

ON THE CONTRASTIVE PHONOLOGY OF THE STRESSED VOWELS IN ENGLISH AND BULGARIAN

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1. INTRODUCTORY NOTES

Although some aspects of the contrastive phonology and phonetics of English and Bulgarian have already been considered at varying length in a number of publications (e.g. in Mincoff (1973), Danchev (1975), (1982), Despotova (1978)), no comprehensive treatment has appeared yet. The purpose of this paper is to (1) offer an overall scheme of the basic correspondences, (2) illustrate a somewhat more specific application of contrastive phonological analysis, and (3) examine briefly some of the methodological and theoretical issues. The presentation is intended to be suggestive rather than exhaustive.

A survey of the literature reveals that almost all the major contrastive phonological studies are pedagogically oriented. Although this very important aspect has been considered here, the original aim was to set up a frame of reference for the cross-language rendition (in this case English → Bulgarian) of proper names, an issue of considerable communicative importance in countries such as Bulgaria, which use a non-Latin alphabet. There arise various difficulties, reflected, for example, in the frequent presence in the receptor language of several different spelling and pronunciation variants of a given source language name (e.g., Anthony may appear as АНТЬНИ or ЕНТЬНИ, Hunter as ХЪНТЪР or ХАНТЪР, a.o. (For more examples and details cf. Danchev 1982)), which often creates public confusion and irritation. As the large majority of authors who have examined the general theoretical and methodological premises of contrastive phonology have worked with Latin script languages, this particular aspect of applied contrastive phonology has been practically overlooked so far.

The present-day proliferation of phonological models has not made the task of the contrastivist linguist any easier (for a survey of some of the

problems cf., e.g., Wardhaugh (1967), Awedyk (1979), Eliasson (1984a)) than it was before the advent of generative phonology. The abstractness issue and the ensuing drift towards more concrete analyses have not contributed very much towards the establishment of a generative contrastive phonology as outlined, for instance, in Fisiak (1976) (and some of the references therein). In fact, in 1984 the impact of generative phonology on contrastive phonology was referred to as "strikingly faint" (Eliasson 1984b:12) and the situation does not seem to have changed very drastically since then. The prevailing orientation of applied contrastive phonological studies has indeed been towards surface phenomena (e.g. in Fisiak et al (1978), Chitoran et al (1984), Basbøll & Wagner (1985)). Given the fact that "surface structure is the decisive factor in the treatment of loanwords" (Fischer-Jørgensen 1979:246) – and foreign names being a variety of loanwords – a more structuralist approach has been adopted here too. As in some other relatively recent publications in the area of contrastive phonology, this does not necessarily imply a general return to structuralist methodology and theoretical principles together with a wholesale rejection of generative grammar. A synthesis of all the productive elements in the various approaches should rather be aimed at (cf., e.g., Bugarski (1982), Grzybowski (1987)).

In any case, irrespective of their theoretical persuasions, most authors agree that the establishment of phonological equivalence remains one of the crucial issues of contrastive phonology. Indeed, the quest for a reliable tertium comparationis here has proved more difficult than in contrastive grammar and lexicology. This is understandable, of course, given the relatively limited number of distinctive features that can be used in phonology as compared to the practically unlimited number of semantic features that can be postulated in general and ad hoc. As a matter of fact, the crudeness of the I. P. A. notation for various distinctive features and the shortcomings of the latter have been criticized repeatedly (cf., e.g. Kohler (1971), Grucza (1976), Lehtonen (1977), Suomi (1983)).

Of the four criteria for establishing equivalence, summed up by Lehtonen (1977), namely, (1) cogency of similar letters in spelling, (2) similarity of phonetic descriptions and conventions of transcription, (3) use of phonological criteria, (4) perceptual similarity, the present approach is based on a combination of the latter three.

