldians.[64]

9. THE PHONOLOGICAL SYSTEM, SERIES, ORDER, CORRELATION, BUNDLE OF CORRELATIONS

9.1.   The system of phonemes is not an unstructured, disorganized whole. On the contrary, it is a well-organized, well-structured system, consisting of sub-systems which together make up the whole system. The system of the phonemes is not a jumbled collection of mutually isolated distinctive units but is a tightly integrated whole. The notions of 'series', 'order' and 'correlation' are well known since the times of Praguian phonological theory. In explaining 'series', 'orders', and 'correlation', Martinet (1960, III-15) writes:

> Une classe de phonèmes consonantiques caractérisés par un même trait pertinent, comme /p f t s š k/ en français, qui s'ordonnent le long du chenal expiratoire est dite **série** ; les consonnes comme /t d n/ ou /š ž/, qui s'articulent au même point de ce chenal, et au moyen du même jeu du même organe, forment ce qu'on appelle un **ordre**. … Deux séries comme /p f t s š k/ et /b v d z ž g/ forment ce qu'on appelle une **corrélation**.

Martinet (1964^2: **3.8** = 2005^3: **3.8**) writes as follows with somewhat different phraseology.

> On dira que des phonèmes consonantiques caractérisés par une même articulation forment une SERIE, si leurs autres articulations caractéristiques sont situées en différents points, le long du chenal expiratoire. Ainsi, en français, /p/, /t/, /k/, qui sont tous caractérisés par la même articulation glottal, mais distingués par la région où se place l'occlusion, forment une série, et de même /b/, /d/, /g/.

I have quoted his above passage deliberately long enough to include Martinet's examples of /p/, /t/, /k/, /b/, /d/ and /g/. Thus, /p t k/ form one series, the "voiceless" series, and

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[63]   In neither Trubebzkoy (1939) nor Trubetzkoy (1969) does the term 'associative function' appear. Martinet's use of this term obviously refers to Trubetzkoy (1949: 53 fn 1). The term is not listed, either, in *Dictionnaire de linguistique de l'Ecole de Prague.* Presumably the term is to be attributed to Jean Cantineau.

[64]   Bloch & Trager (1942: 40) write: "… a phoneme is a class of phonetically similar sounds …". Trager & Smith (1957: 19) write: "The criteria for classifying sounds as allophones of the same phoneme … the sounds should be phonetically similar, they should be in complementary distribution …".

/b d g/ another series, the "voiced" series, and (though Martinet does not explicitly says) /p b/, /t d/ and /k g/ form three orders, the "bilabial" order, the "apical" order, and the "dorsal" order.[65]

Martinet (1964[2]: **3.9** = 2005[3]: **3.9**) rightly says that 'series' and 'order' are *oppositional concepts* since a series presupposes one or more series and an order presupposes one or more orders, just as a phoneme presupposes one or more phonemes and a relevant feature presupposes one or more relevant features.

In performing the commutation test in an attempt to elicit the different relevant features and thereby to identify the individual phonemes definable as mutually different sums of relevant features, it is surely recommended for the analyst to, in the first place, take advantage of and have recourse to the concepts 'series', 'order' and 'correlation'. This I mean to do in what follows in arriving at the consonant phonemes of English. In my view, the quickest way to find the relevant features of the individual consonant phonemes of English, and those of any language whose phonematic system the analyst wishes to arrive at, is to have recourse to 'series', 'order' and 'correlation'.

9.2. Martinet (1960: III-15) says that "Le trait pertinent qui distingue les deux séries s'appelle la marque. Ici la marque est la «sonorité»." I have always disagreed with the view that the mark of correlation is a relevant feature. I would say that the mark of correlation for a pair of series, e.g. the "voiceless" series and the 'voiced' series, is 'voice' (a phonetic feature) not "voice" (a relevant feature). This is no place for me to enter into a discussion on this subject. I should emphatically say that I am in agreement with e.g. Tcheu (1969: 240, 241), who writes:

> La **marque** [Tcheu's emphasis] est donc un caractère phonique qui oppose, par sa présence et son absence, deux phonèmes dont les traits pertinents sont par ailleurs identiques.

and

> La marque fournit, par sa présence et son absence deux traits pertinents, mais elle-même n'est qu'un caractère phonique particulier.

Interested readers may wish to consult Akamatsu (1977, 1978, 1979, 1986).

Martinet (1964[2]: **3.9** = 2005[3]: **3.9**) gives an example of a language which has /p t k m n ŋ/. We can say that /p t k/ form a non-nasal series while /m n ŋ/ form a nasal series, and that /p m/ form the "labial" order, /t n/ the "apical" order, and /k ŋ/ the "dorsal" order. The 6 phonemes which form the two series and the three orders form a correlation. This correlation can be represented as

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[65]   I have presented /p b/ as forming the "bilabial" order, not the "labial" order as I know that the system of the French consonant phonemes is such that "bilabial" and "labiodental" are two separate orders and cannot be globally considered as constituting the single "labial" order (see Akamatsu 2017b: 495). No problem arises about "apical" and "dorsal", though some may propose "dental" instead of "apical". Martinet himself, in the passage quoted, in illustrating /p b/, /t d/ and /k g/, does not specifically name the three orders.

	"labial"	"apical"	"dorsal"

<table>
<tr><td></td><td></td><td>"labial"</td><td>"apical"</td><td>"dorsal"</td></tr>
<tr><td></td><td>"non-nasal"</td><td>/p/</td><td>/t/</td><td>/k/</td></tr>
<tr><td>'nasality'</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>"nasal"</td><td>/m/</td><td>/n/</td><td>/ŋ/</td></tr>
</table>

Fig 1

where 'nasality' is the mark of correlation', and "non-nasal", "nasal", "labial", "apical" and "dorsal" are relevant features.

9.3. It is customary, as will have already been seen, to consider series, orders and correlation as being formed by phonemes. This is what I too normally do. However, as will be seen below, that, *during the commutation test*, I operate with series, orders and correlation *in connection with pre-phonemes* which are not phonemes. This is in my view inevitable as the commutation test can only be performed, at the initial stages, with pre-phonemes.

10. SOME PRE-PHONEMES FORMING SERIES, ORDERS, CORRELATION, BUNDLE OF CORRELATIONS

10.1. When broadly surveying the 24 pre-phonemes, i.e. $/[p]_n/$, $/[b]_n/$, $/[f]_n/$, $/[v]_n/$, $/[m]_n/$, $/[t]_n/$, $/[d]_n/$, $/[\theta]_n/$, $/[\eth]_n/$, $/[n]_n/$, $/[s]_n/$, $/[z]_n/$, $/[t\int]_n/$, $/[d\textthreesuperior]_n/$, $/[\int]_n/$, $/[\textthreesuperior]_n/$, $/[k]_n/$, $/[g]_n/$, $/[\eta]_n/$, $/[l]_n/$, $/[r]_n/$, $/[h]_n/$, $/[j]_n/$ and $[w]_n/$ which are listed in the leftmost column in the commutative series (Table 1 in **4.1**), we are immediately struck by the fact that certain of the pre-phonemes form one series consisting of $/[p]_n/$, $/[f]_n/$, $/[t]_n/$, $/[\theta]_n/$, $/[s]_n/$, $/[t\int]_n/$ $/[\int]_n/$ and $/[k]_n/$, all characterized by a certain glottal status (i.e. open glottis) associated with 'voicelessness', and one other series consisting of $/[b]_n/$, $/[v]_n/$, $/[d]_n/$, $/[\eth]_n/$, $/[z]_n/$, $/[d\textthreesuperior]_n/$, $/[\textthreesuperior]_n/$ and $/[g]_n/$, all characterized by a certain other glottal status (i.e. glottal vibrations) associated with 'voicedness'. The two series may be represented as follows.

<table>
<tr><td></td><td>'voiceless'</td><td>$/[p]_n/$</td><td>$/[f]_n/$</td><td>$/[t]_n/$</td><td>$/[\theta]_n/$</td><td>$/[s]_n/$</td><td>$/[t\int]_n/$</td><td>$/[\int]_n/$</td><td>$/[k]_n/$</td></tr>
<tr><td>'voice'</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>'voiced'</td><td>$/[b]_n/$</td><td>$/[v]_n/$</td><td>$/[d]_n/$</td><td>$/[\eth]_n/$</td><td>$/[z]_n/$</td><td>$/[d\textthreesuperior]_n/$</td><td>$/[\textthreesuperior]_n/$</td><td>$/[g]_n/$</td></tr>
</table>

Fig 2

What I have indicated as 'voice' is what is known as 'mark (of correlation)'. Notice that 'voice' here is *not* a relevant feature but a phonetic feature. Notice also my use of single inverted commas for a phonetic feature.

10.2. It is important to bear in mind that the pre-phonemes that make up the two series, namely the 'voiceless' series and the 'voiced' series, stand in *a multiple differential relationship* between them which shows by what phonetic features the pre-phonemes of each series are differentiated from each other. By examining the multiple differential relationship, i.e. $/[p]_n/$ vs $/[f]_n/$ vs $/[t]_n/$ vs $/[\theta]_n/$ vs $/[s]_n/$ vs $/[t\int]_n/$ vs $/[\int]_n/$ vs $/[k]_n/$, we obtain 8 differential

phonetic features, namely, 'bilabial', 'labiodental', 'apical', 'dental', 'hiss', 'hush', and 'dorsal'. Likewise, by examining the other multiple differential relationship, i.e. /$[b]_n$/ vs /$[v]_n$/ vs /$[d]_n$/ vs /$[ð]_n$/ vs /$[z]_n$/ vs /$[dʒ]_n$/ vs /$[ʒ]_n$/ vs /$[g]_n$/, we obtain 8 differential phonetic features which are identical with those listed just above. These differential phonetic features are identified essentially negatively (i.e. how each is what the others are not) rather than just positively (i.e. what each is).

10.3. In addition to the two series, i.e. the 'voiceless' series and the 'voiced' series shown in Fig 2, we can establish 8 orders as shown below in Fig 3, namely, the 'bilabial' order (constituted by /$[p]_n$/ and /$[b]_n$/), the 'labiodental' order (/$[f]_n$/ and /$[v]_n$/), the 'apical' order (/$[t]_n$/ and /$[d]_n$/), the 'dental' order (/$[θ]_n$/ and /$[ð]_n$/), the 'hiss' order (/$[s]_n$/ and /$[z]_n$/), the 'hush plosive' order (/$[tʃ]_n$/ and /$[dʒ]_n$/), the 'hush fricative' order (/$[ʃ]_n$/ and /$[ʒ]_n$/), and the 'dorsal' order (/$[k]_n$/ and /$[g]_n$/). We thus have a correlation formed by the 2 series and the 8 orders. The correlation mark is 'voice'. The 'voice' correlation can be represented as follows.

		'bilabial'	'labio-dental'	'apical'	'dental'	'hiss'	'hush' 'plosive'	'hush' 'fricative'	'dorsal'
	'voiceless'	/$[p]_n$/	/$[f]_n$/	/$[t]_n$/	/$[θ]_n$/	/$[s]_n$/	/$[tʃ]_n$/	/$[ʃ]_n$/	/$[k]_n$/
'voice'									
	'voiced'	/$[b]_n$/	/$[v]_n$/	/$[d]_n$/	/$[ð]_n$/	/$[z]_n$/	/$[dʒ]_n$/	/$[ʒ]_n$/	/$[g]_n$/

Fig 3

What is indicated as 'voice' in Fig 2 and Fig 3 is a phonetic feature, which is the mark of the 'voice' correlation. What is indicated as 'voiceless' and 'voiced' will subsequently be, in **10.9**, evaluated as two different phonologically relevant features, which I will indicate as "voiceless" and "voiced", respectively. Note in this connection that the absence of 'voice' is then not nil but is a phonologically relevant feature "voiceless", as Martinet (1964[2]: **4.15** fn 10, 2005[3]: **4.15** fn 10) writes as follows.

> Ce qu'on appelle absence de marque doit être compté comme une caractéristique positive puisque correspondant à un type articulatoire distinct: pour réaliser l'absence de voix, par exemple, il faut prendre garde à ne pas laisser le context imposer des vibrations glottales; l'absence de voix correspond à une organisation bien définie de la glotte.

The articulation of /$[t]_n$/ and /$[d]_n$/ can be denti-alveolar, apico-alveolar or apico-post-alveolar, depending on what consonantal segments follow them. Therefore, the term 'apical' subsumes under it these various points of articulation. The common characteristic of these different articulations is that they are all apical.

The term 'dental' employed for /$[θ]_n$/ and /$[ð]_n$/ implies references to both interdental articulation and postdental articulation.

10.4. I now propose that /$[f]_n$/, /$[θ]_n$/, /$[s]_n$/, /$[ʃ]_n$/, /$[v]_n$/, /$[ð]_n$/, /$[z]_n$/ and /$[ʒ]_n$/ appearing in Fig 3 should be moved away from the 'voice' correlation and let them form another 'voice'

correlation consisting of these 8 'fricative' pre-phonemes while /[p]$_n$/, /[b]$_n$/, /[t]$_n$/, /[d]$_n$/, /[tʃ]$_n$/, /[dʒ]$_n$/, /[k]$_n$/ and /[g]$_n$/ remain to form the 'voice' correlation consisting of these 8 'plosive' pre-phonemes. As is seen in Fig 4 below, my proposal will largely modify the shape of the correlations which we saw in Fig 3.

			'labial'	'apical'	'hiss'	'hush'	'dorsal'
'plosive'	'voice'	'voiceless'	/[p]$_n$/	/[t]$_n$/		[tʃ]$_n$/	/[k]$_n$/
		'voiced'	/[b]$_n$/	/[d]$_n$/		/[dʒ]$_n$/	/[g]$_n$/
'fricative'	'voice'	'voiceless'	/[f]$_n$/	/[θ]$_n$/	/[s]$_n$/	/[ʃ]$_n$/	
		'voiced'	/[v]$_n$/	/[ð]$_n$/	/[z]$_n$/	/[ʒ]$_n$/	

Fig 4

There are now two 'voice' correlations, one being formed by the 'plosive' pre-phonemes and the other being formed by the 'fricative' pre-phonemes. The terms 'plosive' and 'fricative', in single inverted commas, have been added for the two correlations.

/[p]$_n$/ and /[f]$_n$/, and /[b]$_n$/ and /[v]$_n$/, which were in the same 'voiceless' series and 'voiced' series, respectively, in Fig 2 (**10.1**), were in Fig 3 (**10.3**) differentiated from each other as 'bilabial' (/[p]$_n$/ and /[b]$_n$/) vs 'labiodental' (/[f]$_n$/ and /[v]$_n$/). In Fig 4 shown just above, 'bilabial' and 'labiodental' are now subsumed under 'labial' (/[p]$_n$/, /[b]$_n$/; /[f]$_n$/, /[v]$_n$/), but /[p]$_n$/ and /[b]$_n$/ on the one hand, and /[f]$_n$/ and /[v]$_n$/ on the other are differentiated from each other as 'plosive' vs 'fricative'. In Fig 3, /[t]$_n$/ and /[d]$_n$/ which are 'apical' were differentiated from /[θ]$_n$/ and /[ð]$_n$/ which are 'dental'. In Fig 4 above, 'apical' (/[t]$_n$/ and /[d]$_n$/) and 'dental' (/[θ]$_n$/ and /[ð]$_n$/) are subsumed under 'apical'. Note that 'apical' shown in Fig 3 and 'apical' shown in Fig 4 just above should not be considered as the same. The former 'apical' in Fig 3 is opposed to 'dental' whereas the latter 'apical' in Fig 4 subsumes 'apical' and 'dental' so that there is no opposition between 'apical' and 'dental'. /[t]$_n$/ and /[d]$_n$/ which are 'plosive' are differentiated from /[θ]$_n$/ and /[ð]$_n$/ which are 'fricative'.

I employ the term 'hiss' for /[s]$_n$/ and /[z]$_n$/ and the term 'hush' for /[tʃ]$_n$/, /[dʒ]$_n$/, /[ʃ]$_n$/ and /[ʒ]$_n$/, as can be seen in Fig 3 and Fig 4. It should be recalled that, as already explained in **2.4**, in my usage of these two terms, 'hiss' is equivalent to 'blade-alveolar' and 'hush' is equivalent to 'post-alveolar', both being two different points of articulation. This is why the labels 'hush plosive' and 'hush fricative' seen in Fig 3 are perfectly justified. The labels 'hush plosive' and 'hush fricative' seen earlier in Fig 3 recur in Fig 4 but in such a way that 'hush' stays alongside with 'labial', 'apical', 'hiss' and 'dorsal' (all these being points of articulation as 'hush' too is) while 'fricative' (of 'hush fricative') is separated as a manner of articulation which is differentiated from 'plosive'. On another point, Fig 4 apparently suggests that /[s]$_n$/ and /[z]$_n$/ are characterized as 'voiceless hiss fricative and 'voiced hiss fricative', respectively, but, as I will explain and correct in **10.16**ff, this is actually erroneous.

In Fig 3, /[tʃ]ₙ/ and /[dʒ]ₙ/ are shown as 'hush plosive',[66] and /[ʃ]ₙ/ and /[ʒ]ₙ/ as 'voiceless hush fricative' and 'voiced hush fricative', respectively. Now that we have, in Fig 4, the 'plosive' correlation and the 'fricative' correlation, and as /[tʃ]ₙ/, /[dʒ]ₙ/, /[ʃ]ₙ/ and /[ʒ]ₙ/ are part of these two correlations, there is no need to retain 'plosive' of 'hush plosive' and 'fricative' of 'hush fricative' in Fig 4. Therefore, only 'hush' applies to all of /[tʃ]ₙ/, /[dʒ]ₙ/, /[ʃ]ₙ/ and /[ʒ]ₙ/. The difference between /[ʃ]ₙ/ and /[tʃ]ₙ/ and that between /[ʒ]ₙ/ and /[dʒ]ₙ/ are made in that /[ʃ]ₙ/ and /[ʒ]ₙ/ are 'fricative' while /[tʃ]ₙ/ and /[dʒ]ₙ/ are 'plosive'.

10.5. In Fig 5 below, I move 'plosive' and 'fricative' rightward so that 'plosive' is situated close to the 'plosive' correlation, and 'fricative' closer to the 'fricative' correlation. This is the only difference between Fig 5 and Fig 4.

			'labial'	'apical'	'hiss'	'hush'	'dorsal'
	'voiceless'		/[p]ₙ/	/[t]ₙ/		/[tʃ]ₙ/	/[k]ₙ/
'voice'		'plosive'					
	'voiced'		/[b]ₙ/	/[d]ₙ/		/[dʒ]ₙ/	/[g]ₙ/
	'voiceless'		/[f]ₙ/	/[θ]ₙ/	/[s]ₙ/	/[ʃ]ₙ/	
'voice'		'fricative'					
	'voiced'		/[v]ₙ/	/[ð]ₙ/	/[z]ₙ/	/[ʒ]ₙ/	

Fig 5

10.6. We are now left with the remainder, just 5, of the total of 24 pre-phonemes. They are /[l]ₙ/, /[r]ₙ/, /[h]ₙ/, /[j]ₙ/ and /[w]ₙ/. None of these pre-phonemes enter into any correlation. They are non-correlated. They are characterized as 'lateral' (/[l]ₙ/), 'spirant' (/[r]ₙ/), 'glottal' (/[h]ₙ/), 'palatal' (/[j]ₙ/) and 'labial-dorsal' (/[w]ₙ/), respectively.

10.7. There is yet another correlation and two series to consider, viz. the 'nasality' correlation ('nasality' being the mark of correlation) and two series, viz. the 'nasal' series and the 'non-nasal' series (twice). The 'nasal' series consists of /[m]ₙ/, /[n]ₙ/ and /[ŋ]ₙ/. The two 'non-nasal' series consist of /[p]ₙ/, /[t]ₙ/, /[k]ₙ/, and /[b]ₙ/, /[d]ₙ/ and /[g]ₙ/. All this can be diagrammatically presented as follows in Fig 6.

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[66] Phoneticians invariably describe [tʃ dʒ] as affricates. However, an affricate is 'a kind of plosive in which the articulating organs are separated more slowly than usual.' (Jones, 1964⁹: § 591). [ʃ] in [tʃ] and [ʒ] in [dʒ] are homorganic fricatives of [t d] the plosives. For my further remarks about [tʃ dʒ] as plosives, see *infra* **12.7** and **12.8**.

		$/[p]_n/$	$/[t]_n/$	$/[k]_n/$
	'non-nasal'			
'nasality'		$/[b]_n/$	$/[d]_n/$	$/[g]_n/$
	'nasal'	$/[m]_n/$	$/[n]_n/$	$/[ŋ]_n/$

Fig 6

10.8. By conflating Fig 5 and Fig 6, we see at this stage of the commutation test 19 pre-phonemes which form 5 orders ('labial', 'apical', 'hiss', 'hush', 'dorsal'); the 'voice' correlation (twice); the 'nasality' correlation; and 11 series, viz. the 'voiceless' series (twice), the 'voiced' series (twice), the 'plosive' series (twice), the 'fricative' series (twice), the 'nasal' series (once), and the 'non-nasal' series (twice).

10.9. We note the following passage in which Martinet says as follows.

> … identification du phonème résulte de l'énumération de ses caractéristiques pertinentes, celles qui assurent la distinction entre ce phonème et les autres phonèmes de la langue. (Martinet 1965: 66)

But first of all, we need to phonologically evaluate the 11 phonetic features we have seen ('voiceless', 'voiced', 'plosive', 'fricative', 'labial', 'apical', 'hiss', 'hush', 'dorsal', 'non-nasal', 'nasal') whereby the pre-phonemes are characterized. We are now ready to start *phonologically evaluating* all 24 pre-phonemes, as can be gathered by referring back to Fig 5 (**10.5**), Fig 6 (**10.7**) and **10.6**. First of all, we need to *phonologically evaluate* as follows the phonetic features, 'voiceless', 'voiced', 'plosive', 'labial', 'apical', 'hiss', 'hush' and 'dorsal'.

