A QUANTITATIVE METHOD OF PREDICTING AREAS OF PHONEMIC INTERFERENCE*

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The comparison of phonemic systems may be undertaken for a variety of reasons, but one of the commonest and most important concerns the study of interference between languages, which is a matter of great interest not only to the language historian but also to the foreign-language teacher. Despite its importance, this topic has not received a great deal of systematic theoretical discussion, far less in fact than one would expect in the light of the many detailed case studies that have been done.

This is particularly evident in the field of foreign-language teaching, even in work done by those who are sophisticated in terms of modern linguistic theory. No less a specialist than Robert Lado, for example, writes:[1]

> In comparing the sound systems of a foreign language and a native language, I find it good safe practice to take up each phoneme separately regardless of any general patterns of difference I may have observed.

This dismissal of the observed general patterns of difference seems to me unscientific, implying as it does that the establishment of patterns does not enlighten us further on the characteristics of the individual units forming the patterns.

If we turn to the standard treatise of interference, U. Weinreich's *Languages in Contact,* we find a much better approach. The two systems involved are laid out as in Figure I,[2] and those phonemes which are in one system and not in the other are boxed in. Under each system, salient facts about positional and combinatory variants, and about prosody, are written in. This, then, is a method of proceeding by inspection, but there is no defined method of procedure, no particular order of inspection, and the observable patterns are not the essential basis of the inspection.

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[1] Lado 1957: 13.

[2] Weinreich 1953: 15, but giving only the consonant comparison; for a similar procedure, cf. Moulton 1962: 27.