The notion of 'phonological translation' (Catford 1965), adopted by a number of authors (e.g. Fisiak 1975) still provides a convenient starting point for certain types of contrastive analysis. It can actually be regarded as an alternative formulation of interlingual substitutions (in terms of Weinreich (1953/1974) and cf. here also Wardhaugh (1967)) and obviously ties in with the idea of "perceptual substitutions as a natural criterion of equivalence" (Lehtonen 1977:38). This makes it possible to relate contrastive phonological

analysis to a broader framework of crosslanguage analysis which includes contact data (cf. Wardhaugh (1967), Nemser & Slama-Cazacu (1970), and also Danchev & Grozeva (1985)). In cases where more than one equivalent is available the choice will depend on phonological and sometimes on other criteria as well (cf. Danchev 1982).

As "the notion of phonemes based on the specifics of any language has been of little value in contrasting languages" (Di Pietro (1978:139), and cf. also Kopczyński (1973)), the use of phonological criteria, or the "phonemic system approach" (Barbour 1984:125) is applied here above all to the similarity of oppositions, not necessarily to complete identity. More specifically, it will be seen that some contrasts are more important than others in both intra- and cross-language terms.

The notion of common phonetic space, which has provided the common frame of reference in this paper, has also given rise to controversial arguments. Whereas certain authors proceed from a universal phonetic space based on the D. Jones cardinal vowels chart (e.g. Chitoran et al 1984), others (e.g. Butcher (1982) reject it in favour of purely phonetic criteria. As a third option a universal classification based on the five most common and basic vowels in the languages of the world – /i/, /e/, /a/, /u/, /o/ (this in terms of Skalička (1961) and statistically motivated also in Maddieson (1984)), to which stressed /ɔ/ has been added, has been accepted here. The overall number of phonetic spaces used as a common frame of reference here is thus six. For the sake of simplicity the phonetic space will be considered as two-dimensional and will be defined by the articulatory features "high", "low", "mid", "central", "front", "back". So as to keep open the possibility for marking differences of degrees, the features are not treated as binary in the strict sense.

Since the system outlined above comes closer to Bulgarian than to English it could be claimed that one cardinal vowel chart, biased towards one or two particular languages (in the case of the traditional chart presumably towards English and/or French), has been merely replaced by another chart, biased towards another language (in this case Bulgarian). However, the fact that Bulgarian happens to be typologically closer to the universal set can also be regarded as a convenient coincidence, which does not invalidate the basic approach in terms of universal properties. It must be admitted, of course, that one type of idealization has been replaced by another, as the 'universal' vowels naturally do not have acoustic correlates rigorously definable in terms of phonic substance.¹ In fact, what we have here can be referred to as 'vowel

¹ It should be possible, theoretically at least, to derive average formant values that could be considered as prototypical by comparing the relevant acoustic data for a statistically representative number of languages (starting perhaps with the 317 sample languages included in the UCLA Phonological Segment Inventory Database – for details cf. Maddieson 1984). The range of such data available today still seems rather limited.

prototypes' to which the vowels in the respective two languages exhibit varying degrees of correspondence or matching, extending over a continuum (cf. Krzeszowski (1986) and the authors mentioned there).

Returning to the question of what to compare worth noting is Gussmann's formulation of the "... basic paradox of contrastive phonological analysis: whatever can be compared in strict, unambiguous terms relates to phonic substance and is of little significance, while the crucial formal aspects of structure can only be approached in an indirect, approximative and partly impressionistic fashion." (Gussmann 1984:34). But if on purely theoretical grounds one might hesitate between one approach or another, in this particular case the question of whether to use a deductive or a data-based approach was settled in advance by the very nature of the task in hand and the existence of a vast corpus of empirical evidence.

As mentioned earlier in this paper, instead of common nouns and words (as is the usual practice), proper nouns have been used here. This has made it possible to avoid artificial contrasts (e.g. of the *thigh* – *thy* and *wreath* – *wreathe* type), i.e., the pairing of words that will hardly ever occur in the same context. Being on the periphery of the structure of language, by their very nature proper nouns are eminently qualified for throwing into relief the importance of surface phonological contrasts, which are often the *only* means of distinguishing communicatively one name from another. Though not novel (the use of proper nouns for phonological analysis is found, e.g., in Jakobson & Halle (1956)), such evidence is still used quite rarely in synchronic contrastive studies (although it is widely used in historical studies).