Phonological evaluation

'voiceless'	$\rightarrow$	"voiceless"
'voiced'	$\rightarrow$	"voiced"
'plosive'	$\rightarrow$	"plosive"
'fricative'	$\rightarrow$	"fricative"
'labial'	$\rightarrow$	"labial"
'apical'	$\rightarrow$	"apical"
'hiss'	$\rightarrow$	"hiss"
'hush'	$\rightarrow$	"hush"
'dorsal'	$\rightarrow$	"dorsal"
'non-nasal'	$\rightarrow$	"non-nasal"
'nasal'	$\rightarrow$	"nasal"

Table 2

10.10. As seen above in Table 2, the 11 nomenclatures listed remain identical in the two columns. The only difference is that I have indicated enclosed by single inverted commas the

phonetic feature e.g. 'plosive' and by double inverted commas the corresponding (phonologically) relevant feature e.g. "plosive". The phonological evaluation of phonetic features in terms of the corresponding relevant feature is of enormous importance in performing the commutation test. The difference between a given phonetic feature and its corresponding relevant feature, though related to each other, is radical.

10.11. What was said in **10.10** will be explained by taking the example 'voiced' → "voiced". It is not just vocal vibrations that are relevantly taken into account. Martinet (1965: 138) writes:

> … « sonorité » … comporte non seulement des vibrations glottales, mais un certain degré de vigueur articulatoire et probablement d'autres caractéristiques qui pourraient être décisives, au moins dans certains contextes. … « sonorité » désigne ce qu'il y a de commun dans le comportement de /b/, /v/, /d/, etc., et qui les distingue des non-sonores correspondantes, et n'implique pas nécessairement, dans toutes les réalisations, des vibrations de la glotte.

Martinet's functionalist idea of 'relevant feature' seen above permeates in all relevant features. It is absolutely essential to make clear that it is not the whole of the phonetic features of pre-phonemes that are to be necessarily found (phonologically) relevant features, as some of the phonetic features of pre-phoneme are phonologically irrelevant as their occurrence are automatically determined by the context they occur in.

What is rarely mentioned by non-functionalist phonologists is that, e.g. the relevant feature "voiced" of e.g. /b/ is conceived in terms of how /b/ behaves vis-à-vis /p/, /v/ behaves vis-à-vis /f/, /d/ behaves vis-à-vis /t/, and so on. Obviously, in English, /b/ and /p/ function as a correlative pair, as do /v/ and /f/, /d/ and /t/, /ð/ and /θ/, /z/ and /s/, /ʒ/ and /ʃ/, /dʒ/ and /tʃ/, /g/ and /k/. The relevant feature "voiced" (in /b/), for example, is seen as opposed to "voiceless" (/p/) in terms of a correlative pair which /b/ and /p/ constitute.

10.12. The placement I have proposed of /[f]ₙ/, /[θ]ₙ/, /[s]ₙ/, /[ʃ]ₙ/, /[v]ₙ/, /[ð]ₙ /, /[z]ₙ/ and /[ʒ]ₙ/ which was shown in Fig. 4 (**10.4**) and Fig 5 (**10.5**) is one of two possible placements suggested. In this connection Martinet (1962: 82) says as follows.

> … /tʃ/ and /ʃ/ are practically produced at the same point and with the same organs, and this is nearly true for /t/ and /θ/. Therefore they can be said to belong to the same order [this is what I have done]. This suggests that we posit two different series for voiceless phonemes, one for stops and one for fricatives [this is what I have done], as shown on our diagram on p. 77 [this corresponds to Fig 4 and Fig 5] … If we now put /t/, /d/, /θ/, and /ð/ in the same vertical row [this is what I have done], and disregard the difference between bilabial and labiodental [this is what I have done], we obtain, as a formula for non-nasal core phonemes … with gaps in the stop series for the sibilants and in the fricative series for the dorsals. If, being more fastidious, we decided that /θ/ is not to /t/ what /ʃ/ is to /tʃ/ and insisted on making bilabials and labiodentals two distinct orders [this is what I have not done], our pattern would be still more lacunar.

10.13. Before moving on, I wish to make a remark on one point Martinet mentions in the passage quoted just above. He writes that '… /tʃ/ and /ʃ/ are practically produced at the same point and with the same organs, and this is nearly true for /t/ and /θ/. Therefore they can be said to belong to the same order.'

I wonder in exactly what sense one can say that (realizations of) /t/ and /θ/ are produced at the same point. Realizations of /t/ are of dental articulation only when /t/ occurs before /θ/ (*eighth*) or /ð/ (*at the …*). None of other realizations of /t/ are dental. They are post-alveolar when occurring before /r/ (*true*). They are alveolar when /t/ occurs before any vowel phoneme (*tea*) or prepausally (*cat*), before /l/ (*bottle, at last*), before /n/ (*mutton*). A generalized statement that /t/ and /θ/ are 'practically produced at the same point and with the same organs' does not seem to hold water. The choice of an appropriate relevant feature for /t/ and /θ/ will resolve this problem. If /t/ and /θ/ are to be in the same order, "apical" will be *the* choice, as all various realizations of /t/ as well as those of /θ/ will be accommodated. It goes without saying that /d/ and /ð/ are also involved and /t d θ ð/ are all placed in the same order, "apical".

10.14. Martinet's passage quoted above in **10.13** suggests several different systems of some (i.e. 14) of the consonant phonemes, i.e. /p b f v θ ð s z tʃ dʒ ʃ ʒ k g/. I will diagrammatically show below the different systems (I will call them System A, System B and System C) which Martinet verbally alludes to.

	"bilabial"	"labiodental"	"apical"	"hiss"	"hush"	"dorsal"
"voiceless" "plosive"	/p/		/t/		/tʃ/	/k/
"voiced"	/b/		/d/		/dʒ/	/g/
"voiceless" "fricative"		/f/	/θ/	/s/	/ʃ/	
"voiced"		/v/	/ð/	/z/	/ʒ/	

System A

Fig 7

	"bilabial"	"labiodental"	"apical"	"dental"	"hiss"	"hush"	"dorsal"
"voiceless" "plosive"	/p/		/t/			/tʃ/	/k/
"voiced"	/b/		/d/			/dʒ/	/g/
"voiceless" "fricative"		/f/		/θ/	/s/	/ʃ/	
"voiced"		/v/		/ð/	/z/	/ʒ/	

System B

Fig 8

		"labial"	"apical"	"hiss"	"hush"	"dorsal"
"voiceless"		/p/	/t/		/tʃ/	/k/
	"plosive"					
"voiced"		/b/	/d/		/dʒ/	/g/
"voiceless"		/f/	/θ/	/s/	/ʃ/	
	"fricative"					
"voiced"		/v/	/ð/	/z/	/ʒ/	

System C

Fig. 9

Of the three Systems I have shown above, it is System C that corresponds to the system which I personally envisage (though not definitively) and which was shown further above in Fig 4 (**10.4**) and Fig 5 (**10.5**) while I was still operating with the pre-phonemes. The system shown in Fig 4 and Fig 5 on the one hand and System C on the other are practically identical with each other. However, there are differences. First, the units which together make up the system in Fig 4 and Fig 5 are pre-phonemes (e.g. /[p]ₙ/), not phonemes, whereas in System C the units are phonemes (e.g. /p/). There is no identifying a pre-phoneme with a phoneme. Second, the various labels by which the units are identified are phonetic labels (e.g. 'apical') in the systems in Fig 4 and Fig 5 whereas those which identify the units in System C are phonological labels (e.g. "apical") which stand for the relevant features. All the same, the placement of the units in Fig 4 and Fig 5 and the placement of the units in System C is seen to be essentially identical with each other.

It is System B that Martinet (1962: 77) presents as one of the conceivable systems.

10.15. We see that what gives rise to Systems A and B is whether /t d θ ð/ are placed in the single order "apical" (as in System A) or are split between two orders, i.e. "apical" and "dental" (as in System B).

In both Systems A and B, /p b f v/ are split between two orders, i.e. "bilabial" and "labiodental".

Only in System C, /p b f v/ are placed in the single order "labial", and /t d θ ð/ in the single order "apical". This is precisely the system which is basically the same in Fig 4 and Fig 5. The systems in Fig 4 and Fig 5 are the one I personally envisage. It is therefore System C that I choose.

It is important not to identify "apical" in System A, that in System B and that in System C as one and the same "apical". The oppositive values of the three "apical"s in the three Systems are different from each other. This is because "apical" in System A is opposed to "bilabial", "labiodental", "hiss", "hush" and "dorsal"; "apical" in System B is opposed to

"bilabial", "labiodental", "dental", "hiss", "hush" and "dorsal"; and "apical" in System C is opposed to "labial", "hiss", "hush" and "dorsal".

In all 3 Systems, and for that matter also the systems in Fig 4 and Fig 5, there are problems affecting /s/ and /z/ as well as /[s]$_n$/ and /[z]$_n$/, and /k/ and /g/ as well as /[k]$_n$/ and /[g]$_n$/. These problems will be clarified and resolved **10.16.**ff. Suffice it to say at this point that /[k]$_n$/ and /[g]$_n$/ and /k/ and/g/ should not be placed where they are, in fact should not appear at all, in the systems in Fig 4, Fig 5 and in all 3 Systems, unless Fig 4, Fig 5 and the 3 Systems are appropriately revised. More about problems about /[k]$_n$/ and /[g]$_n$/ and /k/ and /g/, see **10.16**ff, **11.8**, **11.9**, **11.10** and **11.11**.

10.16. Here is another new figure, Fig. 10. This follows directly from Fig 4 (in **10.4**) shown earlier. The main difference is that all the pre-phonemes have been phonologically evaluated, so that /[p]$_n$/ $\longrightarrow$ /p/, /[b]$_n$/ $\longrightarrow$/b/, and so on.

		"labial"	"apical"	"hiss"	"hush"	"dorsal"
"voiceless"		$^{(?)}$/p/	$^{(?)}$/t/		/tʃ/	$^{(?)}$/k/
	"plosive"					
"voiced"		$^{(?)}$/b/	$^{(?)}$/d/		/dʒ/	$^{(?)}$/g/
"voiceless"		/f/	/θ/	$^{(?)}$/s/	/ʃ/	
	"fricative"					
"voiced"		/v/	/ð/	$^{(?)}$/z/	/ʒ/	

Fig 10

Fig 10 shows 16 consonant phonemes of English. /p/, /b/, /t/, /d/, /k/ and /g/ have now parenthesized superscripted downsized question marks '$^{(?)}$' attached in front of them, meaning that these 6 phonemes are not yet completely defined at this stage in that not all the relevant features with which to define them have yet to be elicited. Besides, I will explain in **11.8**, **11.9**, **11.10** and **11.11** why $^{(?)}$/k/ and $^{(?)}$/g/ should not be placed where they are here. They should not at all appear in Fig 10.

As for $^{(?)}$/s/ and $^{(?)}$/z/, they should not appear, either, where they are here in Fig 10 if the analyst is to arrive at the correct phonological contents of /s/ and /z/, which I will explain in **10.18.**

10.17. At this stage of a *tentative* and *incomplete* analysis, we see the provisional definitions of the 16 phonemes we have established so far, as shown in Fig 10. I will add a few remarks after each case of the definitions of the phonemes.

First, here is the provisional definition of the 16 phonemes as shown in Fig 6 (**10.7**).

^(?)/p/ "voiceless labial plosive"	/f/ "voiceless labial fricative"
^(?)/b/ "voiced labial plosive"	/v/ "voiced labial fricative"
^(?)/t/ "voiceless apical plosive"	/θ/ "voiceless apical fricative"
^(?)/d/ "voiced apical plosive"	/ð/ "voiced apical fricative"
/tʃ/ "voiceless hush plosive"	^(?)/s/ "voiceless hiss fricative"
/dʒ/ "voiced hush plosive"	^(?)/z/ "voiced hiss fricative"
^(?)/k/ "voiceless dorsal"	/ʃ/ "voiceless hush fricative"
^(?)/g/ "voiced dorsal"	/ʒ/ "voiced hush fricative"

Table 3

Of the phonemes marked with prefixed ^(?), the placements of ^(?)/s/ and ^(?)/z/ in Fig 10 are amenable to incorrect definitions of /s/ and /z/, as can be seen in Fig 10 **10.16**); as for why, see **10.18**. The same applies to ^(?)/k/ and ^(?)/g/ (see **11.8**, **11.9** and **11.10**). The rest of the phonemes — six of them — have already been correctly defined and correctly placed in Fig 10 (**10.16**).

10.18. In arriving at the correct phonological contents of /s/ and /z/, it is imperative not to attribute the relevant feature "fricative" to /s/ and /z/. English has neither /ts/ "voiceless hiss plosive" nor /dz/ "voiced hiss plosive".[67] This is the reason why I have attached question marks to /s/ and /z/ in Fig 10. It may be tempting to define /s/ as "voiceless hiss fricative" and /z/ as "voiced hiss fricative" as /s/ and /z/ appear, in Figs 7, 8, 9 (**10.14**) and Fig 10 (**10.16**) as if they were part of the "fricative" series which they are not. To do so is erroneous. The relevant feature "fricative" necessarily presupposes, and is opposed to, "plosive". (Any relevant feature is obligatorily opposed to another or other relevant features in a given language.[68]) The faulty definition of /s/ as "voiceless hiss fricative" would assume the existence of another phoneme definable as "voiceless hiss plosive" — this may well be /ts/ — which does not exist in English. Likewise, the faulty definition of /z/ as "voiced hiss fricative" would assume the existence of another phoneme definable as "voiced hiss plosive" — this may well be /dz/ — which does not exist in English, either. In the absence of plosives /ts/ and /dz/, the correct definitions of /s/ and /z/ must be "voiceless hiss" and "voiced hiss", respectively.

The above-mentioned wrong definitions of /s/ and /z/ may be caused because /s/ and /z/ are shown to be parts of the "voiceless fricative" series, /f θ s ʃ/ and the "voiced fricative" series /v ð z ʒ/ in Figs 7, 8, 9 and 10.

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[67]   Jones (1964⁹: § 591), at the outset of his general statements about 'affricates', says that "An 'affricate' consonant is *a kind of plosive* [my emphasis] in which the articulating organs are separated more slowly than usual." In subsequent sections (§§ 601-6) he treats of [tʃ dʒ ts dz tr dr]. It seems legitimate to consider [tʃ] and /tʃ/ as plosives.
[68]   Akamatsu (1988: 90ff): "No relevant feature is conceivable without there being simultaneously conceivable at least another relevant feature to which it is opposed, so that any relevant feature is by definition opposed to one or more relevant features in a given phonological system." This assertion on my part is nothing less than what Trubetzkoy (1933: 238) writes that "Une qualité phonologique n'existe que comme terme d'une opposition phonologique."

The 8 phonemes which do not have question marks, viz. /f v θ ð ʃ ʒ tʃ dʒ/, have been correctly defined, with no residual problems.

10.19.   I have identified /tʃ/ and /dʒ/ on the basis of the pre-phonemes /[tʃ]ₙ/ and /[dʒ]ₙ/. However, the question must be posed as to whether /tʃ/ and /dʒ/ are to be understood as single phonemes or a sequence of /t/ and /ʃ/ and a sequence of /d/ and /ʒ/. This question needs to be answered. My full explanation about the phonological evaluation of the two pre-phonemes /[tʃ]ₙ/ and /[dʒ]ₙ/ will be given *infra* in **12.1** to **12.6**. If I do not discuss this question immediately, it is simply because I need some considerable space to do so and do not wish to break my expository flow at this point. Until then I will employ the notations /[tʃ]ₙ/ and /[dʒ]ₙ/ and /tʃ/ and /dʒ/.[69]

11. SOME OTHER PRE-PHONEMES FORMING SERIES, ORDERS, CORRELA-TION, BUNDLE OF CORRELATIONS

11.1.   Of the 16 phonemes we have so far seen above, 10 phonemes, viz. /f v θ ð s z ʃ ʒ tʃ dʒ/, are correctly defined while 6 others, viz. /p b t d k g/, remain to be correctly defined. Three more pre-phonemes, /[m]ₙ/, /[n]ₙ/ and /[ŋ]ₙ/, will be dealt with now. /[l]ₙ/, /[r]ₙ/, /[j]ₙ/ and /[w]ₙ/ will be dealt with *infra* in **13.1** and **13.2**.

11.2.   We recall that three pre-phonemes /[m]ₙ/, /[n]ₙ/ and /[ŋ]ₙ/ form a multiple oppositive relation, i.e. /[m]ₙ/ vs /[n]ₙ/ vs /[ŋ]ₙ/, and the 'nasal' series. The three pre-phonemes /[m]ₙ/, /[n]ₙ/ and /[ŋ]ₙ/ are differentiated from each other through being 'labial' vs 'apical' vs 'dorsal' just as are /[p]ₙ/ vs /[t]ₙ/ vs /[k]ₙ/, and /[b]ₙ/ vs /[d]ₙ/ vs /[g]ₙ/. Phonological evaluation of /[m]ₙ/ vs /[n]ₙ/ vs /[ŋ]ₙ/ results in /m/ vs /n/ vs /ŋ/ so that these three phonemes are opposed to each other in terms of "labial" vs "apical" vs "dorsal". What is common to /[m]ₙ/, /[n]ₙ/ and /[ŋ]ₙ/ is 'nasal', and hence what is common to /m/, /n/ and /ŋ/ is "nasal". As /[m]ₙ/ vs /[n]ₙ/ vs /[ŋ]ₙ/ forms the 'nasal' series, so does /m/ vs /n/ vs /ŋ/ the "nasal" series.

11.3.   The following figure, Fig 11, is a partial copy of Fig. 10 (in **10.16**) in which /p t k b d g/ still bearing parenthesized question marks are retained while the other phonemes are temporarily left out as not being directly relevant to the point in question. The question marks signify that /p t k b d g/ are so far incompletely defined.

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[69]   I do not yet wish to use the ligatured symbols 'ʧ' and 'ʤ' at this stage of my analysis as these two symbols will suggest already at this stage that /[tʃ]ₙ/ and /[dʒ]ₙ/ *are* realizations of *single phonemes*, which may otherwise be notated by /č/ and /ǰ/.

	"labial"	"apical"	"dorsal"
"voiceless"	(?)/p/	(?)/t/	(?)/k/
"plosive"			
"voiced"	(?)/b/	(?)/d/	(?)/g/

Fig 11

11.4. We saw (Fig 10) that /p t k/ form a "voiceless" series and /b d g/ form a "voiced" series. These two series form a 'voice' correlation, the mark of the correlation being 'voice'. Whilst /m n ŋ/ form a "nasal" series, /p t k b d g/ form "non-nasal" series; in fact, two "non-nasal" series, viz. /p t k/ and /b d g/. The "nasal" series and the "non-nasal" series together form a 'nasality' correlation, whose mark is 'nasality'. We see that /p t k b d g/ and /m n ŋ/ form a bundle of correlations. The difference between Fig 11 (**11.3**) and Fig 12 (to be presented just below) is that /m/, /n/ and /ŋ/ are added in Fig 12. /m/ is placed in the "labial" order, /n/ in the "apical" order and /ŋ/ in the "dorsal" order, and /m/, /n/ and /ŋ/ form the "nasal" series.

		"labial"	"apical"	"dorsal"
	"voiceless"	(?)/p/	(?)/t/	(?)/k/
"non-nasal"	"plosive"			
	"voiced"	(?)/b/	(?)/d/	(?)/g/
"nasal"		/m/	/n/	/ŋ/

Fig 12

The opposability of each of /m n ŋ/ to (?)/p/ and (?)/b/, (?)/t/ and (?)/d/, and / (?)/k/ and (?)/g/, respectively, is as follows.

1) /m/ is opposed to /n/ and /ŋ/, and also to (?)/p/ and (?)/b/.
2) /n/ is opposed to /m/ and /ŋ/, and also to (?)/t/ and (?)/d/.
3) /ŋ/ is opposed to /m/ and /n/, and also to (?)/k/ and (?)/g/.

(?)/p/ and (?)/b/ are direct neighbours of /m/; (?)/t/ and (?)/d/ are direct neighbours of /n/; and (?)/k/ and (?)/g/ are direct neighbours of /ŋ/.

(?)/p/, (?)/b/ and /m/ form the "labial" order; (?)/t/, (?)/d/ and /n/ form the "apical" order; and (?)/k/, (?)/g/ and /ŋ/ form the "dorsal" order.

Consequently, /m/ is defined as "labial nasal", /n/ as "apical nasal", and /ŋ/ as "dorsal nasal".

Recall that *so far*, (?)/p/ has been defined as "voiceless labial plosive", (?)/b/ as "voiced labial plosive", (?)/t/ as "voiceless apical plosive", (?)/d/ as "voiced apical plosive", (?)/k/ as "voiceless dorsal plosive", and (?)/g/ "voiced dorsal plosive". However, we will see, as I will explain in **11.9** that /k/ should be defined as "voiceless dorsal" and /g/ as "voiced dorsal" and that "plosive" cannot be attributed to either /k/ or /g/.

11.5. The opposability of /m/ to $^{(?)}$/p/ and $^{(?)}$/b/; /n/ to $^{(?)}$/t/ and $^{(?)}$/d/; and /ŋ/ to $^{(?)}$/k/ and $^{(?)}$/g/ leads us to eliciting the relevant feature "non-nasal" to be attributed to each of $^{(?)}$/p/, $^{(?)}$/b/, $^{(?)}$/t/, $^{(?)}$/d/, $^{(?)}$/k/ and $^{(?)}$/g/, and the relevant feature "nasal" to be attributed to each of /m n ŋ/. The relevant features "nasal" and "non-relevant" are of course opposed to each other.

With the addition of "non-nasal" to each of /p b t d k g/, the parenthesized question marks placed against /p b t d k g/ can now be removed as these 6 phonemes have all been completely and correctly defined. The complete definitions of /p b t d k g/ are as follows.