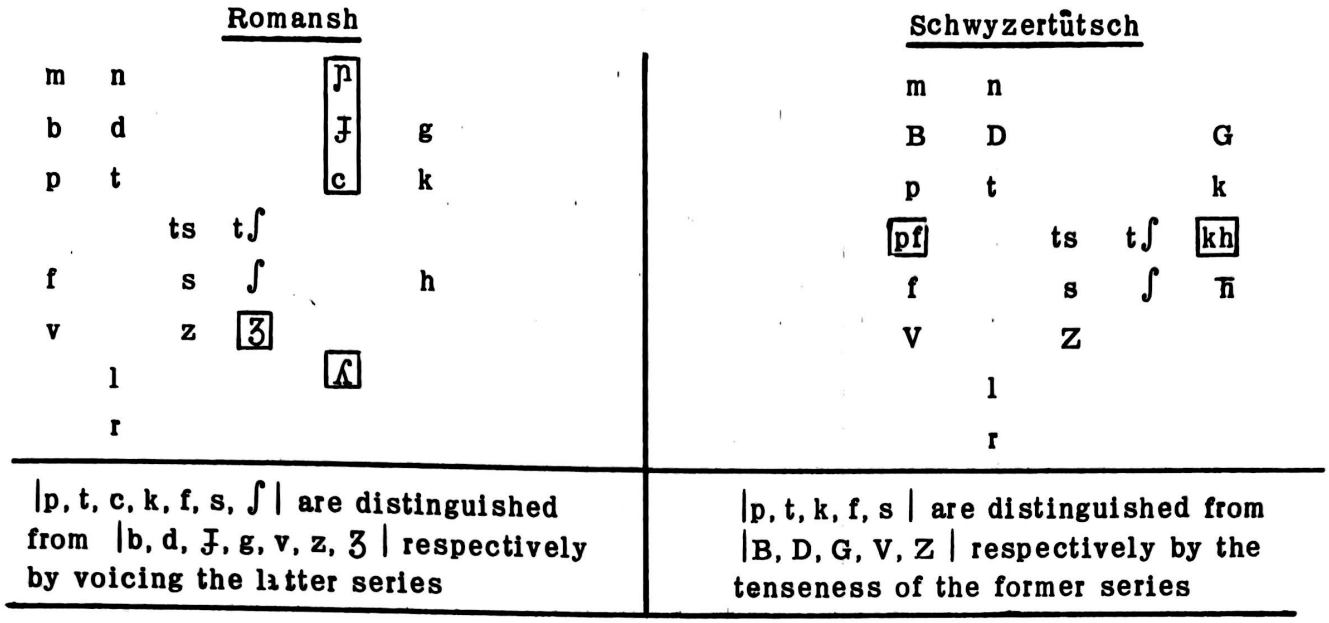

Figure I

A systematic method, based on the patterns characteristic of the phonemic organisation, arises naturally however from the Troubetskoyan approach, as modified in particular by Martinet[3] and Cantineau.[4] Troubetskoy himself did not deal in detail with the question of interference, but it is discussed in a short chapter of his *Principes*.[5] He argues that the phonemic system of a language is like a sieve through which everything uttered must pass; the sieve retains only the phonemic marks which are relevant for the definition of the phonemes. He then goes on to discuss specific examples, and each set of examples deals with a separate stage of the analysis,[6] so that the sieve, as it were, has three nets. His first example concerns the mark of palatalisation which is so fundamental in the Russian consonant system, and which leads a Russian learning German to say [ɪip] for *Dieb*. His second example concerns the positional restrictions of Russian [ə], as a result of which a Russian learning Bulgarian will replace the vowel in Bulgarian |pət| by [a], [E], or [ɯ]. His third example deals with the relation between stress and quantity in Russian, which leads the Russian learning Czech to say [ká:bat] or [kabá:t] for Czech |kába:t|. The primary sieve, then, involves the points of articulation and the correlation marks, the second the positional restrictions and neutralisation, the third the prosodic features of stress, quantity, etc.

In this paper I am concerned only with the first of these, and the fact that it can be quantified in such a way that the areas of interference are immediately and accurately predictable. This approach was first seen some eighteen months ago in studying with a graduate student the interferences responsible for the particular characteristics of the French spoken by a Chinese Tahitian.[7] It has, however, been developed

[3] See in particular Martinet 1957-58.

[4] Cantineau 1960: 127-164.

[5] Troubetskoy 1949: 54-56.

[6] The primacy of the phonemic system over the prosodic is discussed by Martinet 1960: 54-55.

[7] Cf. Hollyman 1964; but the problems of interference are not discussed.

further in preparing this paper, and other examples will be used. We may suitably begin with Weinreich's example, as this will show that the quantified approach suggested is not bound to phonemic analyses done on the Troubetskoyan pattern, but can be used with any accurate phonemic description.

The phonemes are tabulated vertically and horizontally: vertically in the rows they form according to their points of articulation, i.e., in their *orders*;[8] and horizontally in the rows they form according to the mode of passage of the air, i.e., in their *series*.[9] It is in the establishment of the series that the main difference in lay-out occurs as compared with Weinreich's tabulation. In terms of the Romansh system, for example, the fricative nature of |f,v,s,z,ʃ,ʒ| is irrelevant in comparison with the parallelism of opposition between |f|:|v|, |s|:|z|, |ʃ|:|ʒ| on the one hand and |p|:|b|, |t|:|d|, |c|:|ɟ|, |k|:|g| on the other hand. The combination of orders and series of these consonants thus gives a *correlation*[10] marked by voice. Working in this way, we have the following correlations in this Romansh dialect: oral (:nasal), voiced (:unvoiced), affricate (:non-affr.), lateral and vibrant. The Schwyzertütsch dialect gives similar correlations, except that one of tenseness replaces the one of voice in Romansh. The orders are then quantified in the columns of a table directly underneath, and the totals for each correlation are placed on the right. In each case the figure used is that for the total number involved in a given correlation at the given point of articulation: thus |p|:|b|:|m| gives 2 oral: 1 nasal, total 3. This gives a lay-out as in Figure II.

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[8] Cf. Martinet 1955: 69.

[9] Cf. Martinet 1955: 69; a different sense from Cantineau 1960:158.

[10] Cf. Martinet 1955: 70; Cantineau 1960: 160; Troubetskoy 1949:87-90.

Romansh

			ts	tʃ			
p	f	t	s	ʃ	c	k	h
b	v	d	z	ʒ	ɟ	g	
m		n			ɲ		
		l			ʎ		
		r					

Schwyzertütsch

pf			ts	tʃ		kh	
p	f	t	s	ʃ		k	h̄
B	V	D	Z			G	
m		n					
		l					
		r					

									R	S
R	3	2	5	3	3	4	2	1	oral 23	oral 20
S	4	2	5	3	2	0	3	1		
R	2	2	2	2	2	2	2	—	voice 14	tense 10
S	2	2	2	2	0	0	2	—		
R	0	—	—	2	2	—	0	—	affr. 4	affr. 8
S	2	—	—	2	2	—	2	—		
R	—	—	2	—	—	2	—	—	lat. 4	lat. 2
S	—	—	2	—	—	0	—	—		
R	—	—	2	—	—	—	—	—	vibr. 2	vibr. 2
S	—	—	2	—	—	—	—	—		

Figure II

The method of procedure is now as follows:

1. The first correlation is so general that in nearly all cases any differences will re-appear in the other correlations, but it can be significant, as we shall see with a later example.