The names used in this paper are part of a corpus of about ten thousand English (taken in the broad sense, including British, American, Australian, Scottish, etc.) personal, place and other names contained in Danchev (1982) together with their Bulgarian renditions. Only the names that have been transcribed (phonetically and/or phonologically) have been taken into account. All the names whose Bulgarian spelling is traditional (usually bearing the marks of graphic influence – transliteration – of the source language or the mediation of another language) have been left out of consideration.

What has actually been done in this paper is to explicate on a somewhat more theoretical plane the decisions already taken by hundreds of informants (mostly competent bilingual English-Bulgarian translators and interpreters), who have rendered English names with Cyrillic letters in Bulgarian (as summed up in Danchev (1982:40)). This is therefore a post hoc theoretical rationalization of a system already arrived at and tested on more pragmatic grounds. Some kind of a contrastive analysis, albeit rudimentary, underlies most of the empirical decisions mentioned above.

As indicated at the beginning, the highly important question of whether the system of correspondences used for the Bulgarian transcription of English names can be used for pedagogical purposes as well, will also be considered.

The stressed vowels of the two languages will therefore be contrasted in terms of the relevant cross-language substitutions and the phonological contrasts involved. These findings are checked against the phonic substance data in the appendix², after which the vowels belonging to the same phonetic space are specified together with the main differences between them.

2. ANALYSIS

2.0. The comparison is based on the standard varieties of the two languages. The R. P. variety of British English (which is usually taught in Bulgaria) as described, for example, in Gimson 1983, has been used, with occasional brief references to General American English.

The vocalic system of Standard Bulgarian is relatively simple. It has no distinctions based on phonological quantity³ and in addition to the five 'basic' vowels already referred to it also has a stressed mid central /ə/ vowel. Unlike the short vowels of English, the Bulgarian stressed vowels occur word finally too. The system can be presented in the following manner:

/i/		/u/
/e/	/ə/	/o/
		/a/

2.1. E/I/ → B/i/

↗

E/i:/ → B/ij/

As indicated above, the distinction between /I/ and /i:/ in English is often reduced to /i/ in Bulgarian, the latter vowel being unmarked in respect of quantity.

The English /I:/i:/ contrast is usually preserved in minimal pairs such as Китс (Kitts) – Кийтс (Keats), Пит (Pit) – Пийт (Pete), Смит (Smith) – Смийт (Smeeth). The diphthongal (/ij/) spelling (B. *ий*) and pronunciation are used quite consistently in the Bulgarian forms of monosyllabic names such as Дийн (Dean), Лийдс (Leeds), О'Нийл (O'Neil(l)), Флийт Стрийт (Fleet Street), a.o. (for examples cf. Danchev 1982). In polysyllabic names E /i:/

² For competent help in the interpretation of the acoustic data I am indebted to Dr. E. Gerganov from the Laboratory of Applied Linguistics at the Institute for Foreign Students in Sofia.

³ Given the "very questionable status of the concept of "tenseness"" (Suomi 1983:108 f.), I stick to the traditional concepts of "short" and "long" vowels (cf. also Lass 1976, Danchev 1981).

tends to be shortened to /i/, e.g. in *Дифънбейкър* (Diefenbaker) and *Филдинг* (Fielding), thus following the adaptation pattern in ordinary loanwords such as *тим* (team) and *лидер* (leader) (for details cf. Danchev 1986). The tendency for a long vowel to be shorter in polysyllabic words is well known, of course (cf., e.g., Lehiste 1970). B /ij/ is fairly close phonetically to E /i:/, often given as an alternative notation for E /i:/.

It should be noted that /I:/i:/ is the only quantitative contrast of English that can partially be preserved in the corresponding Bulgarian forms. Interestingly, the /ij/ sequence (Bulgarian has no diphthongs proper) in Bulgarian is confined to open syllables only, so that its acceptance in monosyllabic foreign names can be regarded as a marginal phonological innovation (cf. also Danchev 1982, 1986).