/p/ "voiceless labial non-nasal plosive"
/b/ "voiced labial non-nasal plosive"
/t/ "voiceless apical non-nasal plosive"
/d/ "voiced apical non-nasal plosive"
/k/ "voiceless dorsal non-nasal"
/g/ "voiced dorsal non-nasal"

Table 4

/f θ s ʃ v ð z ʒ/ which appear to form the "fricative" series — in fact /s/ is not part of the "fricative" as already pointed out in **10.18** — have nothing to do with the distinction between "non-nasal" and "nasal" phonemes. This is why these phonemes needed not be shown in either Fig 11 (**11.3**) or Fig 12 (**11.4**).

11.6. Although /k/ and /g/ have been completely defined, they should not be placed where they are in Fig 12 (**11.4**), let alone in Fig 4 (**10.4**), Fig 5 (**10.5**), Fig 6 (**10.7**), Fig 7 (**10.14**), Fig 8 (**10.14**), Fig 9 (**10.14**), Fig 10 (**10.16**) and Fig 11 (**11.3**). In fact, /k/ and /g/ should not appear in any of those Figures at all. The reason why they should not will be explained in **11.8**, **11.9**, **11.10** and **11.11**.

11.7. We can now present the definitions of /p b t d k g/ *and* /m n ŋ/, as seen in Table 5 below.

/p/ "voiceless labial non-nasal plosive"	
	/m/ "labial nasal"
/b/ "voiced labial non-nasal plosive"	
/t/ "voiceless apical non-nasal plosive"	
	/n/ "apical nasal"
/d/ "voiced apical non-nasal plosive"	
/k/ "voiceless dorsal non-nasal"	
	/ŋ/ "dorsal nasal"
/g/ "voiced dorsal non-nasal"	

Table 5

The definitions of /f v θ ð ʃ ʒ tʃ dʒ/ seen earlier in Table 3 (**10.17**) can be considered as definitive.

11.8. I will now explain why I said that placing /k/ and /g/ where they are in Fig 12 (**11.4**) is erroneous. Here below is a new figure, Fig 13, in which /m/, /n/ and /ŋ/ introduced in Fig 12 (**11.4**) are retained and in which we bring back /f/, /v/, /θ/, /ð/, /ʃ/, /ʒ/, /tʃ/ and /dʒ/ which were temporarily left out in Fig 11 (**11.3**). Note that /s/ and /z/ appeared prefixed with ⁽ᐟ⁾ in Fig 10 (**10.16**) because they were not yet correctly placed nor were they correctly defined (see Table 3 in **10.17**). This is why /s/ and /z/ do not appear in Fig 13 below.

			"labial"	"apical"	"hiss"	"hush"	"dorsal"
	"voiceless"		/p/	/t/		/tʃ/	⁽ᐟ⁾/k/
"non-nasal"		"plosive"					
	"voiced"		/b/	/d/		/dʒ/	⁽ᐟ⁾/g/
	"voiceless"		/f/	/θ/		/ʃ/	
		"fricative"					
	"voiced"		/v/	/ð/		/ʒ/	
"nasal"			/m/	/n/			/ŋ/

Fig 13

11.9. We see that, in Fig 13, ⁽ᐟ⁾/k/ is placed along with /p t/ in the "voiceless" series and ⁽ᐟ⁾/g/ along with /b d/ which is placed in the "voiced" series. We further see that /p b t d tʃ dʒ ⁽ᐟ⁾k ⁽ᐟ⁾g/ are shown to be "plosive" as against /f v θ ð ʃ ʒ/ (but not /s z/ which do not appar in Fig 13) which are "fricative". This wrongly suggests that ⁽ᐟ⁾/k/ and ⁽ᐟ⁾/g/ are "plosive" as well, which is patently false. It is generally agreed that neither [x] (voiceless dorsal fricative) nor [ɣ] (voiced dorsal fricative) occurs in R.P. ⁽ᐟ⁾/k/ and ⁽ᐟ⁾/g/ could only be "plosive" if RP had /x/ and /ɣ/ as well (this must be ruled out) to which ⁽ᐟ⁾/k/ and ⁽ᐟ⁾/g/ would be opposed. The conclusion is that neither ⁽ᐟ⁾/k/ nor ⁽ᐟ⁾/g/ is "plosive". We have already seen in Table 4 (**11.5**) and Table 5 (**11.7**) that ⁽ᐟ⁾/k/ can be defined as "voiceless dorsal non-nasal" and ⁽ᐟ⁾/g/ as "voiced dorsal non-nasal". These two definitions are correct, and we can now remove the question marks from ⁽ᐟ⁾/k/ and ⁽ᐟ⁾/g/ so that we now have /k/ and /g/.

11.10. I still have reservations about /k/ and /g/ and am still almost tempted to *newly* prefix /k/ and /g/ with parenthesized question marks, not because of their definitions which are perfect now, but because of their wrong placement in the diagrams in Figs 7 (**10.14**), 8 (**10.14**), 9 (**10.14**), 10 (**10.16**), 11 (**11.3**), 12 (**11.4**) and 13 (**11.8**). My task is now to incorporate /k/ and /g/ *properly* in the diagrams of the consonant phonemes so far identified and established.

11.11. It is obvious that placing /k/ and /g/ in addition to /p b t d/ in the existing "non-nasal" series is out of the question. The solution consists in creating another "non-nasal" in which /k/ and /g/ are the only phonemes to fit in and providing another pair of "voiceless" (for /k/)

and "voiced" (for /g/). Once these necessary changes have been brought in, /k/ and /g/ will be both *completely defined* and *properly placed*, as shown in Fig 14 below.

			"labial"	"apical"	"hiss"	"hush"	"dorsal"
	"voiceless"		/p/	/t/		/tʃ/	
"non-nasal"		"plosive"					
	"voiced"		/b/	/d/		/dʒ/	
	"voiceless"		/f/	/θ/		/ʃ/	
		"fricative"					
	"voiced"		/v/	/ð/		/ʒ/	
"nasal"			/m/	/n/			/ŋ/
	"voiceless"						/k/
"non-nasal"							
	"voiced"						/g/

Fig 14

11.12. In Fig 14, all 17 phonemes are correctly presented in terms of series and orders, and /k g/ duly occupy the places they should. Nevertheless, I believe Fig 14 can be improved, as there is still a problem. The problem concerns the placement of /m n ŋ/ which form the "nasal" series. In Fig 14, the "nasal" series /m n ŋ/ and the "non-nasal" series /p b t d tʃ dʒ/ are unduly separated due to the presence of the "fricative" series /f v θ ð ʃ ʒ/ (not /s z/ as well which do not appear in Fig 14 any more than in Fig 13 (**11.8**) placed between the "non-nasal" series and "nasal" series. This is the result of our first identifying /p b t d tʃ dʒ/ forming the "plosive" series and then /f v θ ð z ʃ ʒ/ the "fricative", and lastly /m n ŋ/ the "nasal" series. This is why these three series were successively placed from top downward as we can see in Fig 10 (**10.16**), Fig 11(**11.3**), Fig 12 (**11.4**) and Fig 13 (**11.4**). The "non-nasal" series and the "nasal" series should better be presented adjacent to each other. I propose that the "nasal" series /m n ŋ/ should be moved upward, as can be seen in Fig 15 below, so that it is placed proximate to the non-nasal" series /p b t d/ (but of course not /k g/ as well). After all, /m n ŋ/ as "nasal" is *directly* opposed to /p b t d k g/ as "non-nasal". Fig 15 below shows what I have done.

			"labial"	"apical"	"hiss"	"hush"	"dorsal"
		"voiceless"	/p/	/t/		/tʃ/	
"non-nasal"	"plosive"						
		"voiced"	/b/	/d/		/dʒ/	
"nasal"			/m/	/n/			/ŋ/
		"voiceless"	/f/	/θ/		/ʃ/	
	"fricative"						
		"voiced"	/v/	/ð/		/ʒ/	
		"voiceless"					/k/
"non-nasal"							
		"voiced"					/g/

Fig 15

It is during the process of creating the diagram of the phonemes that we were confronted with the case of e.g. /k/ and /g/ in English which are "non-nasal" like /p b t d/ but not "plosive" unlike /p b t d/. In what way can /k g/ be shown in the diagram in terms of series and orders proved to be a challenge.

11.13. It is evident in Fig 15 that all 17 phonemes are such that each is well interlocked with another or other phonemes by participating in a series and/or an order and thereby forming correlations and a bundle of correlations. This structural organization makes for the stability of the system constituted by all these phonemes. Any one of these phonemes has its direct neighbour in the system by being the member of the same series or order. This is shown below by taking the example of /p/ "voiceless labial non-nasal plosive" and seeing which other phoneme or phonemes is/are direct neighbour(s) of /p/ in the system of the 17 phonemes.

1) /p/ is a direct neighbour of each of /t tʃ k/ through the opposition "labial" (/p/) vs "apical" (/t/) vs "hush" (/tʃ/) vs "dorsal" (/k/).
2) /p/ is a direct neighbour of /b/ through the opposition "voiceless" (/p/) vs "voiced" (/b/).
3) /p/ is a direct neighbour of /f v/ through the opposition "plosive" (/p/) vs "fricative" (/f v/).
4) /p/ is a direct neighbour of /m/ through the opposition "non-nasal" (/p/) vs "nasal" (/m/).

It will have been seen that direct neighbours are those phonemes which are in the same series or order. Obviously this cannot be said of the 5 non-correlated phonemes we shall establish as /l r h j w/ to be shown further below in **13.1** and **13.2**.

11.14. There remains the problem posed by /s/ and /z/ when it comes to how correctly to place them in the diagram of the 19 consonant phonemes we have *so far* established. On the basis of the two pre-phonemes /[s]ₙ/ and /[z]ₙ/ along with /[f]ₙ/, /[θ]ₙ/ and /[ʃ]ₙ/ on the one

hand, and /[v]ₙ/, /[ð]ₙ/ and /[ʒ]ₙ/ on the other, we have established the phonemes /s/ ("voiceless hiss") and /z/ ("voiced hiss") (see Table 3 in **10.17**). These two phonological contents of /s/ and /z/ present no problem. Note again that the relevant feature "fricative" is alien to /s/ and /z/ in the absence of the "plosive" /ts/ and /dz/.

The problem concerns how to place /s/ and /z/ in diagrams. I said earlier that /s/ and /z/ should not be placed where they are provisionally placed in Fig 10 (**10.16**). /s/ and /z/ were prefixed with parenthesized superscripted downsized question marks, thus ⁽ʔ⁾/s/ and ⁽ʔ⁾/z/, since the existence of the present problem was not yet perceived and solved.

11.15.   The solution to the placements of /s/ ("voiceless hiss") and /z/ ("voiced hiss") consists in creating another "voiceless" just for /s/ and "voiced" just for /z/ and retaining "hiss". It is reminded that the problem of where to place /k/ ("voiceless dorsal non-nasal") and /g/ ("voiced dorsal non-nasal") was solved in **11.11** and the proper placements of /k/ and /g/ was shown in Fig 14 (in **11.11**) and shown again in Fig 15 (in **11.12**).

11.16.   The placements of /tʃ/ and /dʒ/ raise a problem in that /tʃ/ and /dʒ/ which are characterized as "plosive" (and also "hush") cannot also be "non-nasal", unlike /p b/, /t d/ and /k g/ all of which are characterized as both "plosive" and "nasal". The solution I propose consists in withdrawing /tʃ/ and /dʒ/ from the "non-nasal" series (where /p b/, /t d/ and /k g/ can rightly stay) along with /ʃ ʒ/ which are characterized as "fricative" and also "hush". (/ʃ ʒ/ of course have nothing to do with either "nasal" or "non-nasal".) Withdrawing /tʃ dʒ ʃ ʒ/ means withdrawing these four phonemes all of which are characterized as "hush" and form the "hush" order. The solution proposed above about the placements of /tʃ dʒ ʃ ʒ/ as well as the solutions earlier proposed about the placements of /s z/ and /k g/ is seen below in Fig 16 which show 19 consonant phonemes of English I have so far established.

			"labial"	"apical"	"hiss"	"hush"	"dorsal"
		"voiceless"	/p/	/t/			
"non-nasal"	"plosive"						
		"voiced"	/b/	/d/			
"nasal"			/m/	/n/			/ŋ/
		"voiceless"	/f/	/θ/			
	"fricative"						
		"voiced"	/v/	/ð/			
		"voiceless"					/k/
"non-nasal"							
		"voiced"					/g/
		"voiceless"			/s/		
		"voiced"			/z/		
		"voiceless"				/tʃ/	
	"plosive"						
		"voiced"				/dʒ/	
		"voiceless"				/ʃ/	
	"fricative"						
		"voiced"				/ʒ/	

Fig 16

11.17. Some may wonder why I insist on providing diagrams of the phonemes established whose definitions have been previously tabularly shown in terms of relevant features. Will the tables of the definitions of the phonemes in terms of relevant features not be enough? I make it a practice of showing the phonemes established through the commutation test in both tabular and diagrammatic forms. The two-dimensional diagrammatic presentation of the phonemes exhibits the structure of the phonematic units of a language (here we are concerned with the phonemes) in a more clear-cut manner in terms of series and orders which may not be easily perceived at a glance in tables of the phonemes presented in terms of their relevant features.

12. ON /č/ AND /ǰ/

12.1. At this stage of our analysis through the commutation test, it is absolutely necessary to tackle and resolve the question of whether /[tʃ]ₙ/ and /[dʒ]ₙ/ should be interpreted monophonematically, i.e. as /ʧ/ and /ʤ/,[70] or biphonematically, i.e. as the sequence of /t/ and /ʃ/ or that of /d/ and /ʒ/. The question of determining two successive sounds either monophonematically or biphonematically with regard to different cases in various languages, though without

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[70] Here I use symbols, 'ʧ' and 'ʤ', instead of 'tʃ' and 'dʒ'. The difference between the two sets of symbols is that, 't' and 'ʃ', and 'd' and 'ʒ' are ligatured in 'ʧ' and 'ʤ' while this is not so in 'tʃ' and 'dʒ'.

respect to [tʃ] or [dʒ] in English, is discussed by Trubetzkoy (1939: 41-47).[71] At a later date, this question was cogently answered from a functionalist viewpoint by Martinet in his several writings (e.g. Martinet 1939: 41-47; 1956: 3-21; 1960: III-23; 1965: 109-123, esp. 114-116). *The* criterion whereby the problem is to be solved is that of the commutation test. Trubetzkoy (1935: 8-15) mentions 10 Rules whereby monophonematic interpretation can be reached. Part of these Rules reappear subsequently in Trubetzkoy (*op cit*: 50-55) which provides 6 Rules (I to VI) whereby to determine two successive sounds monophonematically. These 6 Rules are immediately followed in Trubetzkoy (*op cit*: 55-57) by just one Rule referred to as Rule 7 which determines two successive sounds biphonematically.[72] While formulating Rule II, he does mention 'affricates' but happens not to refer to either [tʃ] or [dʒ] in English. Anyway the criterion stipulated in Rule II concerns the articulatory nature of the two consecutive sounds of an affricate. None of the 6 Rules proposes the criterion of the commutation test.

12.2. Martinet proposes recourse to the commutation test as the key in interpreting [tʃ] and [dʒ] in English either monophonematically or biphonematically. Chapter IV in Martinet (1965: 109-123) entitled 'Un ou deux phonèmes ?' is particularly helpful. This article first appeared as Martinet (1939).[73] In this chapter of substantial length, the part that directly relevant to Martinet's treatment of [tʃ] and/or [dʒ] occurs in Martinet (1939: 98 in the 2nd paragraph = 1965: 114 in the 2nd paragraph = 1966: 119 in 2nd paragraph) while the part directly relevant to his treatment of [dʒ] and [tʃ] occurs in Martinet (1939: 99-100 in the 3rd and 4th paragraphs = 1965: 115-116 = 1966: 119-120).

Martinet writes as follows.

… deux sons successifs ne représentent avec certitude deux phonemes distincts que s'ils sont tous deux commutables, c'est-à-dire si l'on peut, en les remplaçant par un autre son, obtenir un mot différent. Il est important de noter que la commutation est parfaitement valable si elle se fait avec zero. (Martinet 1965: 111)

Martinet further writes as follows.

… le résultat du test de commutation est seul décisif, à condition, il ne faut jamais l'oublier, que l'analyse phonétique sur laquelle il se fonde ait été faite correctement. (Martinet 1965: 122)

and

… dans le système anglais, l'initiale de *chip* s'oppose à celle de *gin* [dʒɪn] comme une sourde à la sonore correspondante, et les deux doivent nécessairement recevoir le même traitement. (Martinet 1960: III-23).

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[71]   He proposes 6 Rules which were originally earlier proposed in Trubetzkoy (1935: 11-15).
[72]   This Rule originally appeared in Trubetzkoy (1935: 15-17).
[73]   Martinet (1939) was reprinted as Martinet (1965: 109-123) with minor modification. The two introductory paragraphs in Martinet (1939: 94-95) were replaced by a new single paragraph in Martinet (1965: 109), and long concluding 8-paragraph remarks were newly added in Martinet (1965: 110-121). A year later, in America, the whole of Martinet (1939) was reprinted, in its original form, in *Readings in Linguistics* II (1966: 116-123).

12.3.   In Martinet (1960: III-23) we find a handy summary, with the examples of [tʃ] (*mu-cho*) in Spanish and [tʃ] (*chip*) in English, of how to determine two successive sounds by applying the commutation test to them. In the case of *chip* [tʃɪp], both [t] and [ʃ] are commutable with zero, resulting in *ship* [ʃɪp] and *tip* [tɪp], respectively. One might on this evidence be tempted to arrive at a biphonematic interpretation of [tʃ]. The voiced correspondent of [tʃ], i.e. [dʒ] (as in *jam*), exists in English. Martinet begins with how to analyze [dʒ] in English (1965: 124). That he begins with [dʒ] rather than with [tʃ] seems to be an analytical strategy. Commuting [ʒ] with zero is possible, resulting in *dam* [d-], but commuting [d] with zero is impossible as the resulting form is *[ʒ-], which is disallowed in English. This would lead to a monophonematic interpretation of [dʒ] as, unless preceded by [d], [ʒ] does not occur in word-initial position in English word.

12.4.   Martinet (1965: 115) then proceeds to consider the question of [tʃ], the voiceless counterpart of [dʒ], and says that [t] and [ʃ] are both commutable in all contexts, i.e. (as I understand) in word-initial, word-medial and word-final contexts, giving some examples as the following; word-initially: *chip* [tʃɪp] – *ship* [ʃɪp] ([t] commuted with zero) – *tip* [tɪp] ([ʃ] commuted with zero); word-finally: *hutch* [hʌtʃ] – *hush* [hʌʃ] ([t] commuted with zero) – *hut* [hʌt] ([ʃ] commuted with zero). Based on the commutability of both [t] and [ʃ] of [tʃ] with zero, Martinet (1965: 115) writes: 'On *devrait* [my italics] donc considérér [tʃ] comme la réalisation d'un groupe de phonèmes t + ʃ.' but one may be in for a surprise. Martinet's conclusive remarks about whether /[tʃ]ₙ/ should be monophonematically or biphonematically interpreted are as follows (Martinet 1965: 116).

> Nous dirons donc, de façon générale, que lorsqu'un groupe de sons est de nature telle et se comporte de telle façon qu'on doit le considérer comme le partenaire corrélatif d'un phonème (phonétiquement homogène ou hétérogène) de la langue, il faut voir dans ce group de sons la réalisation d'un phonème *unique* [emphasis added].

Thus, Martinet interprets both /[tʃ]ₙ/ and /[dʒ]ₙ/ monophonematically in all positions, i.e. word-initially, word-medially and word-finally. Having agreed with Martinet's solution, I will henceforth notate the single phonemes in question by simple symbols, /č/ and /ǰ/, instead of /tʃ/ and /dʒ/.[74]

The pair, [tʃ] (voiceless) and [dʒ] (voiced), share similar behaviour of occurrence word-initially ([tʃ-] *chest*, [dʒ-] *jest*), word-medially ([-tʃ-] *lecher*, [-dʒ-] *ledger*) and word-finally ([-tʃ] *rich*, [-dʒ] *ridge*).[75] What is very important is that [tʃ] and [dʒ] are *a correlative pair*. /č/ and /ǰ/ form a correlative pair in the 'voice' correlation, like /p/ and /b/, /t/ and /d/. For these reasons, both [tʃ] and [dʒ] are, in the final analysis, accorded a monophonematic interpretation, and the two phonemes whose realizations are [tʃ] and [dʒ] can be notated by /č/ and /ǰ/, as I said above I would.

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[74]   We could choose the symbols /ʧ/ and /ʤ/ (note, not /tʃ/ and /dʒ/) instead of /č/ and /ǰ/, but I prefer to use /č/ and /ǰ/ which, being single symbols, be more appropriate to represent single phonemes.
[75]   The example words here need not necessarily be pairs of minimal multiplets.

12.5. It seems to me that, after commuting [t] and [ʃ] of [tʃ] individually with zero, which leads to a biphonematic interpretation of [tʃ] (i.e. as a sequence of /t/ and /ʃ/ in this order), Martinet invokes another criterion (besides the criterion of commutability; *commutability* is my word here), i.e. that of comparable behaviour of correlative pairs, in order to definitively resolve the question of the phonological status of /[tʃ]ₙ/ and /[dʒ]ₙ/ as single phonemes /č/ and /ǰ/. It seems to me that the criterion of correlative pairs overrides that of commutability in dealing with cases like /[tʃ]ₙ/ and /[dʒ]ₙ/, although the criterion of commutability remains fundamentally of primary importance. In considering the phonological status of /[dʒ]ₙ/, Martinet does not need to specifically invoke the criterion of commutability.

12.6. I said earlier (**12.3**) that 'he [Martinet] begins with [dʒ] rather than with [tʃ] seems to be an analytical strategy.' What would happen if Martinet began with [tʃ]? He would clearly be faced with a biphonematic interpretation of [tʃ]. He would then proceed to deal with [dʒ] next and unproblematically obtain a monophonematic interpretation of [dʒ], and would then return to deal with [tʃ] and invoke the criterion of correlative pairs. This is all just speculation on my part but is interesting to ponder.

12.7. [tʃ] and [dʒ]: are they affricates or plosives?