2. The other correlations are then taken one after the other, and in each order every case where the new language has a larger total than the other (usually native) language is ringed or marked in some way. These are the essential interference areas, and the nature of the adaptation made by the speaker will normally be indicated by the relation between the mark relevant in his own language and the mark relevant in the new language.

3. Check the equal numbers, and those where the mother tongue has more, to see whether there are differences of articulation involved, although these are usually of minor importance.

If we take the case of a Romansh speaker learning Schwyzertütsch, we note:

1. The consonant system of both languages is essentially oral.

2. In the voice and tense correlations there are no interference areas other than the overall difference of their marks. They have been placed side by side because in many languages a correlation of voice is doubled by a coextensive one of laxness, i.e., in the languages concerned voice subsumes laxness, lack of voice subsumes tenseness. This is the case with Romansh, and indicates immediately the adaptation that will be made. The lax consonants of S will be voiced by R speakers, and the tense will be unvoiced.

In the affricate correlation, there are two interference points, in the labial and and palatal orders, involving respectively |pf| and |kh|. In terms of his own system, the R speaker will perceive |pf| as |p| + |f|; and he will see no difference between and therefore merge |kh| and |k| into |k|.

3. Checking reveals the difference between |h| and |ħ|, which would not be observed by R speakers.

If we reverse the relationship, and take an S-speaker learning R, we note:

1. The consonant system of both languages is essentially oral.

2. We have again the voice:tense difference, which means that S-speakers will interpret the unvoiced consonants of R as tense, and the voiced as lax. There are also here two interference points, in the shushing and palatalised orders, involving |ʒ| and |c,ɟ|. In terms of the S system, |ʒ| will be treated as a lax |ʃ|; and |c| and |ɟ| will probably be interpreted as [t]+[j] and [d]+[j] respectively, although |c| may be assimilated to |tʃ|.

In the laterals, we have an interference point involving |ʎ|, which will be interpreted as [l]+[j].

3. Checking reveals the |h|-|ħ| difference, which will not be noticed; and the interference point involving |ɲ|, which will be interpreted as [n]+[j].

At this point it may be asked why, in the numerical tabulation, a total figure for the correlation marks is given rather than the respective numbers for each series making up the correlation, e.g. for Romansh, Oral 20:Nasal 3 rather than Oral 23. The only reason lies in the fact that the major figure does give the mark name since in terms of the phonemic system, Nasal is really Non-Oral; and the interference areas missed through using the total figure are picked up by the subsequent third-stage check. If it is desired to eliminate the third check, then the double set of figures can be used in the mark quantifications.

We may now turn to a more complex example, involving Caaqac[11] and French[12]. Caaqac has a very complicated consonant system, and French a relatively simple one.

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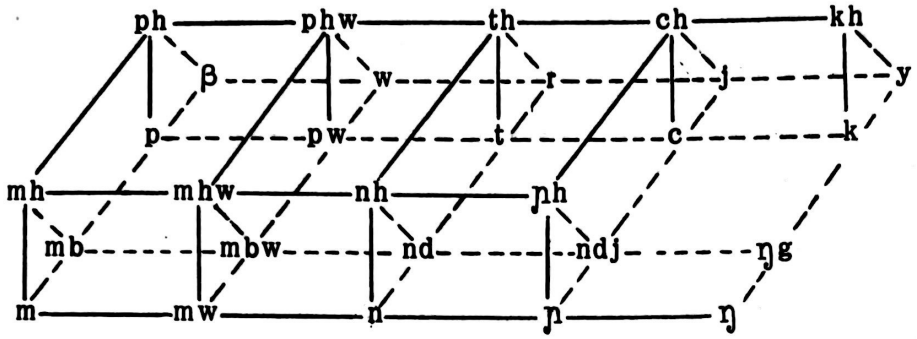
11 See Hollyman 1962. Additional information has shown that the fricative series occur initially in a few words, and may therefore appear as part of the phonemic system. While positional restrictions are important in discussing interference, the archphoneme level is not a practical one for inter-system comparison.