A complex correspondence obtains thus, in which the short vowel of the English contrast corresponds to one vowel in Bulgarian and the long vowel of that same contrast corresponds to two vowels in Bulgarian, one of which is the short vowel of the first correspondence.

More or less the same set of correspondences obtains also in the interlanguages of intermediate and advanced Bulgarian learners of English and ought therefore to be taken into account in planning teaching strategies (for details cf. Danchev 1984).

Both the perceptual and acoustic data suggest that all four sounds: E /I/, E /i:/, B /i/ and B /ij/ belong in the same phonetic space, i.e. the space of the universal prototype vowel /i/, specified by the features "high" and "front". The Bulgarian /i/ is lower and shorter/laxer than E /i:/ and higher and longer/tenser than E /I/ (for acoustic measurements here cf. Despotova 1978) and comes closest to the prototype vowel /i/.

2.2 E /e/ → /e/

This is one of the relatively rarer cases of almost one-to-one correspondence, illustrated by numerous examples in the corpus such as *Едуин* (Edwin), *Хенри* (Henry), a.o.

Both the perceptual and acoustic data indicate that the two vowels belong in the same phonetic space, specified by the features "mid" and "front". B /e/ is somewhat longer than E /e/, but otherwise these are the two sounds that come closest to each other in the two languages. In any case, B /e/ is closer to the universal prototype vowel /e/.

2.3. E /æ/ ↘ E /a:/ ↗ B /a/

The grouping together of E /æ/ with E /a:/ may appear somewhat unexpected, but is motivated from the point of view of the receptor language.

As a matter of fact, the real state of things is a bit more complex than suggested by the E /æ/ → B /a/ correspondence indicated above. Depending on a variety of factors (for details cf. Danchev 1988), E /æ/ can be rendered in Bulgarian by means of a trifurcation comprising /e/, /ja/, /a/ in this approximate order in terms of frequency. Occasionally all three renditions can be found in the Bulgarian forms of the same English name, e.g.:

Campbell: Камбъл — Кембъл — Кямбъл

Southampton: Саутхамптън — Саутхемптън — Саутхямптън

The natural impulse for Bulgarians is to identify E /æ/ with B /e/ (and somewhat less frequently with /ja/ in the case of speakers with an Eastern Bulgarian dialectal background — for details cf. Danchev 1988), as is actually the case with the speakers of many other languages judging by loanwords adaptation (cf., e.g., the data in Filipović (1982), Viereck and Bald (1986)) and interlanguage evidence (cf., e.g., Wode (1980), Barbour (1984)). In all such cases the relevant identification cue is evidently provided by the "front" feature, rather than by the "low" feature.

Though phonetically and perceptually motivated, the serious functional shortcoming of the E /æ/ → B /e/ rendition pattern lies in the fact that it obliterates the important /æ:/e/ contrast in English. Whereas in the case of ordinary words (e.g. *pen* — *pan*, *ten* — *tan*) the context will practically always help to avoid any potential misunderstandings and could thus make the /e/ adaptation acceptable (moreover, it occurs in some varieties of English as well), with proper names the situation is quite different. Being less dependent on the context (as, for example, when occurring on a list or when quoted in isolation), proper names are often distinguished solely through the respective surface contrasts, in this case the /æ:/e/ contrast. There are scores of such cases in the corpus, e.g.:

Addington	—	Edington	Farrer	—	Ferrer
Addison	—	Edison	Hadley	—	Hedley
Alice	—	Ellis	Hampstead	—	Hempstead
Anfield	—	Enfield	Hanley	—	Henley
Ashley	—	Eshley	Madoc	—	Medoc
Bagley	—	Begley	Parry	—	Perry
Bradbury	—	Bredbury	Radcliffe	—	Redcliffe
Campbell	—	Kemble	Radford	—	Redford
Charrington	—	Cherrington	Saxton	—	Sexton
Danby	—	Denby	Stratford	—	Stretford

a.o. (for more examples cf. Danchev 1982). In order to avoid the coalescence in the receptor language of names that are distinct in the source language, the

functional criterion requires that E /æ/ should be rendered with /a/ in Bulgarian. The phonemic system criterion therefore helps us to make the communicatively correct choice out of several existing phonological translation equivalents.