In nearly all manuals of English phonetics, both [tʃ] and [dʒ] in English are described as 'affricates', as distinct from 'plosives' and 'fricatives'. However, in my view, affricates (e.g. [tʃ dʒ]) basically relate to plosives ([t d]). It is worthwhile to note words like the following by Jones (1964[9]: § 591). In other words, affricates are essentially 'a type of' plosive'.

> An 'affricate' consonant is *a kind of plosive* in which the articulating organs are separated more slowly than usual. [emphasis added]

And Gimson (1962[1]: **8.10** (= 166)) says.

> The ' affricate ' … Any plosive, whose release stage is performed so slowly that considerable friction occurs approximately at the point where the plosive stop is made, may be called ' affricate '.

I feel that phoneticians' account of affricates is correct and that affricates as a type of plosives makes sense taxonomically.

12.8. Homorganicity in [tʃ] and in [dʒ]

Jones (1964[9]: § 601) says in connection with [tʃ]: '… the main part of the tongue is shaped nearly as for ʃ … … the removal of the tongue is performed in such a way that the effect of the homorganic fricative is audible …'. Laver (1994: 363) says that 'The brief period of audible friction that results has a perceptible duration, and is *necessarily homorganic with the place of articulation for the stop* [my italics].' In a pair of examples Jones (1931: 64) provides, viz. *why choose* and *white shoes*, the place of articulation of both [t] and [ʃ] of [tʃ] in *why choose* is homorganically palato-alveolar but the place of articulation of [t] is apico-

alveolar and that of [ʃ] is palato-alveolar in *white shoes*. That there intervenes a virtual pause between e.g. *white* and *shoes* has relevance to the fact that [t] and [ʃ] (in the sequence [t] + [ʃ]) are not homorganic. The maximum convenience for the speaker to achieve the homorganicity for [t] and [ʃ] would be that both share the same place of articulation, i.e. palato-alveolar. It would indeed be more economical and easier for the speaker if [t] and [ʃ] have *the same articulatory gesture* from the outset, that is, *palato-alveolar*. What has been said about hormorganicity in [tʃ] applies equally, *mutatis mutandis,* to [dʒ] as in *jaw* [dʒɔː], *pigeon* [pɪdʒ(ə)n], *edge* [edʒ], etc.

Homorganicity mentioned above between [t] and [ʃ] in [tʃ] is also paralleled in [ts dz tr dr] in English. Homorganicity in [ts dz] is blade-alveolar, that in [tr dr] is post-alveolar. Jones (1964⁹: § 596) cites [pɸ tθ ts tʃ tɹ̥ kx] as affricates exhibiting hormorganicity, not all of which occur in English.

12.9.   I wish to add my personal observation on the phonetic status of [t̠ʃ] and [d̠ʒ][76] and say that they are closely knit single phonetic entities. Phoneticians are agreed – and I agree with them – that [t̠] and [ʃ] of [t̠ʃ], and [d̠] and [ʒ] of [d̠ʒ], are homorganic, i.e. palato-alveolar (Gimson 1962¹: 169). [ʃ] and [ʒ] are unmistakably palato-alveolar (Jones 1964⁹: § 592), and [t̠] and [d̠] are also palato-alveolar, different from [t] or [d] as in *tin* [tɪn] or *din* [dɪn] which is alveolar. [t̠ʃ] as in *chip* [t̠ʃɪp] differs from [t] + [ʃ] as in *courtship* in a similar way that [d̠ʒ] as in *Jill* [d̠ʒɪl] differs from [d] + [ʒ] as in *good gîte*.[77] I propose that we should regard both [t̠ʃ] and [d̠ʒ] as single phonetic units and moreover single plosive consonants with a single point of articulation, i.e. palato-alveolar. This takes me to another point I wish to make.

[t̠] and [d̠] which result from commuting [ʃ] with zero and [ʒ] with zero are palato-alveolar, not alveolar. It is not easy, in allegro speech in particular, in pronouncing the affricates [t̠ʃ] and [d̠ʒ], to first articulate [t] and [d] (which are alveolar) and then pass smoothly to [ʃ] and [ʒ] which are inherently palato-alveolar. In what is indicated as '[t̠ʃɪp] *chip* ⟶ [tɪp] *tip*' (commuting [ʃ] with zero), [tɪp] is actually with [t̠] (palato-alveolar) not with [t] (alveolar). The difference between the two different places of articulation in question would be subtle and probably imperceptible to English speakers ([tɪp] and [t̠ɪp] would be accepted as much the 'same') and may not necessarily be noticed by an English-speaking analyst unless he is very sensitive to the difference between the alveolar [t] and the palato-alveolar [t̠] because this difference is functionally unimportant in English. What has been said applies equally to [d] and [d̠].

12.10.   As was mentioned in **12.7**, [tʃ] and [dʒ] (or rather [t̠ʃ] and [d̠ʒ]) or [t͡ʃ] and [d͡ʒ] (as oftener symbolized) can be considered as (a type of) plosives. There will then be congruity

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[76]   The phonetic symbols 't̠' and 'd̠' with subscripted minus signs are taken from Ladefoged & Maddieson (1996: 15).
[77]   On these points see Jones (1964⁹: § 511, § 522, § 601, § 609, § 727, § 737). Compare also in *op cit* Fig 69 (in § 601), Figs 99 and 100 (in § 726).

between /č/ and /ǰ/ (i.e. [t̪ʃ], [ʧ] and [d̪ʒ], [ʤ]) being "plosives" and [tʃ] and [dʒ] being 'plosives'. [tʃ] and [dʒ] can be regarded as realizations of /č/ and /ǰ/. This said, I continue to emphasize that the criterion of commutability and, if necessary, the additional criterion of correlative pairs remains the sole functionally justifiable keys to solve the question whether [tʃ] and [dʒ] are to be monophonematically or biphonemaically interpreted.

What we have seen in **12.1** to **12.10** is that phonologically [tʃ] and [dʒ] are single entities, i.e. /č/ and /ǰ/. Phonetically, too, [tʃ] (i.e. [t̪ʃ] or [ʧ]) and [dʒ] (i.e. [d̪ʒ] or [ʤ]) are single entities. This would suggest that the speaker makes a single choice for /č/ and /ǰ/, not two successive choices, that is, /t/ + /ʃ/, or /d/ + /ʒ/.

13. PRE-PHONEMES /[l]ₙ/, /[r]ₙ/, /[h]ₙ/, /[j]ₙ/ AND /[w]ₙ/

13.1. We have earlier seen in the table of the commutative series, i.e. Table 1 (**4.1**), lacunae for /[h]ₙ/, /[r]ₙ/, /[j]ₙ/ and /[w]ₙ/ in CS 7 to CS 10 in the phonetic contexts 'word-final'. This can be easily explained. No English words end with /[h]ₙ/, /[r]ₙ/, /[j]ₙ/ and /[w]ₙ/.[78]

Having established 19 consonant phonemes of English in the foregoing parts of this paper, we are left with 5 pre-phonemes to phonologically evaluate. They are: /[l]ₙ/, /[r]ₙ/, /[h]ₙ/, /[j]ₙ/ and /[w]ₙ/. We see first of all that these pre-phonemes cannot be envisaged as forming any series or orders among them, nor can they join any of the 19 other pre-phonemes to be part of series or orders. In other words, all these 5 pre-phonemes are non-correlated. These 5 pre-phonemes should be phonologically evaluated as 5 non-correlated phonemes which are differentiated from each other as such and from all 19 other phonemes.

13.2. The result of the phonological evaluation of the 5 above-mentioned pre-phonemes is as follows.

Phonological evaluation

/[l]ₙ/	→	/l/
/[r]ₙ/	→	/r/
/[h]ₙ/	→	/h/
/[j]ₙ/	→	/j/
/[w]ₙ/	→	/w/

Fig 17

The definition in terms of a relevant feature of each of the 5 phonemes listed above will be as follows.

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[78] In my phonological analysis of English, I do not favour describing the English diphthongs [eɪ], [aɪ], [aʊ], [əʊ] and [ɒɪ] in terms of [ej], [aj], [aw], [əw] and [ɒj].

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/l/	"lateral"
/r/	"spirant"
/h/	"glottal"
/j/	"palatal"
/w/	"labial-dorsal"

Table 6

13.3. Justification for including /j/ "palatal" and /w/ "labial-dorsal" as English consonant phonemes

Some may question my including /j/ and /w/ in the list of the consonant phonemes of English. Here are some remarks wherein I present justification for my including /j/ "palatal" and /w/ "labial-dorsal" among the English consonant phonemes.

/[j]ₙ/ and /[w]ₙ/, realizations of /j/ and /w/, respectively, are said to be phonetically vocalic) but functionally (i.e. phonologically) consonantal in that both /[j]ₙ/ and /[w]ₙ/ occur in positions where the consonant phonemes largely occur, for example prevocalically, if not in all positions, e.g. syllable-finally.

It is often the case that, in establishing the system of the English consonant phonemes, one does not identify /j/ and /w/ in terms of their respective relevant features. What is the justification for including them, as I do?

/[j]ₙ/ and /[w]ₙ/ are commutable in word-initial position with the other consonantal segments except /[ŋ]ₙ/ and /[ʒ]ₙ/. In the context [– iː], for instance, /[j]₁/ and /[w]₁/ are commutable with other consonants in items like the following: *pea, bee, fee, vee, tea, Dee, thie(f), thee, see, zea(l), she, gi(gue), Chee, gee, key, ghee, me, knee, lea, Rhee, he, ye, we* (see CS 1 in **4.1**). /[ʒ]ₙ/ and /[ŋ]ₙ/ rarely occur in word-initial position in English, but possible exceptions are found in *gi(gue)* (cited above), *Gibran, Gide, Gigi, gilet, Giscard* (*d'Estaing*), *Giselle, gite/gîte, Givenchy*, etc. which begin with /[ʒ]ₙ/, and in *Ngaio/ngaio, Ngiyambaa/Ngiyampaa* and *Nguni* which begin with /[ŋ]ₙ/ (alternatively with [əŋ]). All these exceptions are foreign words or loanwords in English, which explains the general non-occurrence of /[ʒ]ₙ/ and /[ŋ]ₙ/ in word-initial position in English.

Furthermore, /[j]ₙ/ and /[w]ₙ/ themselves are commutable with each other, viz. *yore* vs *war, yet* vs *wet, ye* vs *wee, yak* vs *wack, yin* vs *win, yang* vs *Wang, year* vs *were, yell* vs *well, yon* vs *wan, yew* vs *woo, York* vs *walk, yawn* vs *warn, yuck* vs *wuck*, etc.

As will have been seen, /[j]ₙ/ and /[w]ₙ/ occur in word-initial position where the other consonants with the exception of /[ŋ]ₙ/ also occur. In other words, /[j]ₙ/ and /[w]ₙ/ share with each other as well as with other consonantal segments the characteristic of the consonantal segments occurring in that position.

In sum, /[j]ₙ/ and /[w]ₙ/ can be identified as realizations of /j/ and /w/.

14. DEFINITIONS OF /l/, /h/, /w/, /j/ AND /r/

14.1.   There is no problem defining /l/ as "lateral" and /h/ as "glottal". My definition of /w/ as "labial-dorsal" and that of /j/ as "palatal" do not seem problematic. Realizations of /j/ requires raising the anterodorsum towards the hard palate, hence the relevant feature "palatal". Realizations of /w/ are co-articulated, that is, the lips are rounded to various degrees while at the same time the posterodorsum is raised towards the velum, hence the single relevant feature "labial-dorsal" in which the term 'labial' and 'dorsal' are linked by the hyphen to form a compound. It goes without saying "labial" and "dorsal" carry semantically and articulatorily equal weight.

It is the term 'spirant' by which I have defined /r/ (Table 6 in **13.2**) which may require some comments below.

14.2.   Martinet (1956: 2-21) refers to the term 'spirante' as follows.

Les consonnes dont l'articulation suppose le passage de l'air dans un chenal axé au centre de la bouche sont désignées d'ordinaire indifféremment comme des **spirantes**, des **fricatives** ou des constrictives, mais il est indiqué de distinguer entre les articulations relâchées (type du *d* d'esp. *occupado* [sic]), qui tendent vers une ouverture de type vocalique, pour lesquelles on réservera le terme de spirantes, et des consonnes d'articulation ferme, nettement caractérisées par le frottement de l'air, qui sont proprement des fricatives (type du *th* d'angl. *father*). [boldface by Martinet]

And notably so far as we are concerned at this juncture, Martinet (1962: 77) writes:

… weakly articulated spirants like English /r/…

There is a brief reference to the term 'spirant' in Martinet (1960: II-24) with different appropriate examples:

On a intérêt à parler de **spirantes** lorsque, dans le cas d'un resserrement du chenal, on perçoit plutôt des résonances qu'un frottement : au *z* d'esp. *caza* correspond une fricative, au *d* de *cada* une spirante [Martinet's boldface].

I find Martinet citing '*d* de *cada*' particularly apposite, as '*d* de *cada*' is often pronounced in allegro speech with an appreciably loose articulation, that is, the apico-dental closure for [d] is significantly relaxed so that even the process [kaḏa] > [kaa] could occur in relaxed speech. (The diacritic ' ˌ' signifies 'opener'.) However, [d] as in *cada* is frequently and inappropriately indicated with the phonetic symbol 'ð' in many manuals of Spanish phonetics. [ð] is a fricative as in *father, another*, etc.[79] If it is insisted that the phonetic symbol 'ð' should nevertheless be employed, one would prefer to choose the symbol 'ð̞' so that close

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[79]   It is enough to refer in this connection to just one representative of many manuals, viz. Macpherson (1975: 4 & 6). We are told as follows: '/θ/ as in *cera* θéra', 'β as in *ave* áβe', 'ð as in *náda* náða', 'ɣ as in *lago* láɣo'.

approximation necessary for [ð] is shown to be replaced by open approximation [ð̞]. Incidentally, the voiceless consonant corresponding to *z* in *caza* is, as Martinet rightly says, a fricative, whether *z* is pronounced [θ] or [s].

14.3.   Navarro Tomás (1985²²: 19 *et passim*) employs the phonetic symbols 'ƀ', 'đ' and 'ǥ' but treats them as fricatives which includes genuine fricatives like [s], [f], etc. He lists [ƀ], [f], [θ], [z̞], [đ], [l̩], [l̩], [s̞], [z̞], [s], [z], [ɹ], [l], [l̩], [y], [x] and [ǥ] as fricatives. Alarcos Llorach (1965⁴: 161 *et passim*) too employs the phonetic symbols 'ƀ', 'đ' and 'ǥ' when writing about Spanish consonant phonemes but he calls them 'fricatives' not 'spirants'. The list of what Alarcos Llorach (1965⁴ : *op cit, loc cit*) calls the fricatives in Spanish comprises [ƀ], [f], [θ], [z̞], [đ], [s̞], [z̞], [s], [z], [ɹ], [y], [x], [ǥ] and [w]. It is indeed an admixture of fricatives and spirants. Thus, in indicating the apico-dental spirant as '*d* de *cada*' mentioned by Martinet, Alarcos Llorach employs the phonetic symbol 'đ' even though he refers to it as a 'fricative'. Incidentally, the phonetic symbols 'ƀ', 'đ' and 'ǥ' are not recognized by the IPA, hence the temptation of many phoneticians who most probably do not differentiate between fricatives and spirants to make do with the phonetic symbols [β], [ð] and [ɣ], but without adding diacritics. Martinez-Celdrán (2004: 201 *et passim*) employs the symbols 'β̞', 'ð̞', 'j̞' 'ɣ̞', and classifies [β̞ ʋ ð̞, j̞ ɣ̞] as spirants (*op cit*: 204, 208 *et passim*) but writes (*op cit*: 205) that 'Even though the label 'spirant' used to be considered as a synonym of fricative, nowadays this term is out of use and is, thus, available for this sound sub-class 'non-rhotic central approximants'. He actually cites part of Martinet (1956: 2-21) which I myself cited above in **14.2**. Incidentally, I personally do not operate with the notion and term of 'approximant' (which is sanctioned by IPA and is widely used in our days) which I find ill-defined. See Akamatsu (1992c: **9.4-9.8** = 28-32).

Martinez-Celdrán's (2004: § 5) proposed redefinition of 'approximants' is criticized by Veiga (2006: 60 fn 15).

The symbol 'đ' is as suitable as 'd̞' I used above. Likewise, 'ƀ' (as in *haber*) and 'ǥ' (as in *agua*) are as suitable as 'b̞' and 'g̞'. Phonetic symbols like 'b̞', 'd̞' and 'g̞', or 'ƀ', 'đ' and 'ǥ', deserve to be recommended as not misleading like 'β', 'ð' and 'ɣ' which may largely represent fricatives, not spirants.

14.4.   Jones (1964⁹: § 796) refers to [ɹ] used by many English speakers as a 'frictionless continuant instead of as a fricative'. [ɹ] is in addition 'post-alveolar'. Jones (*loc cit*) significantly describes this frictionless continuant as being 'equivalent to a weakly pronounced 'retroflexed' ɚ, from which description we can surmise the absence of friction and which definitely points to [ɹ] as a spirant and not a fricative at all. O'Connor (1973: 149) describes the initial consonant segment in *red* in RP as 'a post-alveolar frictionless continuant [ɹ]'.

I end this section by mentioning that Martinet (1981a) and Martinet (1981b) concentrate on the topic of the difference between fricatives and spirants.

15. ALL 24 CONSONANT PHONEMES OF ENGLISH (RP) ESTABLISHED

15.1. The diagram in Fig 16 (in **11.16**) can now be modified as follows in Fig 18 below by adding the 5 non-correlated phonemes /l r h j w/ which we have defined above in terms of relevant features (see Table 6 in **13.2**). Fig 18 is the *definitive* version of all 24 English consonant phonemes that I have established through performing the commutation test. This diagram should be viewed in conjunction with Table 7 to be presented below of the 24 English consonant phonemes with the respective phonological contents in terms of relevant features. The diagram shown in Fig 18 is the same as that previously shown in Akamatsu (2017a: 21) where /s/ and /z/ were, however, not yet properly placed. In this sense, the diagram in Fig 18 is a definite improvement.

			"labial"	"apical"	"hiss"	"hush"	"dorsal"
	"voiceless"		/p/	/t/			
"non-nasal"		"plosive"					
	"voiced"		/b/	/d/			
"nasal"			/m/	/n/			/ŋ/
	"voiceless"		/f/	/θ/			
		"fricative"					
	"voiced"		/v/	/ð/			
	"voiceless"						/k/
"non-nasal"	"voiced"						/g/
	"voiceless"				/s/		
	"voiced"				/z/		
	"voiceless"					/č/	
		"plosive"					
	"voiced"					/ǰ/	
	"voiceless"					/ʃ/	
		"fricative"					
	"voiced"					/ʒ/	

/l/ /r/ /h/ /j/ /w/

Fig 18

The diagram of the English consonant phonemes seen in Fig 18 may look less neat and more complex compared with diagrams customarily presented by other writers. However, the advantage of the diagram in Fig 18 is that there is a perfect match between the definitions of all the English consonant phonemes in terms of relevant features on the one hand and their diagrammatic representation on the other. The diagram in Fig 18 represents the logical conclusion of defining the English consonant phonemes by strictly adhering to the functionalist

concepts of opposition. In this sense, the diagram in Fig 18 can be said to be different from those in System A (Fig 7), System B (Fig 8) or System C (Fig 9) we saw earlier in **10.14**.

15.2.   The definitions of all 24 consonant phonemes established are shown below in Table 6. These definitions are exactly what I presented in Akamatsu (2017a: 20-21) except that I now employ "labial-dorsal" instead of "dorso-labial".

/p/	"voiceless"	"labial"	"non-nasal"	"plosive"
/b/	"voiced"	"labial"	"non-nasal"	"plosive"
/m/		"labial"	"nasal"	
/f/	"voiceless"	"labial"		"fricative"
/v/	"voiced"	"labial"		"fricative"
/t/	"voiceless"	"apical"	"non-nasal"	"plosive"
/d/	"voiced"	"apical"	"non-nasal"	"plosive"
/n/		"apical"	"nasal"	
/θ/	"voiceless"	"apical"		"fricative"
/ð/	"voiced"	"apical"		"fricative"
/s/	"voiceless"	"hiss"		
/z/	"voiced"	"hiss"		
/č/	"voiceless"	"hush"		"plosive"
/ǰ/	"voiced"	"hush"		"plosive"
/ʃ/	"voiceless"	"hush"		"fricative"
/ʒ/	"voiced"	"hush"		"fricative"
/k/	"voiceless"	"dorsal"	"non-nasal"	
/g/	"voiced"	"dorsal'"	"non-nasal"	
/ŋ/		"dorsal"	"nasal"	
/j/		"palatal"		
/w/		"labial-dorsal"		
/l/		"lateral"		
/r/		"spirant"		
/h/		"glottal"		

Table 7

15.3.   In the foregoing part of the present paper, i.e. in Part I, I have elicited, identified and established through performing the commutation test all 24 consonant phonemes of English by defining them in terms of relevant features. It will be remembered that by phonematic units are meant both phonemes and archiphonemes. Martinet (1949: 7) says that '… the phoneme list should include archiphonemes'. I would go so far as to say that the list of the phonematic units consists of both phonemes and archiphoneme, just as I would say that the minimum distinctive units of the second articulation are phonemes and archiphonemes. In order to establish the total of the consonantal phonematic units of English, it is necessary to establish all consonant archiphonemes of English as well. The final list of the consonantal phonematic units (to be given in **22** in Table 10 and Table 11) should therefore consist of all the consonant phonemes and all the consonant archiphonemes.

PART II

16. NEUTRALIZATION, ARCHIPHONEME, SYSTEMATIC NON-OCCURRENCE OF A PHONEME

16.1. At this stage of the commutation test where, having established the 24 consonant phonemes of English, we are about to investigate instances of neutralization and the archiphonemes associated therewith.