12 See Martinet 1945.

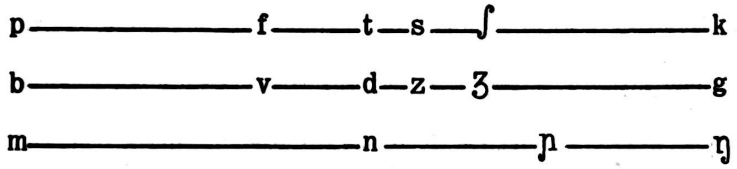
Only the interferences resulting from a Caaqac-speaker learning French will be discussed; the reverse problem, while of great theoretical interest, has to date been of such rare occurrence in practice that it may be left aside. The notable facts here are that we have orders, series and correlations that do not correspond from language to language, and even where there is general correspondence, the details differ. The lay-out is is given in Figure III:

Caaqac



and |l| |h|

French



and |l| |ʀ|

									C	F
C	6	6	0	6	0	0	6	5	Nasal 29(2)	Oral 16 (2)
F	3	0	2	3	2	2	1	3		
C	3	3	—	3	—	—	3	3	Fricative 15	
F	0	0	—	0	—	—	0	0		
C	3	3	—	3	—	—	3	2	Semi-Nas.14	
F	0	0	—	0	—	—	0	0		
C	0	—	0	0	0	0	—	0		Voice 12
F	2	—	2	2	2	2	—	2		
C	2	2	—	2	—	—	2	2	Aspir. 10	
F	0	0	—	0	—	—	0	0		
C	2	2	—	2	—	—	2	—	Press. 8	
F	0	0	—	0	—	—	0	—		

Figure III

1. We note firstly that the consonant system of Caaqac is essentially nasal,[13] whereas that of French is essentially oral. There will therefore almost certainly be interference of this type in the other correlations.

[13] This is not apparent from the table, but is based on the positional uses of the phonemes, cf. Hollyman 1962: 45.

2. Since we are working from Caaqac to French, the next correlation to consider is the one of voice. In Caaqac, voice is co-extensive with all nasal series and with the fricative series: we may therefore expect that the French correlation will be adapted through the influence of these, taking the closest orders into account as well. For |p|:|b|, |t|:|d|, |k|:|g|, therefore, we may expect |p|:|mb|, |t|:|nd|, |k|:|ŋg|; but with |f|:|v|, |s|:|z|, |ʃ|:|ʒ|, we have adaptation to a different order, so that |f|:|v| becomes |ph|:|β|, |s|, |z| are merged in |c|, with [ndj] in intervocalic position (|ch| does not occur other than initially). (Experience of this particular bilingual situation shows that adaptation to the French system is rather better than this, because all Caaqac-speakers are bilingual in Caaqac and another Melanesian language, and the latter often has correlations giving closer parallels with those of French.)

3. Final checking gives the Caaqac |r|, French |ʀ| difference: the Caaqac speaker uses a dental [r] in speaking French.

The discussion so far has been restricted to consonant systems, and there is a reason for this. Vowel systems generally speaking are quantitatively less complex than consonant systems, and there is not the same need for a quantified comparison to show the interference areas. This might be so with languages having a complex set of diphthongs, but the other usual complexities of vowel systems involve quantity and stress, which are prosodic features. In the case of most vowel systems, then, simple inspection would appear to be adequate, as can be seen with the treatment of the French nasal vowels by Caaqac speakers.

	Caaqac localisation			French localisation		
aperture	non-rded	rounded mid	rounded back	non-rded	rounded mid	rounded back
close	i ĩ	y	u ũ	i	y	u
mid	ɛ ɛ̃	œ	o õ	e ɛ ɛ̃	ø œ	o õ ɔ
open	a ã			a		ɑ ɑ̃

Figure IV

The interference here concerns the French |ɑ̃|, which will be merged with |õ| by Caaqac speakers. This has in fact happened, and because this particular solution to the problem is common to speakers of most Melanesian languages in New Caledonia, the consequent reduction of the French nasal vowels to two has become a general feature of New Caledonian French.[14]

14 This reduction has nothing to do with the more recent identical one among some metropolitan French speakers (cf. *Vie et langage* 153/dec.1964/724).

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