The acoustic data show that E /æ/ is closer to B /e/ in F2 values and closer to B /a/ in the F1 values. The fact that Bulgarian native speakers tend to identify E /æ/ mainly as /e/ is due to the fact that F2 is more relevant for the identification of front vowels. It may be recalled that the acceptability of B /a/ for E /æ/ can also be argued for from the point of view of some varieties of English.

Therefore /a/ is recommended as the Bulgarian phonological equivalent of E /æ/, both for the rendition of names and as an acceptable interlanguage variant (where it can provide the starting point for a gradual approximation towards /æ/).

Let us turn now to the E /a:/ → B /a/ correspondence. Since the E /æ/:E /a:/ contrast is lost in Bulgarian there arises the question as to its functional importance. The corpus does not seem to contain any instances in which this contrast is crucial for the distinction of names (except for cases where the lengthening is due to /r/). This is easily explained, of course, since due to specific historical developments R. P. /æ/ and /a:/ usually occur in complementary distribution.

Whereas E /a:/ and B /a/ undoubtedly belong in the same phonetic space, specified by the features "back" and "low", E /æ/ evidently belongs here only partly. In terms of prototype theory this would then be a typical case of 'partial matching' (Krzyszowski 1986). With its "front" feature, which was seen to be perceptually more relevant, E /æ/ matches partially the universal /e/ vowel. However, the functional criteria make us prefer the E / → B /a/ correspondence.

2.4. E /ʌ/ ↘ B /ə/
E /ɜ:/ ↗

This is another instance of two different English sounds being rendered by one sound in Bulgarian (an 'inverse bifurcation', so to speak). A straightforward bifurcation, not indicated above, actually occurs with E /ʌ/, which has two phonological equivalents in Bulgarian — /ə/ (more frequent) and /a/.

Once we have accepted the E /æ/ → B /a/ phonological correspondence (cf. § 2.3 above), the phonological system criterion obviously requires us to render E /ʌ/ with /ə/ (spelled with Cyrillic ъ) in Bulgarian. In this manner the English /ʌ/:/æ/ contrast is preserved in Bulgarian as well, e.g. in names such as

Bunting	— Banting	Humbert	— Hambert
Culver	— Calver	Humphrey	— Hamphrey

Chuffey	— Chaffe,	Rumsay	— Ramsay
Cumbria(n)	— Cambria(n)	Tunner	— Tanner
Dudley	— Dadley	Unstone	— Anston
Durrel	— Darrell	a.o.,	

and there are also names such as

E	B
Redford	Редфорд
Radford	Радфорд
Rudford	Ръдфорд

which make quite obvious the advantage of taking into account surface phonological contrasts, unlike the purely phonetic criteria, which can easily lead to communicative inadequacy.

By means of the /ə/ equivalent the coalescence is avoided in Bulgarian of names that are pronounced distinctively in English. The /ə/ is therefore recommended (and is indeed current in Bulgarian public usage) for the Cyrillic transcription of all English names that contain the /ʌ/ vowel, e.g. Хъдсън (Hudson), Мънди клуб (Monday Club), Сънди Таймс (Sunday Times), a.o.

The same substitution is acceptable for learner interlanguages (moreover, /ə/ instead of /ʌ/ occurs in American English and in some varieties of British English) and such a teaching strategy has indeed been discussed (Danchev 1984).

The E /ɜ:/ → B /ə/ correspondence is practically exceptionless, illustrated by numerous examples such as Бърт (Burt), Ернест (Ernest), Шърли (Shirley), a.o. The obvious question to ask is again whether such a reduction of two vowels in the source language to one vowel in the receptor language is acceptable in view of the existing contrasts in the source language. In this particular case the corpus has not produced any problematical situations. This is due to the fact that since the E /r/ is preserved in the Bulgarian forms the latter will always remain distinctive. From a functional point of view such a solution is therefore acceptable and informationally adequate.