16.2. The particular order in which 'neutralization', 'archiphoneme' and 'systematic non-occurrence of a phoneme' are placed above in the title of section **16** is deliberate on my part and is to be taken seriously. In analyzing the phonic material on which the commutation test is conducted in what follows, neutralization will be the first to be confirmed, and as a consequence the identification of the archiphoneme will be made, while systematic non-occurrence of a phoneme(s) will be confirmed last. Some may perhaps wonder why, having established above the 24 consonant phonemes of English, I do not proceed straightaway to establish the consonant archiphonemes of English which the commutation test can also establish. Why the intervention of 'neutralization' preceding the identification of the archiphonemes? The answer will be given below.

16.3. I have given in the past a few somewhat differently couched definitions of neutralization (Akamatsu 1988: 111[80], 1992a: 81[81]). Here is yet another new one on this occasion.

> Neutralization is a phonological phenomenon wherein an exclusive opposition that is valid in some contexts loses its validity in some other contexts consequent upon the cancellation of the opposition between those relevant features that serves the validity of the exclusive opposition.

The first-mentioned 'contexts' are known as 'contexts of relevance' and the second-mentioned as 'contexts of neutralization'.

16.4. In the above definition of neutralization, by an exclusive opposition is meant a phonological opposition whose two or more member phonemes exclusively share those relevant

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[80]   'By neutralization is to be meant the inoperability of a phonological opposition between two or more phonemes in some context or contexts (context(s) of neutralization) which is operative elsewhere (context(s) of relevance) in a given phonological system. A neutralizable opposition is necessarily an exclusive opposition. Neutralization is effected with the cancellation of the opposition between the relevant features which serves to distinguish from each other the member phonemes of the neutralizable opposition in the context(s) of relevance.'

[81]   'Neutralization is the non-validity of a neutralizable opposition in the context of neutralization consequent on the cancellation of the opposition between a set of those relevant features which serves to maintain the validity of the neutralizable opposition in the context of relevance.'

features which are common to them and which are not found in any other phoneme in the phonological system of a given language.

The concept and term of 'exclusive opposition' are mine (Akamatsu 1988: 2.9, 1992a: 5.1, 2000: 5.4, 2013a: esp. 2.3.7. = 150-152), 2015)[82] which are inspired from Martinet's concept and term of '[phonemes which stand in an] exclusive relation' (Martinet 1949: 7) / '… (sont dits) dans un rapport exclusif' (Martinet 1956: 3-17 & 3-18). 'Exclusive opposition' is concisely defined in Akamatsu (1988: 2.9) as 'a phonological opposition whose two or more terms are in an exclusive relation'.

Of the few writings of mine cited above on 'exclusive opposition', Akamatsu (2015) is entirely devoted to the subject 'exclusive opposition and non-exclusive opposition'.

Neutralizable oppositions are necessarily exclusive oppositions, though exclusive oppositions are not necessarily neutralizable oppositions. Non-exclusive oppositions are necessarily non-neutralizable oppositions, and vice versa.

16.5.   It will be seen that in connection with 'neutralization', 'neutralizable opposition', 'exclusive opposition' and 'non-exclusive opposition', I do not operate with any of 'bilateral opposition', 'multilateral opposition', 'privative opposition', 'gradual opposition' and 'equipollent opposition' which are well known in the writings of Trubetzkoy (1936a: 7-8 & 14-17, 1936b: 31, 1939: 66). I have serious reservations about these types of 'opposition' as types of *phonological* opposition. See in this connection Akamatsu (1977, 1988: 2.4-2.7).

16.6.   It is often erroneously stated by some that neutralization results from the 'neutralization' of the opposition between those relevant features that serve to distinguish from each other the (two or more) member phonemes of the neutralizable opposition in the context of relevance. In my view, the opposition between the relevant features of the phonemes of a neutralizable opposition is 'cancelled' (not 'neutralized') and, as a consequence, the opposition of the phonemes itself is neutralized.

16.7.   In explaining the concept of neutralization, it is widely customary to cite the case of [raːt] *Rat* ~ [raːt] *Rad* in German accompanied by a reference to [raːtəs] *Rates* ~ *Rades* [raːdəs]. This sort of illustration tends to lead many astray into the so-called 'morpho(pho)nology', resulting in poor comprehension of neutralization. Besides, such illustration starts with the wrong end, i.e. the occurrence of neutralization and ends with the neutralizable opposition in the context of relevance. If an illustration of neutralization is to be taken from German, I would prefer to first cite e.g. [taŋk] *Tank* vs [daŋk] *Dank* (which shows the opposition /t/ vs /d/ in the context of relevance) and then cite e.g. [ʊnt] *und* (which shows neutralization of /t/

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[82]   I introduced the term 'exclusive opposition' in Akamatsu (1988: 2.9 *et passim*). To the best of my knowledge, Martinet never employed this term. Maiden (1990: 566) makes a factual error by attributing it to Martinet.

vs /d/ in the context of neutralization). It seems to me that the widespread illustration which was first shown above is 'putting the cart before the horse'. Besides, I believe neutralization which is a phonological phenomenon can be clearly explained without examples involving grammatical procedure, e.g. the addition of *-es*, *-er* in German.

16.8.   Another illustration of neutralization is frequently made with reference to the opposition /r/ vs /ɾ/ in Spanish, in e.g. *carro* vs *caro*, *forro* vs *foro*, *perra* vs *pera* (in which /r/ vs /ɾ/ is valid) and e.g. *rabo* and *bar*, *rima* and *mujer*, *río* and *deber* (where /r/ vs /ɾ/ is neutralized). I am as much in favour of this illustration as in disfavour of the illustration with *Rad* vs *Rat* and *Rades* vs *Rates* in German. In Spanish, [r] and [ɾ] occur in the following fashion.

	Word-initially	Word-medially	Word-finally
[r]	☺	☺	——
[ɾ]	——	☺	☺

Fig 19

The symbol ' ☺ ' signfies the occurrence of [r] (*carro*) and [ɾ] (*caro*), as the case may be, and the long dash '——' the non-occurrence of either [r] or [ɾ], as the case may be.

We see that, word-medially, [r] and [ɾ] are in differential relation to each other[83] so that [r] and [ɾ] are, respectively, realizations of two consonantal phonematic units, i.e. /r/ and /ɾ/, which are two consonant phonemes in opposition to each other, viz. the opposition /r/ vs /ɾ/. It is by virtue of this opposition that *carro* and *caro* are distinguished from each other. The phonological contents of /r/ and /ɾ/ may be said to be "multiple tap" and "single tap", respectively. Turning our attention to word-initial [r] and word-final [ɾ], we see that [r] and [ɾ] are in complementary distribution, so that they are realizations of a single consonantal phonematic unit (note that I am not saying a phoneme here) whose combinatory variants [r] and [ɾ] occur in different contexts, viz. word-initially and word-finally, and which share the phonetic feature 'tap'. This means that the single consonantal phonematic unit in question possesses the relevant feature "tap" and is the archiphoneme /r-ɾ/ in which the opposition /r/ ("multiple tap") vs /ɾ/ ("single tap") is neutralized with the cancellation of the opposition between "multiple" and "single". The opposition /r/ vs /ɾ/ is an exclusive opposition as the common base of /r/ ("multiple tap") and /ɾ/ ("single tap") is "tap" which is exclusive to /r/ and /ɾ/. The archiphoneme /r-ɾ/ definable as "tap" is realized by [r] word-initially and by [ɾ] word-finally.[84]

Many of the writers who do point out the neutralization of /r/ vs /ɾ/ and postulate the archiphoneme /r-ɾ/ seem to stop short of *actually defining* its phonological content. I have

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[83]   This is what is customarily known as 'contrastive distribution' (along with 'non-contrastive'), which term I, however, hesitate to use, mainly because of the term 'contrastive' which is associated with the term 'contrast' which many employ instead of 'opposition'. My hesitation does not extend to 'complementary distribution' and 'partial complementary distribution'.

[84]   /r/ and /ɾ/ in Spanish are defined differently by various writers. The definition of /r/ as "multiple tap" and /ɾ/ as "single tap" is mine and may be or may not be shared by some other writers.

ventured above to define this archiphoneme as "tap", preceding which I defined /r/ and /ɾ/ as "multiple tap" and "single tap". Thus, "multiple" and "single" will be regarded as two different relevant features.[85]

   The distributional picture of the occurrence of [r] and [ɾ] in word-medial position and that of either [r] in word-initial position or [ɾ] in word-final position is describable in terms of 'partial complementation'. It is partial complementation that is said to reveal the fact of neutralization. Martinet (1960: III-19) mentions 'Neutralisation et complémentarité partielle' exemplified by the case of [r] and [ɾ] in Spanish.

16.9. In my view, there is no temporal sequence between the validity of a neutralizable opposition in contexts of relevance and the loss of the validity through neutralization in contexts of neutralization, in either direction. The fact of non-neutralization and the fact of neutralization, as it were, 'coexist' atemporally, non-sequentially, in the functioning of a given language at any moment. The analyst may have the choice of *describing* the phenomenon of neutralization and that of non-neutralization in either direction, viz. either from non-neutralization to neutralization or from neutralization to non-neutralization, but a direction is actually irrelevant. All the same, if I insist on the former direction (non-neutralization → neutralization), it is only because this is the theoretically logical way, in the *description* of neutralization.

16.10. In my view, neutralization and the archiphoneme are ineluctably linked to each other and, what is more, the archiphoneme is only conceivable with the actual occurrence of neutralization. The archiphoneme is perforce the product of neutralization and is inconceivable as a pure abstraction separate from neutralization. In this regard I depart from Martinet's view of the archiphoneme as 'a pure abstraction' (Martinet 1945: 2.9, 1956: 3.19[86], 1949: 7[87]) which would suggest that the archiphoneme may not necessarily be a phonematic entity, also

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[85] Martinet (1960: III-19.) also refers to the opposition /r/ vs /ɾ/ and its neutralization in Spanish. He characterizes [r] as 'vibrante forte' and [ɾ] as 'vibrante faible'. Alternatively he characterizes [r] as 'vibration' and [ɾ] as 'battement'. He subsequently refers to [r] as 'variante forte' and [ɾ] as 'variante faible', that is to say, [r] and [ɾ] being combinatory variants of the archiphoneme /r-ɾ/ which he characterizes as 'vibrations apicales'. Then he goes on to characterize what he notates by /r:/ (my /r/) as "vibrante forte" and what he notates by /r/ (my /ɾ/) as "vibrante faible". If we follow all this, the archiphoneme /r:-r/ will be "vibrante" which is the product of the neutralization of the opposition /r:/ vs /r/ as a result of the cancellation of the opposition "forte" vs "faible". I suppose that one may yet alternatively talk about "long" (instead of "forte") and "short" (instead of "faible"), or "trill" and "flap". I believe that all these different nomenclatures whereby to designate the relevant features in question are acceptable. Martinet (1965: 139-140) returns to provide an interesting discussion on the question of how to define /r/ and /r̄/ in Spanish as "r" and "r̄". There seems to be an unfortunate misprint in Martinet (1965: 140) in line 11 from bottom where '… noté /r/…' occurs, which should be 'noté /ɾ/…' as previously correctly printed original in Martinet (1957: 84).
[86] His words are: 'L'archiphonème peut être … une pure abstraction qui jamais ne se réalise …'
[87] His words are as follows: 'In French *p* and *b* … can be considered as forming an archiphoneme. But this archiphoneme is, in that language, never realized as such, it is probably just as well not to mention it.' Incidentally, I know for a fact that /p/ vs /b/ in Martinet's French pronunciation is non-neutralizable.

from his idea that 'Là où l'archiphonème se réalise, on dit qu'il y a neutralisation' (Martinet 1960: III-18).

Martinet writes that 'L'ensemble de traits pertinents communs à des phonèmes qui sont dans un rapport exclusif est appelé **archiphonème** [Martinet's emphasis]' (Martinet 1956: 42) and that '… l'archiphoneme … est l'ensemble des traits pertinents, communs à deux ou plus de deux phonèmes qui sont seuls à les presenter tous.' (Martinet 1960: III-18). I am in complete agreement with Martinet's concept of and definition of 'archiphoneme'. I suspect, however, that Martinet's wording which does not concomitantly mention 'neutralization' still suggests the idea of the archiphoneme as a pure abstraction as well.

My definition of 'archiphoneme' presented in Akamatsu (1988: 199) runs in part as follows.

The archiphoneme is a distinctive unit whose phonological content is identical with the relevant features common to the member phonemes of a neutralizable opposition, and which is distinct from any of these member phonemes and which occurs in the position of neutralization.

In this definition of the archiphoneme, I have added a precautionary passage to make sure that the member phonemes are precluded from occurring in the position of neutralization.[88]

17. NEUTRALIZATION AND SYSTEMATIC NON-OCCURRENCE OF A PHONEME

17.1. Having discussed a few theoretical points about 'neutralization' and 'archiphoneme', we can start analyzing some cases which we will determine as either neutralization (in which case we identify the archiphoneme therewith) or as systematic non-occurrence of a phoneme.

We will look at the neutralization of /p/ vs /b/, /t/ vs /d/, /č/ vs /ǰ/, /k/ vs /g/, /f/ vs /v/, /θ/ vs /ð/ and /s/ vs /z/, in this order.

17.2. The archiphoneme /p-b/ ("labial non-nasal plosive")

The opposition /p/ ("voiceless labial non-nasal plosive") vs /b/ ("voiced labial non-nasal plosive") is an exclusive opposition as the common base of /p/ and /b/, viz. "labial non-nasal plosive", is exclusive to /p/ and /b/. This opposition is neutralized word-medially and word-finally after /s/ as well as after word-initial /s/. The archiphoneme /p-b/ associated with the neutralization of /p/ vs /b/ is definable as "labial non-nasal plosive" and is realized by [p].

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[88]   This precautionary passage is necessary in view of frequent presentations of neutralization – even by some functionalists or by those sympathetic to functional phonology – such that one of the phonemes, perhaps the so-called 'unmarked phoneme' of a neutralizable opposition, but not the archiphoneme, occurs in the position of neutralization. See in this connection Vachek (1966: 61-62) and Buyssens (1967: 157-159), etc. See also Akamatsu (1992b).

The opposition /p/ vs /b/ is **valid** word-initially, word-medially and word-finally. Here are some examples.

Word-**initially**, *pack* /**p**æk/ vs *back* /**b**æk/
Word-**medially**, *Cupit(t)* /kju**p**ɪt/ vs *Cubit(t)* /kju**b**ɪt/
Word-**finally**, *tap* /tæ**p**/ vs *tab* /tæ**b**/

The opposition /p/ vs /b/ is **neutralized**

Word-**initially,** after /s/, *spit* /s **p-b** ɪt/ [p]
Word-**medially**, after /s/, *vesper* /ves **p-b** ə/ [p]

Word-**finally**, after /s/ *gasp* /g ɑ s p-b/ [p]

The word *asbestos* [æsbestəs, æzb-] caused notorious analytical problems to Bloomfieldians because of the variant forms [-sb-] and [-zb-]. Its derivative word *asbestosis* [æsbestəʊsɪs, æzb-])] can be also mentioned in this connection. The form [-sb-] suggests that there is no neutralization of /p/ vs /b/ after word-medial /s/ (witness e.g. *aspect* [æspekt]), hence /p/ vs /b/ is valid word-medially after /s/. On the other hand, the non-occurrence of [p] after word-medial [s] would suggest the neutralization of /p/ vs /b/ after word-medial /z/. As for [-zb-] in [æzbestəs], this suggests that /p/ vs /b/ *is* neutralized after word-medial /z/, hence /æs p-b …/.

17.3. The archiphoneme /t-d/ ("apical non-nasal plosive")

The opposition /t/ ("voiceless apical non-nasal plosive") vs /d/ ("voiced apical non-nasal plosive") is an exclusive opposition as their common base "apical non-nasal plosive" is exclusive to /t/ and /d/. The opposition /t/ vs /d/ is **valid** word-initially, word-medially, word-finally, etc. Here are some examples.

Word-**initially**, *tuck* /**t**ʌk/ vs *duck* /**d**ʌk/
Word-**medially**, *utter* /ʌ**t**ə/ vs *udder* /ʌ**d**ə/
Word-**finally**, *cat* /kæ**t**/ vs *cad* /kæ**d**/[89]

The opposition /t/ vs /d/ is **neutralized** word-medially after /p/, /b/, /f/, /s/, /ʃ/, /k/, /g/. The archiphoneme /t-d/ associated with the neutralization of /t/ vs /d/ is definable as "apical non-nasal plosive". The neutralization of /t/ vs /d/ occurs as described below.

(i) After word-**initial** /s/, *stab* /s **t-d** æb/ [t]

(ii) Word-**medially** *after* /p b f s ʃ k g/
    captor /kæp **t-d** ə/ [t]   *Justin* /ǰʌs **t-d** ɪn/ [t]
    abdomen /æb **t-d** əmən/ [d]   *Rushton* /rʌʃ **t-d** ən/ [t]
    after /ɑf **t-d** ə/ [t]   *actor* /æk **t-d** ə/ [t]
    castor /kɑs **t-d** ə/ [t]   *Sugden* /sʌg **t-d** (ə)n/ [d]

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[89]   I can additionally mention cases in which /t/ vs /d/ is valid word-finally as in e.g. *melt* vs *meld,* or *bent* vs *bend,* where /t/ vs /d/ is valid following /l/ or /m-n-ŋ/ (not /n/), respectively. Thus, *melt* /melt/ vs *meld* /meld/, *bent* /be m-n-ŋ t/ vs *bend* /be m-n-ŋ d/.

(iii) Word-**finally** /t/ vs /d/ is neutralized *after* /p b f v θ ð č ǰ s z ʃ ʒ k g/

apt /æp **t-d**/ [t]	*mist* /mɪs **t-d**/ [t]
snubbed /snʌb **t-d**/ [d]	*teased* /tiz **t-d**/ [d]
soft /sɒf **t-d**/ [t]	*hushed* /hʌʃ **t-d**/ [t]
heaved /hiv t-d/ [d]	*rouged* /ruʒ **t-d**/ [d]
earthed /ɜθ **t-d**/ [t]	*kicked* /kɪk **t-d**/ [t]
soothed /suð **t-d**/ [d]	*hugged* /hʌg **t-d**/ [d]
fetched /feč **t-d**/ [t]	*tempt* /te m-n-ŋ p **t-d**/ [t] ([tempt])
judged /ǰʌǰ **t-d**/ [d]	

It is obvious that realizations of the archiphoneme /t-d/ are [t] or [d] after those consonant phonemes which have the relevant feature "voiceless" or "voiced", as the case may be, in their phonological contents.

A few remarks are necessary as follows.

1) Word-finally following /ŋ/, there occurs only /d/ (e.g. *hanged* [hæŋd] /hæŋd/). The cluster [ŋt] does not occur word-finally.[90] This means that /t/ is systematically absent word-finallty after /ŋ/. This is not a case of neutralization of /t/ vs /d/.

2) Prepausally, e.g. *tempt, contempt, exempt* and *unkempt*, are pronounced [mpt] or [emt] ([p] is omissible; pronouncing dictionaries indicate [em*p*t]). When pronounced [mpt], this is phonologically /m-n-ŋ p **t-d**/ in which /t/ vs /d/ is neutralized after /p/. This case is the same as *apt* /æp **t-d**/ [t] cited above. However, When pronounced [mt], this is phonologically /mt/, in which /t/ vs /d/ is valid following /m/; witness /mt/ vs /md/ (e.g. *fremd*[91], *hemmed*).

3) Words ending with *-med*, e.g. *armed, formed*, *named*, generally pronounced [md], phonologically /md/.

4) An exception is the verb *dream* which has two forms in past and past participle; (i) *dreamed* pronounced [dri:md], phonologically /drimd/, and (ii) *dreamt* pronounced [dremᵖt] in which [ᵖ] is an epenthetic plosive ascribable to /m/ but not an omissible plosive, as it is part of the realization of /m/[92]. [dremᵖt] is phonologically /dremt/.

After /j/ and /w/, /t/ vs /d/ does not occur. These are cases of systematic non-occurrence.

17.4. The archiphoneme /č-ǰ/ ("hush plosive")

The opposition /č/ ("voiceless hush plosive") vs /ǰ/ ("voiced hush plosive") is an exclusive opposition as their common base "hush plosive" is exclusive to /č/ and /ǰ/.

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[90]   Trnka (1966: 118) indicates that [ŋt] is non-occurrent word-finally. He does not show [ŋd] word-finally, either.

[91]   Rare, chiefly dialectal (Scottish).

[92]   See Akamatsu (2011: esp 101-103).

/č/ vs /ǰ/ is **valid** in the following contexts.

Word-**initially**, *chin* /čɪn/ vs *gin* /ǰɪn/
Word-**medially**, *lecher* /lečə/ vs *ledger* /leǰə/
Word-**finally**, *rich* /rɪč/ vs *ridge* /rɪǰ/

The opposition /č/ vs /ǰ/ is **neutralized** after /s/ in word-**medial** position[93] only in a group of words whose pronunciation contains [-stʃ-] word-medially. Such words are *question*, *questionable*, *unquestionable*, *questioner*, *questionnaire*, etc. and also all such other English words like *combustion, congestion, digestion, exhaustion, indigestion, moxibustion, suggestion* and *ustion*. The word *bastion*[94] is not listed with the others.

The archiphoneme /č-ǰ/ which is associated with the neutralization of /č/ vs /ǰ/ is definable as "hush plosive" and is realized by [tʃ].

Some might wonder if the words *kirsch*, *pasch* and *romansch*, because of the spelling -*sch*, may be relevant to the neutralization of /č/ vs /ǰ/. This is actually not so, as *sch* of *kirsch* and *romansch* corresponds to [ʃ] and s*ch* of *pasch* corresponds to [sk]. Word-final [-sk] relates to the neutralization of /k/ vs /g/ after /s/.

That /č/ vs /ǰ/ is a neutralizable opposition is hardly, if ever, mentioned in the phonological literature. I myself failed to touch on this neutralization in my writings in the past,[95] and this is the first occasion on which I am mentioning it.

Actually, nearly 70 years ago, Hubbell (1950[96] [1972]: 20-21) had the following to say.

… the palato-alveolar affricates (*question* and the like) … Under these conditions [i.e. after /s/] the oppositions /p/ - /b/, /t/ - /d/, /k - /g/, /f/ - /v/, and /tʃ/ - /dʒ/ do not occur. … Whenever an opposition is suspended in a particular position [which Hubbell refers to as 'position of suspension', *op. cit*: 21], the question how one is to classify the phones arises. To label them archiphonemes or to establish a separate phonemic category in each instance of the sort is undoubtedly the procedure least open to attack.

Hubbell elects to operate outright with 'archiphoneme' and 'suspension' against the then prevailing Bloomfieldians' non-functionalist solution which was, in particular, against the notion of the archiphoneme[97]. Hubbell's fundamentally functionalist view of neutralizations of various phonological oppositions amidst the atmosphere of Bloomfieldianism is singularly welcome to functionalists, past and present, deserves special attention. In my opinion,

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[93]   Notice that *disˈcharge* (v) and *disˈjoint* are not included because [tʃ] and [dʒ] are in accented syllables.
[94]   The pronunciation [bæstiən], not even [bæstjən], seems normal in BrE while in AmE [bæstʃ(ə)n] prevails. Such an example reminds us of e.g. *overture* which is generally pronounced [-tjʊə -tʃʊə -tʃə] in BrE but [-tʃɚ, -tʃʊə] in AmE, though phonetic context is different in that [s] does not precede in these words.
[95]   Even in Akamatsu (1997).
[96]   1950 was the year when Hubbell's doctoral dissertation entitled the same as in Hubbell (1972) was published in New York by King's Crown Press.
[97]   With the possible exception of W. F. Twaddell. See Twaddell (1935). My reassessment of Twaddell's stance on neutralization and archiphoneme as latent in his theory of the micro-phoneme and the macro-phoneme can be found in Akamatsu (1984).

Hubbell adumbrated three score and ten years ago the neutralization of /tʃ/ - /dʒ/ we are concerned with here.

17.5. The archiphoneme /k-g/ ("dorsal non-nasal")

The opposition /k/ vs /g/ is an exclusive opposition as the common base of /k/ ("voiceless dorsal non-nasal") and /g/ ("voiced dorsal non-nasal"), i.e. "dorsal non-nasal", is exclusive to /k/ and /g/. The opposition /k/ vs /g/ is **valid** word-initially, word-medially, and word-finally.

>Word-**initially**, *cat* /**k**æt/ vs g*at* /**g**æt/
>Word-**medially**, *hackle* /hæ**k**l/ vs *haggle* /hæ**g**l/
>Word-**finally**, *back* /bæ**k**/ vs *bag* /bæ**g**/

The opposition /k/ vs /g/ is **neutralized** after word-initial /s/, word-medially after /s/, /t/, /d/, and word-finally after /s/. The archiphoneme associated with the neutralization of /k/ vs /g/ is definable as "dorsal non-nasal" and is realized by [k] or [g], as the case may be.

>After word-**initial** /s/, *skin* /s **k-g** ɪn/ [k]

>Word-**medially** *after* /s/, *husky* /hʌs **k-g** ɪ/ [k]
>   *after* /t/, *Atkins* /æt **k-g** ɪnz/ [k]

>Word-**finally**, *after* /s/, *mask* /mɑs **k-g**/ [k]

17.6.   The archiphoneme /f-v/ ("labial fricative")

The opposition /f/ ("voiceless labial fricative") vs /v/ ("voiced labial fricative") is an exclusive opposition as their common base "labial fricative" is exclusive to /f/ and /v/.

The opposition /f/ vs /v/ is **valid** word-initially, word-medially and word-finally.

>Word-**initially**, *fat* /**f**æt/ vs *vat* /**v**æt/
>Word-**medially**, *liefer* /li**f**ə/ vs *leaver* /li**v**ə/
>Word-**finally**, *leaf* /li**f**/ vs. *leave* /li**v**/

The opposition /f/ vs /v/ is **neutralized** in the following contexts. The archiphoneme associated with this neutralization is "labial fricative" and is realized by [f].

>*After* word-**initial** /s/, *sphere* /s **f-v** ɪə/ [f]

>Word-**medially** after /s/, *asphodel* /æs **f-v** ədel/ [f]

The word *sforzando*, an Italian loanword, can be cited along with *sphere*. Other words which can also be cited are *sferics*, *sfumato*, *sphagnum*, *sphalerite*, *sphene*, *spherical*, *spheroid*, *sphincter*, *sphinx*, *sphragistic*, *sphygmomanometer*, etc.

The words *svelt* and *svengali* are pronounced with [sv-] or [sf-], so that /f/ vs /v/ is valid after word-initial /s/; in this case there is no neutralization of /f/ vs /v/. The words *Svalbard* and *Svarabhakti* are pronounced with [sv-] only, while *Sverdlovsk* is pronounced with [sf-] only, so that this seems to suggest that there is neutralization of /f/ vs /v/ in both *Svalbard*

and *Sverdlovsk* and the archiphoneme /f-v/ is differently realized, by [v] in *Svalbard* but [f] in *Svarabhakti*. The Norwegian loanword *Svalbard* is pronounced with [sv-] in Norwegian (which is kept in English with [sv-]), while *Sverdlovsk* which is a Russian loanword pronounced [sv-] in Russian is pronounced with [f] in English. The word *svarabhakti* (from Sanskrit) pronounced with [sʋ-] in Hindi ([ʋ] is a voiced labiodental spirant) but is pronounced in English with [sf-] only is interesting in that the process [ʋ] → [f] seems to suggest that [sf-] rather than [sv-] is more compatible with the English habit.

17.7. The archiphoneme /θ-ð / ("apical fricative")

The opposition /θ/ vs /ð/ is an exclusive opposition as the common base of /θ/ ("voiceless apical fricative") and /ð/ ("voiced apical fricative") is exclusive to /θ/ vs /ð/.

The opposition /θ/ vs /ð/ is **valid** in the following contexts:

Word-**initially**, *thigh* /θaɪ/ vs *thy* /ðaɪ/
Word-**medially**, *ether* /iθə/ vs *either* /iðə/[98]
Word-**finally**, *sooth* /suθ/ vs *soothe* /suð/

The opposition /θ/ vs /ð/ is **neutralized** word-**finally** when preceded by /m n ŋ/. To the best of my knowledge, this neutralization has so far never been mentioned by other writers.

warmth /wɒm **θ-ð**/ [θ]
tenth /ten **θ-ð**/ [θ]
length /leŋ **θ-ð**/ [θ]

Word-**finally**, [mθ], [nθ] and [ŋθ] occur in *warmth*, *tenth* and *length*, respectively, as shown above, while [mð], [nð] or [ŋð] does not occur in this context. Thus, [mθ] in *warmth*, [nθ] in *tenth*, and [ŋθ] in *length* are phonologically interpreted as /m θ-ð/, /n θ-ð/, and /ŋ θ-ð/.

The archiphoneme /θ-ð/ associated with this neutralization is definable as "apical fricative" and is realized by [θ], never by [ð].

[mθ], [nθ] and [ŋθ] may occasionally and alternatively be realized by [mᵖθ], [nᵗθ] and [ŋᵏθ], respectively, where [ᵖ], [ᵗ] and [ᵏ] are epenthetic consonantal plosives. In my view, [ᵖ], [ᵗ] and [ᵏ] are *part* of realizations of /m/, /n/ and /ŋ/, respectively, not those of /p/, /t/ and /k/. This view of mine was explained in Akamatsu (2011: esp. 101-103).

/θ/ vs /ð/ is also **neutralized** in another context, that is, word-**medially** when preceded by /n ŋ/. Word-medially, [nθ] and [ŋθ] occur in e.g. *anthem* and *lengthen*, respectively, as shown below, while [nð] or [ŋð] does not occur in this context. [nθ] in *anthem* and [ŋθ] in *lengthen* are phonologically interpreted as /n θ-ð/ and /ŋ θ-ð/, respectively.

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[98]   [iːðə] *is* heard in BrE as well, if not frequently. *LPD*[3] (265) indicates: '*Preference polls, BrE:* 'aɪð- *87%,* 'iː-ð- *13 %; AmE:* 'iː-ð- *84%,* 'aɪð- *16%.*'

anthem /æn **θ-ð** əm/ [θ]
lengthen /leŋ **θ-ð** (ə)m/ [θ]

A few words are in order for me to explain the difference between the phonological notations /əm/ and /(ə)m/. The former corresponds phonetically to [əm] where [ə] is indispensable and [m] is non-syllabic, while the latter corresponds phonetically to [əm] or [m̩] which is syllabic, as the case may be. /(ə)m/ is a conflation of [əm] and [m̩]. A potential notational problem is that the phonological notation /(ə)m/ can be taken as corresponding to either phonologically /əm/ (a sequence of /ə/ and /m/ in this order) or phonologically /əm/, i.e. phonetically [m̩] (Akamatsu 2013b: 160ff).

I referred above, in last but one paragraph, to the context 'word-**medially** when preceded by /n ŋ/. In this context /m/ is systematically absent. I will explain this. It will have been noticed that [mθ] does not occur while, as we have seen, [nθ] and [ŋθ] do. There is thus a lacuna for [m] before [θ]. Is one to see neutralization of /n/ vs /m/ or, alternatively, neutralization of /ŋ/ vs /m/? This case is fundamentally, *mutatis mutandis*, similar to the case of the lacuna for [ŋ] as against the occurrence of [m] and [n] word-initially in English, that is, e.g. [met] /met/ (*met*) vs [net] /net/ (*net*) but *[ŋet]. In other words, in the case of the lacuna for [m] ([mθ]) against the occurrence of [n] ([nθ]) and [ŋ] ([ŋθ]), the conclusion is that /m/ is systematically absent word-medially preceding /θ-ð/, i.e. */m θ-ð/.

As shown above, /n θ-ð/ is realized by [nθ], and /ŋ θ-ð/ by [ŋθ], but may occasionally and alternatively be realized by [nᵗθ] and [ŋᵏθ], respectively, [ᵗ] and [ᵏ] being epenthetic consonantal plosives which are, in my view, *part* of the realizations of /n/ and /ŋ/, respectively, not realizations of /t/ and /k/, and /ŋ/, respectively. Again see Akamatsu (2011: esp. 101-103).

The opposition /θ/ vs /ð/ is **neutralized** word-**finally** in more contexts, when preceded by /p t d f s-z/. The archiphoneme /θ-ð/ is realized by [θ], as shown below.

depth /dep **θ-ð**/ [θ]   *fifth* /fɪf **θ-ð**/ [θ]
eighth /eɪt **θ-ð**/ [θ][99]   *sixth* /sɪk s-z **θ-ð**/ [θ]
width[100] /wɪd **θ-ð**/ [θ]

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[99] *LPD*3: 265 indicates that *eighth* is pronounced [eɪθ] in AmE (and *eighths* [eɪθs]), while *EPD*18 indicates only [eɪθ] without characterizing it as either BrE (by default) or AmE. *PDAE*: 143 indicates [etθ] but not [eθ]. Incidentaly, *PDAE*: xviii says that [e] (the phonetic symbol they employ) 'is very often (but by no means always) a diphthong … . On linguistic principles the one symbol **e** properly stands for all varieties of the sound (whether diphthong or not).' In this paper in which I am concerned fundamentally with RP, [eɪθ] (instead of [eɪtθ]) is irrelevant.
[100] *LPD*3: 901 shows [wɪtθ] (subvariant) as well as [wɪdθ], and similarly *widthways* ['wɪdθweɪz] and ['wɪtθweɪz] (subvariant). *EPD*18 does not enter *widthways*. If so, [wɪtθ] joins a case like [eɪtθ]. It is interesting to see that *EPD*18: 545 indicates [wɪtθ] and [wɪdθ] in this order, that is, in the reverse order from that in *LPD*3: 901. Incidentally, *LPD*3: 904 tells us that [wɪθ] with [θ] for the word *with* is BrE non-RP. The sharp difference of preference for [wɪð] or [wɪθ] between BrE and AmE is clearly indicated in the graph shown on the same page, i.e. 85% (BrE) for [wɪð] and 84% (AmE) for [wɪθ]. *PDAM* (1951³: 478) says that [as for the choice between [wɪð] or [wɪθ] which are listed in this order] 'there is no consistent general practice. **wɪθ** is clearly not substandard.'

Note that the archiphoneme /θ-ð/ is realized by [θ], whether /θ-ð/ is preceded by /p t f s-z/ ("voiceless …") or /d/ ("voiced …").

The opposition /θ/ vs /ð/ is **neutralized** also word-**medially** when preceded by /p f t d s-z/. The archiphoneme /θ-ð/ is again realized by [θ], as shown below.

depthwise /dep **θ-ð** waɪz/ [θ]   *widthways* /wɪd **θ-ð** weɪz/ [θ]
fifthly /fɪf **θ-ð** lɪ/[101] [θ]   *sixthly* /sɪk s-z **θ-ð** lɪ/ [θ]
eighthly /eɪt **θ-ð** lɪ/[102] [θ]

17.8. The archiphoneme /s-z/ ("hiss")

The opposition /s/ vs /z/ is an exclusive opposition as the common base of /s/ ("voiceless hiss") and /z/ ("voiced hiss"), i.e. "hiss", is exclusive to these two phonemes.

/s/ vs /z/ is **valid** word-initially, word-medially and word-finally.

Word-**initially**, *sip* /**s**ɪp/ vs *zip* /**z**ɪp/
Word-**medially**, *racer* /reɪs**ə**/ vs /reɪz**ə**/ *razor*
Word-**finally**, /pɑs/ *pass* vs /pɑz/ *parse*

The opposition /s/ vs /z/ is **neutralized** in the following contexts. The associated archiphoneme /s-z/ definable as "hiss" is realized by [s] or [z] as indicated below.

The opposition /s/ vs /z/ is **neutralized** word-**finally** after /p b f v t d θ ð k g m n ŋ/, and the archiphoneme /s-z/ is realized by [s] or [z] as the case may be, as indicated below.

lips /lɪp **s-z**/ [s]   *deaths* /deθ **s-z**/ [s]
cabs /kæb **s-z**/ [z]   *mouths* /maʊð **s-z**/ [z]
cuffs /kʌf **s-z**/ [z]   *box* /bɒk **s-z**/ [s]
doves /dʌv **s-z**/ [z]   *bogs* /bɒg **s-z**/ [z]
quartz[103] /kwɔt **s-z**/ [s]   *alms* /ɑm **s-z**/ [z]
pads /kæd **s-z**/ [z]   *cans* /kæn **s-z**/ [z]
                                        tongs /tɒŋ **s-z**/ [z][104]

Table 8

It would have been interesting to cite *quarts* /kwɔt **s-z**/ alongside with *quartz* /kwɔt **s-z**/. Both words have /s-z/ at the end.

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[101]   Some present-day writers on English phonetics are of the view that the opposition /i/ vs /ɪ/ is neutralized in final open unaccented syllable as in e.g. /ˈfɪf θ-ð l i-ɪ/, /ˈsɪk s-z θ-ð l i-ɪ/ and /ˈeɪt θ-ð l i-ɪ/. However, I believe that such neutralization is irrelevant to RP as described in e.g. Jones (1964⁹) with which I am concerned in this paper.

[102]   Neither *LPD*3 nor *EPD*18 nor *PDAE* (1951³) records this word. On the other hand, *RHDEL*: 624 does.

[103]   Further alternative examples can be [spɪts] *spitz* /s p-b ɪt **s-z**/ and [wɔːlts] *waltz* /wɔlt s-z/, though *waltz* is also pronounced [wɔːls, wɒls, wɒlts]. /wɔls, wɒls, wɔlt s-z/.

[104]   Note that the sequence [ŋs] does not occur word-finally in English.

Word-**medially** after /p b t d k g/, the opposition /s/ vs /z/ is **neutralized** and the archiphoneme /s-z/ is realized by [s] or [z], as the case may be, as indicated below.

sepsis /sep **s-z** ɪs/ [s] *Hudson* /hʌd **s-z** (ə)n/ [s]
abscess /æb **s-z** es/ [s] *axil* /æk **s-z** ɪl/ [s]
Batson /bæt **s-z** (ə)n/ [s] *exhibit* (v/n) /ɪg **s-z** ɪbɪt/[105] [z]

A few remarks are in order concerning the occurrence of [s] or [z] after [k g ŋ p].

1) Trnka (1966: 41) is of the view that no consonantal segment occurs after [ŋ] (though he does not specify the context(s)), which would mean that [ŋs] and [ŋz] are both impossible sequences of consonantal segments after [ŋ] in English. However, we have seen *tongs* /ŋ s-z/ [ŋz] in word-final position. Trnka is right about [ŋs] not occurring in that context, but [ŋs] does occur in word-medial context as in *songster* [sɒŋstə].

2) The element *-ster* is a suffix. It seems to me legitimate to consider *songster* as a whole to be a single word with no potential pause internally.

3) The opposition /s/ vs /z/ is **not neutralized** in words spelled *ps-* in initial position such as *psalm*, *psychology*, *psychic*, etc., since the optional [p] in initial position has ceased to occur regularly or semi-regularly for decades.[106]

18. NEUTRALIZATIONS OF OPPOSITIONS BETWEEN "NASAL" CONSONANT PHONEMES

By the expression ' "nasal" consonant phonemes' I conveniently refer to those consonant phonemes in English whose phonological contents include the relevant feature "nasal". They are /m/, /n/ and /ŋ/.

Up to this point, we have seen neutralizations of oppositions between consonant phonemes whose phonological contents do *not* include the relevant feature "nasal", viz. /p b t d č ǰ k g f v θ ð s z/. Of these /ʃ ʒ/ are alone in not being involved in neutralizations.

We are now ready to investigate instances of neutralization of oppositions between those consonant phonemes whose phonological contents include the relevant feature "nasal", viz. /m n ŋ/.

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[105] This word (v/n) is also pronounced [-ks-], phonologically /k **s-z**/, as in *axil* /æk **s-z** ɪl/ [s]. A similar case is *exit* [eksɪt, egzɪt].
[106] The progressive trend of pronouncing or not pronouncing word-initial [p] followed by [s] may be seen in consulting successive editions of *EPD*. The optional presence of [p] is noted side by side with its absence in early editions (1st to 12th, D. Jones), but in later editions (13th onward, multiple eds.) the optional presence of [p] is shown to be a secondary variant. The pronunciation of word-initial [p] followed by [s] disappeared in *EPD*15 onward, the latest edition up to now is *EPD*18. *LPD*3 provides, in the entry 'ps …' a note in this connection as follows: 'Note: words spelt with *ps* … are occasionally pronounced with initial ps, as written, rather than with the usual plain **s** sound. Thus *palm* is occasionally pronounced **psɑːm** …'

18.1. The archiphoneme /m-n-ŋ/ ("nasal")

The opposition /m/ ("labial nasal") vs /n/ ("apical nasal") vs /ŋ/ ("dorsal nasal") is an exclusive opposition as the common base of /m/, /n/ and /ŋ/, "nasal", is exclusive to these three phonemes.

The opposition /m/ vs /n/ vs /ŋ/ is **valid** word-**medially** *before* /p b t d k g f v n s ∫ h r l j w θ-ð/:

impede vs *input* vs *pingpong*   *Gimson* vs *Hansen* vs *gangster*
amber vs *Dunbar* vs *Pangbourne*   *cumshaw* vs *pension* vs *kingship*
Amtrak vs *winter* vs *Langton*   *Amharic* vs *Dunhill* vs *ringhals*
Amdahl vs *hinder* vs *kingdom*   *Imran* vs *inroad* vs *stingray*
cumquat vs *encash* [n][107] vs *anchor*   *amlet* vs *Henley* vs *ringlet*
Palmgren vs *ingrate* [n] vs *anger*   *permute* vs *pinion* vs *Kingussie*
camphor [m] vs *infant* [n] vs *Lingford*   *chamois* vs *Fenway* vs *Hemingway*
circumvent vs *envy* [n] vs *Langver*   *warmth* vs *tenth* vs *length*
Cumnor vs *leanness* vs *wrongness*

The opposition /m/ vs /n/ vs /ŋ/ is also **valid** word-**finally** *before* Ø, e.g. *Sim* vs *sin* vs *sing*.

NB1. In *warmth* vs *tenth* vs *length*, /m/, /n/ and /ŋ/ occur before /θ-ð/, not before /θ/.
NB2. The context 'before Ø' is equivalent to 'before pause' or 'in prepausal position'.
NB3. The examples above were largely taken from Akamatsu (2017a: 47).

The opposition /m/ vs /n/ vs /ŋ/ is **neutralized** *before* /p b t d k č ǰ ∫ ʒ/, and the archiphoneme /m-n-ŋ/ associated with this neutralization is definable as "nasal" and is realized by [m], [n], [nʲ][108] or [ŋ], as the case may be.

/m/ vs /n/ vs /ŋ/ is **neutralized** word-**finally** *before* /p b t d k č ǰ/:

lump /p/ [m]   *hand* /d/ [n]
iamb[109] /b/ [m]   *bank* /k/ [ŋ]
cant /t/ [n]   *inch* /č/ [nʲ]
     hinge /ǰ/ [nʲ]

/m/ vs /n/ vs /ŋ/ is also **neutralized** word-**medially** *before* /č ∫ ǰ ʒ/:

luncheon [t∫][110] [nʲ]   *danger* [dʒ][111] [nʲ]
luncheon [∫][112] [nʲ]   *danger* [ʒ][113] [nʲ]

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[107]   When pronounced [n], not [ŋ], in slow speech.
[108]   By the notation [nʲ] I mean 'palatalized [n]' (not 'palatal nasal' which is [ɲ]).
[109]   When *iamb* is pronounced [aɪæmb] instead of [aɪæm] which is a commoner pronunciation. Other English words ending with *-mb* and pronounced [m, mb] are *choliamb, choriamb, chorymb, dithyramb, jamb, rhomb, stromb,* etc. The word *lamb* pronounced [læm] is also spelled *lam.*
[110]   When *luncheon* is pronounced [lʌnʲt∫(ə)n].
[111]   When *danger* is pronounced [deɪnʲdʒə].
[112]   When *luncheon* is pronounced [lʌnʲ∫(ə)n].
[113]   When *danger* is pronounced [deɪnʲʒə].