E /ə:/ and B /ə/ belong in the same phonetic space, specified by the features "central" and "mid", whereas E /ʌ/ is closer to the universal /a/ vowel type. This is an obvious instance of a functional correlation being established between vowels belonging to different phonetic spaces.

2.5. E /v/ ↘ B /u/
E /u:/ ↗

The rendition of both E /v/ and /u:/ by means of B /u/ (spelled y in the Cyrillic alphabet) is practically exceptionless, as seen e.g. in names such as Буш (Bush), Гудман (Goodman), Пул (Poole), О'Тул (O'Toole), Джуди (Judy), a.o.

Here too there arises the question as to the functional relevance of the respective contrast in English. It is worth noting at this point that the /v/:/u/ contrast has had a low functional load throughout the history of English (for details cf. Danchev 1981), so that its loss in the Bulgarian renditions of the respective English names does not create any communicative problems (except in some cases of back derivation of names from Bulgarian to English). As regards learner interlanguages, however, the same strategy as with E /i:/ has been recommended, that is (cf. § 2.1), /u:/ in monosyllabic words and /v/ or /v/ in all other cases.

The perceptual and acoustic data indicate that E /v/, E /u:/ and B /u/ belong in the same phonetic space, specified by the features "back" and "high". The Bulgarian vowel is lower and shorter than E /u:/ and higher and longer than E /v/, thus coming closest to the universal /u/ vowel prototype.

2.6. E /ɔ/ ↘ B /o/
E /ɔ:/ ↗

Here too the rendition of both E /ɔ/ and E /ɔ:/ by means of B /o/ is practically exceptionless (some *a* spellings, which reflect the more open quality of the short vowel in American English, e.g. Уатърс (Waters), are statistically unimportant), illustrated by examples such as Огдън (Ogden) and Джон (John) for the short vowel and Ормс (Orms), Хок (Hawk) for the long vowel.

The corpus does not seem to contain many pairs of the Hock: Hawk type and all the minimal pairs in which the long vowel is before /r/ remain distinctive in Bulgarian as well since the /r/ (though silent in R. P. English) is always preserved in the Bulgarian transcriptions of English names. The neutralization of this contrast therefore does not entail any significant communicative problems.

The perceptual and acoustic data indicate that all three vowels considered in this section belong in the same phonetic space, specified by the features "back" and "mid". The Bulgarian vowel is more rounded than either of the English vowels. It is shorter than the E /ɔ:/ and longer than the /ɔ/, thus coming closest to the universal /o/ prototype.

3. SOME CONCLUSIONS

As has been pointed out by Fisiak (1975:346), applied phonological contrastive studies are unidirectional, and thus far the direction has been from English towards Bulgarian. The point now is whether the correspondences established here can be used for pedagogical purposes. As was noted in various places in this paper, practically the same set of correspondences (especially of the short vowels) can be used for teaching strategies as well. This

implies a change of direction, of course, namely from Bulgarian as the native language towards English as the target language. The fact that some of the correspondences turn out to be bidirectional implies that they can be regarded as valid on the systemic level of analysis as well and can therefore be part of an expanded model of contrastive analysis which processes both language and speech data (for a more general description of such a model cf. Danchev & Grozeva (1985)).

The following correspondences (bidirectionality is marked by double arrowheads) can be set up now:

A		B	
Short Vowels		Long Vowels	
E	B	E	B
/ɪ/ ↔	/i/	/i:/ ↗	/ij/
/e/ ↔	/e/		↘ /i/
/æ/ ↔	/a/	/u:/ →	/u/
/v/ ↔	/u/	/ɜ:/ →	/ə/
/ɔ/ ↔	/o/	/ɔ:/ →	/o/
/ʌ/ ↔	ə/	/a:/ →	/a/

The fact that bidirectionality applies only to the short vowels (plus the B /ij/ ↔ E /i:/ correspondence) is evidently due to the absence of long vowels in Bulgarian. On the whole, the scheme of correspondences offered above ensures the preservation of relevant phonological contrasts without violating too much the phonetic parameters (except in the case of E /æ/ and E /ʌ/). On the contrary, by proceeding from perceptual data a degree of naturalness is achieved. The short vowels have the optimal scheme of correspondences (with all the contrasts preserved), whereas the long vowels exhibit neutralization of phonological quantity.