18.2. The archiphoneme /m-n/ ("non-dorsal nasal")

The opposition /m/ ("labial nasal") vs /n/ ("apical nasal") is an exclusive opposition as the common base of /m/ and /n/, "non-dorsal nasal", is exclusive to these two phonemes.

The opposition /m/ vs /n/ is **valid** in different contexts as indicated below.

word-**initially**, *map* vs *nap*
after word-**initial** /s/, *smear* vs *sneer*
word-**medially** before /č/, *Kamchatka* vs *luncheon* [tʃ][114]
word-**medially** before /ǰ/, *circumjacent* vs *banjo* [nʲ]
word-**medially** before /z/, *hamza* vs *Kansas*
word-**finally** before /f/, *lymph* [m] vs *Banff* [n]
word-**finally** before /l/, *camel* vs *funnel*
word-**finally** before a pause, *cam* vs *can*

In the contexts shown above, /ŋ/ is systematically non-occurrent.

The opposition /m/ vs /n/ is **neutralized** *before* /p b f v m/ in the various contexts shown below:

word-**medially**, *impede, input* [m]   word-**medially**, *circumvent* [ɱ], *envy* [ɱ]
word-**medially**, *amber, Dunbar* [m]   word-**medially**, *teammate, inmate* [m]
word-**medially**, *camphor* [ɱ], *infant* [ɱ]
word-**finally** *lymph* [ɱ], *Banff* [ɱ]

/ŋ/ is systematically non-occurrent in these contexts.

Note that the common base of /m/ and /n/ is *not* "nasal" which is correctly attributed to the common base of /m/, /n/ and /ŋ/, i.e. the archiphoneme /m-n-ŋ/ ("nasal"). We have already seen that the common base of /m/, /n/ and /ŋ/ *is* "nasal" (see **18.1**)

18.3. The archiphoneme /n-ŋ/ ("non-labial nasal")

The opposition /n/ ("apical nasal") vs /ŋ/ ("dorsal nasal") is an exclusive opposition as the common base of /n/ and /ŋ/, "non-labial nasal", is exclusive to these two phonemes. Note that the common base of /n/ and /ŋ/ is *not* "nasal" any more than is the common base of /m/ and /n/ (see **18.2**).

The opposition /n/ and /ŋ/ is **valid**

word-**medially** *before* /θ-ð/, *tenth* vs *length*
word-**medially** in intervocalic position, *sinner* vs *singer*
word-**medially** *before* /θ-ð/, *anthem* vs *lengthen*
word-**medially** *before* /m/, *inmate* [nm] vs *Tangmere*

word-**finally**, *sin* vs *sing*

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[114]   As fn 110.

The opposition /n/ vs /ŋ/ is **neutralized** before /k g/

word-**medially** *before* /k/, *encash*[115] [ŋ], *anchor*
word-**medially** *before* /g/, *ingrate*[116] [ŋ], *anger*

/m/ is systematically absent in these contexts.

I have found no instances of the neutralization of /m/ vs /ŋ/, so I do not establish such a phonematic unit which might, if found, be an archiphoneme definable as /m-ŋ/ ("non-labial nasal").

This conclude my analysis of the neutralizations of oppositions between "nasal" consonant phonemes.

19. NEUTRALIZATION OF CONSONANT OPPOSITIONS AFTER /s/

Many writers on English phonetics have shown particular interest in the occurrence of [p t k] after [s]. (No-one seems to mention the occurrence of [tʃ] after [s].) This phenomenon has relevance to neutralizations and archiphonemes and will be discussed in what follows.

19.1.   Much has been written about the phonetic quality of the stops following [s], that is, whether they are more like [p] or [b], more like [t] or [d], and more like [k] or [g], so that the phoneme following /s/ is accordingly determined as /p/ or /b/, as /t/ or /d/, and as /k/ or /g/ (inter alia Davidsen-Nielsen 1969, 1974a, 1974b, 1975a, 1975b).[117] Such investigations in themselves, be they auditory, acoustic or physiological, are of interest as such, but are irrelevant to identifying the consonantal phonematic unit following /s/. The criterion whereby to identify the consonantal phonematic unit after /s/ should be the validity or invalidity of a given opposition. As Martinet (1968: 5) says, '*Fonctionnellement* [Martinet's italics], la façon dont se realise la neutralisatiion n'importe pas.'

19.2.   Gimson (1962[1]: 147 fn 1; 1970[2]: 152 fn 1; 1980[3]: 154 fn 1; 1989[4]: 153 fn 1) writes as follows in a footnote.

> Accented /p, t, k/ also show some loss of aspiration as a result of a preceding /s/ which is not in the same syllable,[118] e.g. /k/ in *discussed* is only very weakly aspirated compared with the /k/ of *custard*, so that *discussed* may be distinguished from *disgust* only by the fortis nature of /k/.

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115   When pronounced [ŋ] in fast speech.
116   When pronounced [ŋ] in fast speech.
117   Predictably, the conclusion of such investigations is that the stop consonantal segment after [s] is assigned to either /b/ or /p/, but with equal validity, the segment in question being voiceless, fortis and unaspirated. The investigations in question do not ultimately have the concept of 'opposition' as the criterion.
118   Gimson (1980[3]: 154 fn 1, 1989[4]: 153 fn 1) rephrases 'which is not in the same syllable' in the earlier editions by 'which may be regarded as not in the syllable'.

19.3. The above quoted passage is completely rephrased (by Cruttenden the reviser) in Gimson (1994⁵:140) and reads as follows, not in a footnote any more but in text proper.

> Where a plosive follows /s/ within the same syllable, the distinction between /p,t,k/ on the one hand and /b,d,g/ on the other is neutralized … the resulting plosives are unaspirated …

The new element in the passage quoted just above, which is actually attributed to Cruttenden, is the introduction of the alleged fact that /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ are neutralized when preceded by /s/ provided that /s/ occurs within the same syllable as the 6 plosive consonant phonemes. That the resultant plosives are unaspirated is then mentioned as a statement of secondary importance. Cruttenden's mentioning neutralization of /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ when preceded by /s/ is welcome, but in point of fact, it is not neutralization he has in mind but the so-called 'defective distribution' of either /p/ or /b/, either /t/ or /d/, and either /k/ vs /g/, when preceded by /s/. Cruttenden's erroneous understanding of 'neutralization' is revealed in what he writes in Gimson (1994⁵: § 5.3.4 [entitled Neutralization]) to which we readers are referred.

19.4. With a view to checking the occurrence after [s] of all 24 consonantal segments in English, I have prepared Table 9 below consisting of 6 commutative series, CS 11 to CS 16, in which the phonetic context 'preceded by [s]' appears associated with different accentual patterns.

	CS 11 [♯'s ▬]	CS 12 [– 's ▬]	CS 13 [– s' ▬]	CS 14 ['– s ▬ ♯]	CS 15 [♯ s ▬']	CS 16 [' – s ▬]
[p]	*'spin*	*di'sperse*	*dis'place*	*'lisp*	*spi'toon*	*'Espy*
[b]			*dis'burse*			
[f]	*'sphinx*		*dis'figure*		*sfu'mato*	*'asphalt*
[v]	*'svelt*		*dis'value*[119]			*'MILSVY*[120]
[m]	*'smell*		*dis'miss*	*'handsome*[121]		*'asthma*
[t]	*'star*	*di'stend*	*dis'taste*	*'dust*	*stam'pede*	*'Estefan*
[d]			*dis'dain*			*'Potsdam*
[θ]						*'sixth*
[ð]						
[n]	*'sneak*		*dis'nature*[122]	*'lesson*	*sna'fu*	*'listener*
[s]			*dis'satisfy*[123]			
[z]						
[tʃ]			*dis'charge* (v)			*'question*
[dʒ]			*dis'join*			
[ʃ]			*dis'shroud*[124]			
[ʒ]						
[k]	*'skin*	*di'scuss*	*dis'cursive*	*'risk*	*ski'doo*	*'husky*
[g]			*dis'gust*			
[ŋ]						
[h]			*dis'hearten*			
[r]	*'sri*		*dis'rupt*		*Sri'nagar*	
[l]	*'slur*		*dis'lodge*	*'mussel*	*Sla'vonic*	*'hustler*[125]
[j]	*'sue*		*dis'yoke*[126]		*su'perb*	*'hirsute*
[w]	*'swine*		*dis'warren*		*Swa'hili*	*'raceway*

Table 9

19.5. Cruttenden writes in Gimson (1994[5]: § 5.3.4) that 'Where a plosive follows /s/ within the same syllable', neutralization of /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ occurs. He refers to CS 12 [– 's ▬] where [s] is effectively in the same syllable as the plosives. However, he is wrong to cite *di'spense* vs *dis'burse* and *di'scussed* vs *dis'gust* in which he sees the validity

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[119] A rare word in current English.
[120] The acronym for Military Survey (UK).
[121] I have in mind the pronunciations [-sm] in which the schwa does not occur between [s] and [m]. In this case, [m] is, precisely speaking, syllabic, hence [m̩]. Pronounced either way, i.e. with or without the schwa, the multiplet in question is disyllabic.
[122] As a transitive verb meaning 'to render unnatural'. As an intransitive verb meaning 'to get into or be in disordered condition', this word is rare in current English.
[123] A word pronounced with [-ss-] as in *dis'satisfy* seems rare as -*ss*- tends to be pronounced [-s-] (e.g. *di'ssent*) or [-z-] (e.g. *di'ssolve*). Note that *dis'satisfy* is pronounced optionally with secondary accent on *dis*-, i.e. ˌ*dis'satisfy*.
[124] This word is rare in current English. Another word like *mis'shape* could be cited instead.
[125] There exists an alternative pronunciation [ˈhʌzlə] with [z] instead of [s]. The letter *t* in this word is of course 'silent'.
[126] This word is rare in current English. Generally, *unyoke* is used instead.

of /p/ vs /b/ and /k/ vs /g/.[127] An example Cruttenden should cite instead is *di'stend* or *di'scuss*. (There is no case like *di'sb-*. See CS 12.) Neutralization of /t/ vs /d/ occurs in *di'stend*, and neutralization of /k/ vs /g/ in *di'scuss*.

19.6.   Both Gimson and Cruttenden treat *di'scuss* vs *dis'gus(t)* as if they were a minimal pair word-medially, which they are not because accent falls at different locations. Different multiplets which are prosodically different (in this case the location of accent, or the accentual patterns) cannot be in the same commutative series. As can be seen in Table 9 above, *di'scuss* appears in CS 12 [– 's ▬] while *dis'gus(t)* appears in CS 13 [– s' ▬]. A suitable near-minimal pair would be *dis'place* (not Cruttenden's example) vs *dis'burse* which both (would) appear in CS 13 [– s' ▬].

19.7.   In what follows I will discuss how certain English consonant archiphonemes are elicited and identified in terms of their relevant features in the context after [s]. I do this through the commutation test. This is why I have provided 6 commutative series above, CS 11 to CS 16.

19.8.   A few remarks are in order concerning some details of CS 11 to CS 16 presented above.

1) The phonetic contexts with which CS 11 and CS 15 are associated is 'word-initial position' and the phonetic context with which CS 14 is associated is 'word-final position', and those phonetic contexts with which CS 12, CS 13 and CS 16 are associated is 'word-medial position'.

2) The thick dash '▬' in the phonetic contexts indicates the place where consonantal segments listed vertically on the leftmost corner occur. The thin dash '–' shows the place where consonantal or vocalic segments may or may not occur. For the sake of the forthcoming check, I have chosen the prefix *dis-* for the unaccented prefix but some other appropriate prefix such as *mis-* (*mi'stake*, *mis'state*) could just well be chosen.

3) Monosyllabic words occurring in isolation are naturally accented.[128] I have added the accent mark ' *'* ' for all the monosyllabic multiplets in CS 11 and CS 14. The accent mark is placed on the accented syllables in polysyllabic multiplets in all 5 commutative series. In the case of polysyllabic multiplets, I relied on *LPD* for the information about the place of accent.

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[127]   I wonder if this is because Cruttenden sees /p/ occurring in *di'sperse* and /k/ in *di'scussed*. The concept of 'archiphoneme' is totally extraneous to Cruttenden. This applies to a host of other writers including Gimson, Roach, O'Connor et al. who interpret 'neutralization' in terms of de facto 'defective distribution'.
[128]   To cite again, 'Lorsque le mot est isolé, la mise en valeur accentuelle est toujours réalisée.' Martinet (1960: III-31).

4) The reason why I provide CS 12 and CS 13, associated, respectively, with [– 's ▬] and [– s ' ▬] is that the location of accent is not the same in CS 12 and CS 13.

5) Some of the multiplets presented in CS 13 are rarely used words in current English; I have attached footnotes about them. They are nevertheless to be regarded as valid multiplets to be cited as they do not violate either the phonetic or phonological practice of native speakers of English.

6) Under [♯'s ▬] (CS 11) should also be considered [spl-] (e.g *splinter*), [spr-] (e.g. *spruce*), [spj-] (e.g. *spew*); [str-] (e.g. *strap*), [stj-] (e.g. *stew*) and [skr-] (e.g. *screw*).

7) It will have been seen that none of the phonetic contexts with which CS 1 to CS 10 (in **4.1**) are associated involved 'preceded by [s]'.

8) *Both* members of the pairs [p b], [t d] and [k g] occur in CS 1 through CS 10.

19.9. Here follows my analysis of what is shown in CS 11 to CS 16 in Table 9 (**19.4**).

CS 11 and CS 15 are associated with [♯ s ' ▬] (i.e. word-initially) and [♯ s ▬ '] (i.e. word-initially), respectively, while CS 14 is associated with ['– s ▬ ♯] (i.e. word-finally).

In CS 11, [p] occurs (*spin*) but not [b], [t] occurs (*star*) but not [d], and [k] occurs (*skin*) but not [g].

In CS 14, [p] occurs (*lisp*) but not [b]; [t] occurs (*dust*) but not [d]; and [k] occurs (*risk*) but not [g].

In CS 15, [p] occurs (*spi'toon*) but not [b], [t] occurs (*stam'pede*) but not [d], [k] occurs (*ski'ddoo*) but not [g].

The occurrence of [p t k] against the non-occurrence of [b d g] in CS 11, CS 14 and CS 15 suggests neutralization of /p/ vs /b/, /t/ vs /d/ and /k/ vs /g/, while the non-occurrence of [b g] against the occurrence of [p k] in CS 16 suggests neutralization of /p/ vs /b/ and /k/ vs /g/. The occurrence of both [t] and [d] in CS 16 suggests /t/ vs /d/ as non-neutralized in the context ['– s ▬]. CS 12 in which [p t g] occurs but [b d g] do not is problematic and inconclusive since none of *di'sb-* [dɪ'sb-], *di'sd-* [dɪ'sd-] and *di'sg-* [dɪ'sg-] are attested. One is led to the conclusion that (i) either /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ are neutralized in *di'sperse*, *di'stend* and *di'scuss*, or (ii) /b/, /d/ and /g/ are systematically non-occurent in /dɪ's-/.

19.10. Each of /p/ vs /b/, /t/ vs /d/, and /k/ vs. /g/ is an exclusive opposition as the common base of the phonological contents of /p/ and /b/, "labial non-nasal plosive", that of /t/ and /d/ "apical non-nasal plosive" and that of /k/ and /g/ "dorsal non-nasal", respectively, are exclusive to /p b/, /t d/ and /k g/, respectively, and are not found in any other phoneme of the English consonantal phonematic system. Therefore I conclude that /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ are neutralized after /s/ in CS 11, CS 14, and CS 15. Hence, *spin* /s p-b ɪn/, *star* /s t-d ɑ/, *skin* /s k-g ɪn/; *lisp* /lɪs p-b/, *dust* /dʌs t-d/, *risk* /rɪs k-g/; *spitoon* /s p-b ɪtun/, *stampede*

/s t-d æ m-n-ŋ pid/, *skiddoo* /s k-g ɪdu/. (As mentioned at the end of **19.9**, no decisive state-ment can be made in the case of CS 12 as to whether /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ are neutralizable, so that no definitive statement is possible concerning the potential archipho-nemes /p-b/, /t-d/ and /k-g/.) The three archiphonemes, viz. /p-b/, /t-d/ and /k-g/, are realized by [p], [t] and [k], respectively. In CS 11, CS 14 and CS 15, the archiphoneme /p-b/ is opposed to /m/ (*smell, handsome, stampede*), and the archiphoneme /t-d/ is opposed to /n/ (*sneak, lesson, snafu*). In the case of the archiphoneme /k-g/, we say that it is not opposed to /ŋ/ as [sŋ] is non-occurrent in all phonetic contexts in CS 11 to CS 16. However, /k-g/ "dorsal non-nasal" is opposed to /p-b/ "labial non-nasal plosive" and /t-d/ "apical non-nasal plosive" in all these positions. The relevant feature "plosive" is irrelevant when opposing /k-g/ to both /p-b/ and /t-d/. As for the non-occurrence of [sŋ] in all these positions, we can say that [ŋ] is phonotactically disallowed after [s], and consequently /ŋ/ is systematically absent after /s/ in all these positions.

19.11. We note that that the above-mentioned neutralizations occur not only in accented syllables following word-initial /s/ as seen in CS 11 (*spin, star, skin*), but also in accented syllables word-medially following /s/ as seen in CS 16 (*Espy, Estefan, husky*)[129], also in ac-cented syllables following word-prefinal /s/ as seen in CS 8 (*lisp, dust, risk*), and also in post-accentual *unaccented* syllables in e.g. *'typist* and *'damask,*[130] examples which do not figure in but could be included in CS 14 (as a subvariety of CS 14).

19.12. We see that in CS 11, none of [θ ð], [s z], [tʃ dʒ], and [ʃ ʒ] which are pairs of 'voice-less' and 'voiced' segments occur after word-initial [s]. Therefore, none of the oppositions /θ/ vs /ð/, /s/ vs /z/, /č/ vs /ǰ/ and /ʃ/ vs /ʒ/, occurs after word-initial /s/, and we are here in the presence of systematic gaps of /θ ð s z č ǰ ʃ ʒ/ after word-initial /s/. As for [f] and [v], both occur (*sphinx*; *svelt*) after word-initial [s], so that /f/ vs /v/ is valid in this context. /m/ (*smell*), /n/ (*sneak*), /r/ (*Srinagar*), /l/ (*Slavonic*), /j/ (*superb*) and /w/ (*Swahili*) occur also after word-initial /s/.

19.13. In CS 14, none of [f v], [θ ð], [s z], [tʃ dʒ], and [ʃ ʒ] (these are pairs of 'voiced' and 'voiceless' consonantal segments) and none of [ŋ], [h], [r], [j] and [w] occur while [l] does. Therefore, none of the oppositions /f/ vs /v/, /θ/ vs /ð/, /s/ vs /z/, /č/ vs /ǰ/ and /ʃ/ vs /ʒ/, and /l/, are conceivable word-finally after /s/. /ŋ h r j w/ are systematically absent in this context.

19.14. In CS 15, none of [s z], [tʃ dʒ] (these are pairs of 'voiceless' and 'voiced' consonantal segments) occur. Nor do any of [b], [v], [d], [g], [ŋ], [h]. Therefore, the oppositions /p/ vs /b/, /f/ vs /v/, /t/ vs /d/, /k/ vs /g/ are neutralized after word-initial /s/ in unaccented syllables, the

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129   The syllabification of the three example words as follows: ['esp ɪ], ['est ə fæn], ['hʌsk ɪ].
130   The syllabification of the two example words are as follows: ['taɪp ɪst], ['dæm ə sk]

archiphonemes associated therewith being /p-b/, /f-v/, /t-d/ and /k-g/. Systematically absent in this context are /s/, /z/, /č/, /ǰ/, /ŋ/ and /h/.

19.15. In CS 16, in word-medial position, none of [b], [θ], [ð], [s], [dʒ], [ʃ], [ʒ], [g], [ŋ], [h] and [r] occur, but [m], [k], [l], [j] and [w] do. /f/ vs /v/ and /t/ vs /d/ are valid in this context. /p/ vs /b/, /s/ vs /z/, /č/ vs /ǰ/, and /k/ vs /g/ are neutralized. /θ/, /ð/, /ʃ/, /ʒ/, /ŋ/, /r/, /h/ and are systematically non-occurrent.

19.16. To summarize, *so far*, the places where the above-mentioned neutralizations occur are as follows. In addition to the monosyllabic multiplets already cited above, I will add polysyllabic multiplets, where appropriate.

'After word-initial /s/' (CS 11), the syllable beginning with /s/ being always accented, and the syllables containing /s/ followed by the archiphonemes /p-b/, /t-d/ and /k-g/ being accented (*'spin*, *'sponsor*; *'star*, *'stigma*; *'skin*, *'skirmish*);

'Word-finally preceded by /s/' (CS 14), the syllable with prefinal /s/ being accented (*'list*) or unaccented (*'handsome*);

'After word-initial /s/' (CS 15), the initial syllable beginning with /s/ being never accented (*spi'toon*, *stam'pede*, *ski'doo*).

It seems, thus far, that the critical condition for the neutralization of /p/ vs /b/, /t/ vs /d/, and /k/ vs /g/ after /s/ is that the relevant syllables start with /s/, and that those syllables are accented or unaccented.

CS 16 associated with the phonetic context ['– s ▬] is interesting on one particular point in that, we find the neutralization of /č/ vs /ǰ/ (*question* /'kwes č-ǰ ən[131]/) which is not generally noted by many writers.

In CS 16 (['– s ▬]), both [f] and [v] occur (*asphalt*, *MILSVY*), so that /f/ vs /v/ is valid in word-medial context. Both [t] and [d] occur (*Estefan*, *Potsdam*), so that /t/ vs /d/ is also valid in this context. [m] (*asthma*), [n] (*listener*), [l] (*hustler*), [j] (*hirsute*) and [w] (*race-way*) occur, hence /m /, /n/, /l/, /j/ and /w/ occur in this context.

Neither [θ ð] nor [ʃ ʒ] occur in this context, where neither /θ/ vs /ð/ nor /ʃ/ vs /ʒ/ is conceivable.

On the other hand, still in CS 16, [p] (*Espy*) occurs, but [b] does not, nor does [z]. [s] (*listener*) and [k] (*husky*) occur but not [z] and [g]. So /p/ vs /b/, /s/ vs /z/, and /k/ vs /g/ are neutralized in this context. /č/ vs /ǰ/ is also neutralized in this context.

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[131]   The notation /ən/ here corresponds to [n̩].

19.17.   We now move on to study at some length CS 12 and CS 13 which are associated with the two phonetic contexts, viz. [– 's ▬] and [– s ' ▬], respectively.) I actually treated of this subject in Akamatsu (1997), but what follows here has been written independently of this past writing.

It may well be wondered why I provided two commutative series here instead of one. The simple reason is that the multiplets cited in CS 12 and those cited in CS 13 are clearly prosodically different from each other, that is, in [– 's ▬] and [– s ' ▬], the place of accent are different from each other. The accent is *not identically* placed between members of each pair, i.e. *di'sperse* vs *dis'burse*, *di'stend* vs *dis'dain*, and *di'scuss* vs *dis'gust*. In the former phonetic context accent falls on the syllable *beginning with* [s] while in the latter accent falls on the syllable *following* [s]. It may be remembered that one of the precautions to be taken in choosing multiplets in commutative series is that all multiplets cited in a given commutative series should share an identical prosodic characteristic. The 3 multiplets in CS 12, viz. *di'sperse*, *di'stend* and *di'scuss*, all share the accentual pattern [– 's ▬] while the 19 multiplets cited in CS 13 all share the accentual pattern [– s ' ▬]. To present and consider pairs like *di'sperse* and *dis'burse*, *di'stend* and *dis'dain*, and *di'scussed* and *dis'gust* as minimal pairs is mistaken both phonetically and phonologically.

19.18.   Many analysts make a rather simplistic statement that /p/ vs /b/, /t/ vs /d/ and /k/ vs /g/ are not valid (they do not necessarily say 'neutralized') when preceded by /s/ and compare e.g. *di'sperse* with *dis'burse*, *di'stend* with *dis'dain*, or *di'scuss* with *dis'gust*, by ignoring the two different accentual patterns which are borne by members of each pair, and conclude that each of such pairs of words are distinguished from each other through /p/ vs /b/, /t/ vs /d/ or /k/ vs /g/.

We should look at *'sperse* which is part of *di'sperse*, *'stend* which is part of *di'stend*, and *'scuss* which is part of *di'scuss*. That [s] begins the accented syllable in *di'sperse*, *di'stend* and *di'scuss* is shared by e.g. *'spin*, *'star* and *'skin* cited in CS 11. It is easy to see that [p], [t] and [k] in *'sperse*, *'stend* and *'stend* are realizations of the archiphonemes /p-b/, /t-d/ and /k-g/, respectively, that are associated with neutralizations of /p/ vs /b/, /t/ vs /d/ and /k/-/g/, respectively, that occurs 'after /s/'.

19.19.   The phonetic context [– s' ▬] (CS 13) is basically similar to [♯ – i:], [♯ – u:] and to [♯ – ɪt] which CS 1, CS 2 and CS 3 we have seen further above (Table 1 in **4.1**) are associated with. The fact that different vocalic segments follow [s] (in CS 1, CS 2, CS 3) is unimportant. What is essential is for us to see is what consonantal segments follow [s] in CS 13. There occur [p], [b], [f], [v], [m], [t], [d], [n], [s], [tʃ], [dʒ], [ʃ], [k], [g], [h], [r], [l], [j] and [w], which are realizations of, respectively, /p/, /b/, /f/, /v/, /m/, /t/, /d/, /n/, /s/, /č/, /ǰ/, /ʃ/, /k/, /g/, /h/, /r/, /l/, /j/ and /w/. Of these, /f/ (*dis'figure*) vs /v/ (*dis'value*) is valid. So are /č/ (*dis'charge* (v)) vs /ǰ/ *(dis'join)* and /k/ (*dis'cursive*) vs /g/ (*dis'gust*). Non-occurrent are [θ], [ð], [z], [ʒ] and [ŋ], which leads to the interpretation that /θ/, /ð/, /z/, /ʒ/ and /ŋ/ are systematically non-occurrent in this context. It goes without saying that [– sˈb –] (*dis'burse*), [– sˈd –] (*dis'dain*)

and [– s'g –] (*dis'gust*) – where accent falls on *'burse* (not on *'sburse*), on *'dain* (not on *'sdain*) and on *'gust* (not on *'sgust*) – are phonologically interpreted as /– s'b –/, /– s'd –/ and /– s'g-/ since /p/ vs /b/, /t/ vs /d/ and /k/ vs /g/ are not neutralized.[132] Thus [b], [d] and [g] are realizations of /b/, /d/ and /g/. On the other hand, in /– 's p-b –/, /– 's t-d –/ and /– 's k-g –/ in *di'sperse*, *di'stend* and *di'scuss*, /p/ vs /b/, /t/ vs /d/ and /k/ vs /g/ are neutralized and [p], [t] and [k] are realizations of the archiphonemes /p-b/, /t-d/ ands /k-g/.

19.20.　One interesting point I have mentioned in the past[133] is that alternative pronunciations with [s] and [z] exist for *dis'burse* [dɪs 'b –, dɪz 'b –], *dis'dain* [dɪs 'd –, dɪz 'd –] and *dis'gust* [dɪs 'g –, dɪz 'g –], which is evidence that we do have /b/ in *dis'burse*, /d/ in *dis'dain*, and /g/ in *dis'gust* and that regressive assimilation characteristic in English gives rise to the pronunciation with [z] in addition to [s].[134] This phenomenon would not happen with *di'sperse* [– 'sp –], *di'stend* [– 'st –] and *di'scuss* [– 'sk –], in which [p], [t] and [k] occur which are realizations of the archiphonemes /p-b/, /t-d/ and /k-g/. There are no alternative forms [– 'sp –] ∿ [– 'sb –], [– 'st –] ∿ [– 'sd –], and [– 'sk –] ∿ [– 'sg –]. This is not surprising as /p-b/, /t-d/ and /k-g/ are devoid of the relevant feature "voiced" (as well as "voiceless"), unlike /b/, /d/ and /g/, so that there is no possibility of [– 'sb –], [– 'sd –] or [– 'sg –] occurring. An occasional pronunciation with [z] in addition to [s] in e.g. *di'scern, dis'arm, dis'honest, dis'order*, which involves no neutralization nor regressive assimilation resulting in [– z –] is a separate phenomenon. A number of cases of this and other nature are mentioned in Akamatsu (1983).

19.21.　I will show below the phonological notation of the relevant parts of all the multiplets listed in CS 12 and CS 13. This is in order to see the occurrence after /s/ of /p-b/ or /p/ or /b/; /t-d/ or /t/ or /d/; /k/ or /g/ or /k-g/ in the first place, but also the occurrence after /s/ of other consonant phonemes, i.e. /f v m n s č ǰ ∫ h r l j w/.

(CS 12 [– 's ▬]): *di'sperse* /dɪ's p-b –/, *di'stend* /dɪs t-d –/, *di'scuss* /dɪs k-g –/;

(CS 13 [– s '▬]): *dis'place* /dɪs 'p –/, *dis'band* /dɪs 'b –/, *dis'figure* /dɪs 'f –/, *dis'value* /dɪs 'v –/, *dis'miss* /dɪs 'm –/ [s, z], *dis'taste* /dɪs 't –/, *dis'dain* /dɪs 'd –/ [s, z], *dis'nature* /dɪs 'n –/ (not recorded in *LPD*), *dis'satisfy* /dɪs 's –/, *dis'charge* (v) /dɪs 'č –/, *dis'join* /dɪs 'ǰ –/, *dis'shroud* /dɪs '∫ –/ (not recorded in *LPD*), *dis'cursive* /dɪs 'k–/, *dis'gust* /dɪs 'g –/ [s, z], *dis'hearten* /dɪs 'h –/, *dis'rupt* /dɪs 'r –/, *dis'lodge* /dɪs 'l –/, *dis'yoke* /dɪs 'j –/, *dis'warren* /dɪs 'w –/ (not recorded in *LPD*).

　　What has been said and shown above (**19.2** to **19.20**) proves that a simplistic statement like '/p/ vs /b/, /t/ vs /d/ and /k/ vs /g/ are neutralized after /s/' is not entirely sustainable.

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[132]　The alternative pronunciations mentioned here seem not to occur regularly. For instance, *dis'band* is pronounced with [dɪs b-], not [dɪz b-], according to *LPD*3: 234.
[133]　See Akamatsu (1997).
[134]　See Akamatsu (1997: 19-20). The once hotly debated alternative pronunciations of *asbestos*, [æsˈbest-] and [æzˈbest–], in (mainly American) linguistics literature) may be recalled in this respect.

Such a statement is attributable to most writers on English phonetics and is made by taking into account only cases like *'spin*, *'sphinx*, *'star* and *'skin* which are found in CS 11 ([ʈˈs ▬]).[135]

19.22. We have seen that, among the multiplets listed for CS13 ([– sʼ ▬]), *dis'dain* and *dis'gust* are pronounced [dɪs –] and [dɪz –] but but not so *dis'burse* and *dis'join* despite the fact that the accented syllables in all of them begins with voiced segments, i.e. [d], [g], [b] and [dʒ]. As, in these multiplets, there occurs no neutralization of /t/ vs /d/, /k/ vs /g/, /p/ vs /b/, and /č/ vs /ǰ/, it is not surprising that [d], [g], [b] and [dʒ] in question are realizations of /d/, /g/, /b/ and /ǰ/ all of which are characterized by "voiced" and /d/, /g/, /b/ and /ǰ/ are amenable, at least potentially, to affect /s/ being realized by [s̬] ('voiced' [s]) through regressive assimilation, though I have shown and will show [z] (as well as [s̬]) which *EPD* and *LPD* systematically indicate instead of [s̬]. That this realization does not necessarily occur is testified by the examples *dis'band* and *dis'join* which are pronounced [dɪs –] only.

On the other hand, *dis'miss* is pronounced both [dɪs –] and [dɪz –], but *dis'rupt*, *dis'lodge*, *dis'yoke* and *dis'warren* are pronounced [dɪs –] only. All of [m r l j w] of *dis'miss*, *dis'rupt*, *dis'lodge*, *dis'yoke* and *dis'warren* are realizations of /m r l j w/ which are extraneous to the "voiceless" vs "voiced" opposition. Only *dis'miss* with [m] gives rise to [s] and [z] (though *dis'missal* is prononced with [dɪs –] only). I cannot make any definite statement on *dis'nature* and *dis'value* which neither *LPD* nor *EPD* enters. However, we should not be surprised if *dis'rupt*, *dis'lodge*, *dis'yoke* and *dis'warren* developed [dɪz] like *dis'miss* which is pronounced with [dɪs –] and [dɪz –].

There appears to be fluctuation as *'dismal* is pronounced with only [dɪz –] while *dis'may* is prononced with both [dɪs –] and [dɪz –] and, as already noted above, *dis'missal* is pronounced with only [dɪs] while *dis'miss* is pronounced with both [s] and [z]. The apparently irregular (and potential) development of the variants with [dɪz] through regressive assimilation in *dis*-words is not surprising since regressive assimilation is less of a feature in English than is progressive assimilation. It seems that, for *dis*-words, [dɪs] is the normal starting point, which potentially give rise to [dɪz] as an additional subvariant, and in some words [dɪz] establishes itself as the only regular form. It is conceivable that this phonetic change is formulated as [dɪs] → [dɪs̬] → [dɪz].

19.23. Be that as it may, it is notable that certain *dis-* words are umistakably pronounced with [dɪz] only, not with [dɪs] *or* [dɪz]. I know just a few words of such a case, e.g. *Disney* and *Disneyland* and *Disraeli.* It is of some interest to know that *Disney* (pronounced with [dɪz] only) is not entered up to *EPD*10 (1949) but makes its first appearance in *EPD*11 (1956),

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[135]   Gimson (and Cruttenden et al.) (1962[1]: 48; 1970[2]: 48-49; 1980[3]: 53; 1989[4]: 50; 1994[5]: 46; 2001[6]: 46; 2008[7]: 45; 2014[8]: 47), Roach (1983[1]: 100; 1991[2]: 115-116; 2000[3]: 127; 2009[4]: 101). More writers' works on the relevant point could be cited.

while *PDAE* (1951³) does not record it. *LPD*1-3 consistently records *Disney* pronounced with [z] only.

19.24. A question may be asked about the phonological status of [s] and [z] in [dɪs ˈb –, dɪz ˈb –], [dɪs ˈd –, dɪz ˈd –] and [dɪs ˈg –, dɪz ˈg –].[136] Should one understand the notation [dɪz] which is placed alongside with [dɪs] in the sense of [dɪs, dɪs̬], so that there is a three-way choices, between [dɪs], [dɪs̬] and [dɪz]? This would be an otiose question which, however, may interest instrumentalists, not functionalist phonologists.[137] So far as the native speaker of English is concerned, what matters is that he hears the distinction between (voiceless) [s] and (voiced) [z] and (if at all possible) [s̬], corresponding to the distinction between /s/ and /z/. Only to a native speaker of some language in which the three-way 'phonological' distinction operates would a three-way choice between [dɪs], [dɪs̬] and [dɪz] be meaningful. I have in the past referred to the question of [z] and [s̬] being comprised as [z] in Akamatsu (1983: 133).

20. NEUTRALIZATION OF /t/ VS /d/

It will have been noticed that I have not mentioned what is often alleged to be neutralization of /t/ vs /d/ in some contexts (as in *atom/Adam*, *latter/ladder*). This is because this alleged neutralization, if it does happen, is not regarded as a regular phenomenon in RP.

21. THE ANALYTICAL OUTCOME OF THE COMMUTATION TEST

I have conducted the commutation test first with the aim of establishing all the consonant phonemes, which are definable in terms of 24 mutually different sums of relevant features. I continued the commutation test in an attempt to discover instances of neutralizations of oppositions between "non-nasal" consonant phonemes and the archiphonemes associated therewith. I next turned my attention to discovering instances of neutralizations of oppositions between "nasal" consonant phonemes, thereby identifying the archiphonemes associated therewith. One of the main purposes of my enquiry in the present paper was to identify the consonantal phonematic units, both phonemes and archiphonemes, and thereby

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[136] Throughout in Akamatsu (1997) I mentioned [s̬] as well as [z] in connection with words like *disˈburse* and *disˈdain*.
[137] Martinet (1965¹/1968²: 71) writes, and I quote at length: '… Cette activité phonologique [i.e. eliciting and identifying the distinctive units in terms of relevant features] réclame certes, de celui qui l'exerce, une bonne habitude des faits phonétiques, celle sans laquelle il n'est pas de bon linguiste. Mais elle ne suppose nullement l'aptitude à poursuivre des recherches instrumentales originales. D'un descripteur, on peut exiger *qu'il sache identifier une même réalité phonique dans deux combinaisons ou deux contextes différents, mais, en aucune façon, qu'il soit capable de donner, de cette réalité, une description exhaustive* [Martinet's italics]. Ceci est la tâche des spécialistes, phonéticiens instrumentalistes et autres.' I am in full agreement with Martinet here.

to establish the phonological system constituted by the consonant phonemes in terms of orders and series which clearly shows the entire structure of the English consonant phoneme system. Those consonant phonemes that do not fit in the structure of correlations were not disregarded, as they too in their own right can be regarded as non-correlated but nevertheless as forming part of the system of the consonant phonemes.

22. LIST OF THE CONSONANTAL PHONEMATIC UNITS IN BRITISH ENGLISH (RP)

Here first are the consonantal phonematic units that the commutation test has established. Presented first are the consonant phonemes.

/p/ "voiceless labial plosive"	/m/ "labial nasal"
/b/ "voiced labial plosive"	/n/ "apical nasal"
/t/ "voiceless apical plosive"	/ŋ/ "dorsal nasal"
/d/ "voiced apical plosive"	
/θ/ "voiceless apical fricative"	/l/ "lateral"
/ð/ "voiced apical fricative"	/r/ "spirant"
/č/ "voiceless hush plosive"	/h/ "glottal"
/ǰ/ "voiced hush plosive"	/j/ "palatal"
/k/ "voiceless dorsal non-nasal"	/w/ "labial-dorsal"
/g/ "voiced dorsal non-nasal"	
/f/ "voiceless labial fricative"	
/v/ "voiced labial fricative"	
/s/ "voiceless hiss"	
/z/ "voiced hiss"	
/ʃ/ "voiceless hush fricative"	
/ʒ/ "voiced hush fricative"	

Table 10

Here next are all the consonant archiphonemes.

/p-b/ "labial non-nasal plosive"	/m-n-ŋ/ "nasal"
/t-d/ "apical non-nasal plosive"	/m-n/ "non-dorsal nasal"
/č-ǰ/ "hush plosive"	/n-ŋ/ "non-labial nasal"
/k-g/ "dorsal non-nasal"	
/f-v/ "labial fricative"	
/θ-ð/ "apical fricative"	
/s-z/ "hiss"	
/ʃ-ʒ/ "hush fricative"	

Table 11

23. HOW TO NOTATE ARCHIPHONEMES?

My general practice of notating archiphonemes is not with single symbols (frequently upper-case letters and occasionally in lower-case letters) but with strings of multiple symbols standing for the member phonemes of neutralizable oppositions. This practice on my part has drawn comments from some fellow functionalists. While other writers indicate the archiphoneme associated with the neutralization of e.g. /p/ vs /b/ in English with a single upper-case letter 'P', thus /P/, I customarily indicate it by /p-b/.[138] My intention consists essentially in showing the identity of the neutralizable opposition, i.e. /p/ vs /b/ in this case, the phonological content of the archiphoneme /p-b/ being inferable from the phonological contents of /p/ and /b/ which will have been previously identified. In the case of e.g. the archiphoneme associated with the neutralization of /m/ vs /n/ vs /ŋ/ in English, I indicate the archiphoneme by /m-n-ŋ/ whereas other writers would prefer to indicate it as /N/. In English as I have analyzed above, there are among others three "nasal" archiphonmes, viz. /m-n-ŋ/, /m-n/ and /n-ŋ/, as shown in my fashion. Most writers who fundamentally prefer to employ single upper-case letters for archiphonemes would have to look for, besides /N/ (i.e. my /m-n-ŋ/), two more upper-case symbols by which to notate the two other archiphonemes (i.e. my /m-n/ and /n-ŋ/). I do not know how this would be done. I know of some other cases in which I symbolize archiphonemes with strings of more than three letters. How would other writers deal with such archiphonemes by indicating each with a single symbol? It is basically my intention to show what phonological opposition is neutralized, to show what are the member phonemes of the neutralizable opposition and indirectly indicate the phonological content of the archiphoneme through prior knowledge of the phonological contents of the two or more member phonemes of the neutralizable opposition.

24. CONCLUDING REMARKS

The main purpose of the present paper has been to demonstrate how the commutation test may be conducted, as I personally understand it, whereby to elicit, identify and establish the consonantal phonematic units, i.e. the phonemes and the archiphonemes, in RP, the pronunciation of the Standard British English described by e.g. Daniel Jones in his various writings on English phonetics. My choice of RP can be justified in that it is a methodological description of the commutation test that I have intended to present by taking up the case of RP which is best familiar to me and which is widely described in most manuals of (British) English phonetics. The methodology of the commutation test which I have shown can, it is hoped, be applied to the commutation test if another analyst happens to choose

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[138]   The choice of 'P' seems to be motivated by the phonetic nature, as determined by the analyst, of realization of the archiphoneme /p-b/. On the other hand, the archiphoneme /m-n-ŋ/ in Spanish is frequently notated by 'N' as its realizations vary depending on different contexts where /N/ occurs (see e.g. Alarcos Llorach 1965[4]: 182 *et passim*). Interestingly, Alarcos Llorach (*op cit, loc cit*) actually indicates 'Los archifonemas *N* (= m/n/ɲ/)'. A symbol whereby the archiphoneme /m-n-ŋ/ in English, or for that matter the archiphoneme /m-n-ɲ/ in Spanish, may be indicated by /˜/ (a tilde), a symbolization of an archiphoneme definable as "nasal" which I have used on some occasions in the past.

another form of English pronunciation as the phonic material on which the commutation test is performed. Different details in another form of English pronunciation than RP will of course be suitably incorporated and worked on, if necessary.

In performing the commutation test, the concept of 'opposition' is borne in mind throughout. I wish to stress that the Saussurean concept of 'opposition' is the bedrock on which the commutation test rests.

It will have been apparent that I do not operate with what are known as 'minimal pairs' (which are what I call 'simple oppositions') to which the majority of writers customarily have recourse as the analytical procedure in establishing the phonemes of English or any other languages. Creating the commutative series at the start of the commutation test demands essentially what I call 'multiple oppositions' rather than 'simple oppositions'.

My recourse to the concepts of 'series', 'order' and 'correlation' throughout the stages of operating with 'pre-phoneme' proves the quickest and sure-fire method by which to eventually elicit and identify the phonemes of a language (English in the present paper). The concepts of 'series' and 'order' apply of course to phonemes as well.

Forward and backward steps taken during the operation of the commutation test may be necessary in endeavouring to define correctly the phonological contents in terms of relevant features of at least some of the phonemes.

I cannot overemphasize that the concept of 'relevant feature' I operate with is totally extraneous to that of 'distinctive feature' such as the overwhelming majority of non-functionalist phonologists operate with. Relevant features I operate with are not binary, universal, aprioristic, predetermined. Relevant features must be identified with respect of each individual language whose phonological structure is under investigation, and differ from language to language.

The commutation test continues to be conducted until, not before, both phonemes and archiphonemes have been established.

It is for other functionalists to judge to what extent I have been successful in carrying out the commutation test as I believe in.

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