At first sight the neutralization of the vowel quantity contrasts constitutes the most obvious drawback of the above system. However, on closer scrutiny it turned out that the losses are not so significant after all. The degree of loss is assessed through the time honoured functional load criterion of classical phonology. Although its usefulness has been questioned by various authors (e.g. Lass 1980), there are obvious cases where it can be used profitably. The application of this criterion to the data in the corpus revealed, e.g., that the heaviest functional load occurs with the English /I:/i:/ contrast, that is, precisely the one which it is possible to preserve in the receptor language. The English /v/:/u:/ contrast was seen to have a statistically unimportant functional load and most of the remaining contrasts are preserved thanks to the retention and pronunciation in the receptor language of the source language silent /r/.

The approach adopted here evidently points to the further rehabilitation of the surface phoneme, advocated in a number of publications (e.g. Schane (1971), Donegan & Stampe (1979), and cf. also Danchev (1983)). And, as has been pointed out, "... surface sound distinctions, though rehabilitated, have not recovered the very important position which they should have for contrastive analysis" (Barbour 1984:124). One of the aims of this paper has been to draw attention to a specific practical area where such an approach has proved indispensable and productive in cross-language argumentation. Some more far-reaching generalizations and conclusions can be made after the contrastive analysis of the consonants. On the other hand, being confined to static surface phenomena, such an analysis undoubtedly remains incomplete, unless morphophonemic alternations are examined too (cf. also Awedyk 1979). Thus, for example, a generative oriented approach would be needed to capture vocalic alternations in Bulgarian examples such as *xljap* (bread) and *xleben* (adjective, derived from 'bread').

A further refinement of the analysis can be achieved by scaling more precisely the perceptual distances between the various vowels.

The relatively simple system of six phonetic spaces, represented by the universal vowel prototypes /i/, /e/, /a/, /o/, /u/ plus /ə/, has proved sufficient for establishing the basic phonological correspondences of the stressed vowels. Though phonetically crude, it has turned out to be adequate for the establishment of the relevant surface phonology contrasts.

APPENDIX – ACOUSTIC DATA

1. ENGLISH

VOWELS	FORMANT No	Wells (1962)	Delattre (1964)	Henton (1982)
/i:/	1	285	300	272
	2	2373	2200	2361
/I/	1	356	350	380
	2	2098	1950	2085
/e/	1	569	400	525
	2	1965	2100	1943
/æ/	1	748	750	713
	2	1746	1700	1615
/a:/	1	677	750	636
	2	1083	1100	1050
/ɔ/	1	599	550	551
	2	891	900	860
/ɔ:/	1	449	400	429
	2	737	800	697
/v/	1	376	375	406
	2	950	1000	1103

VOWELS	FORMANT No	Wells (1962)	Delattre (1964)	Henton (1982)
/u:/	1	309	300	347
	2	939	900	1149
/ɜ:/	1	581	500	514
	2	1381	1200	1417
/ʌ/	1	722	600	645
	2	1236	1200	1200

2. BULGARIAN

VOWELS	FORMANT No	Tilkov (1968)	Lehiste & Popov (1970)	Simeonova 1975
/i/	1	251	325	242
	2	2006	2140	2187
/e/	1	411	500	373
	2	1665	1810	1751
/ə/	1	350	495	365
	2	1132	1515	1440
/a/	1	513	770	412
	2	1083	1455	1390
/o/	1	367	495	416
	2	794	990	1050
/u/	1	278	365	305
	2	662	945	836

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