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BRNO 2008

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**PHONEMATICS OF CZECH:
AN AXIOMATIC-FUNCTIONALIST VIEW**

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Brno 2008

I hereby confirm that the present thesis was worked out independently. All sources are acknowledged in the accompanying list of references.

Brno, February 21, 2008

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Preface and Acknowledgments

The inventory of phonemes and their mutual relations in Czech have already been described in several studies (Kučera 1961, Vachek 1968, Horálek 1986, Palková 1997, Krčmová 2006). This work wants to offer an alternative view of the phonematics of Czech, a view based on the theory and principles of Axiomatic Functionalism. A description of the phonematic, i.e. of the oppositional aspect of the Czech phonological system is a necessary requisite for a description of the phonotactic aspect of the system by which we mean a description of distributions and combinations of Czech phonemes. A detailed treatment of the latter is as yet lacking but I hope to present its outline in a separate paper.

This work would not be possible without help of many people, though their help was mostly indirect. I want to express my sincere thanks to Jan W. F. Mulder, Tsutomu Akamatsu, Barry Heselwood, James Dickins and Paul Rastall for helping me in understanding functionalism in general and Axiomatic Functionalism in particular. The greatest thanks go to Marie Krčmová whose valuable comments and suggestions led to improvements of this analysis. Though I do not agree with all of them, her comments are always welcomed and carefully thought about. All the errors of this paper and its final form are, however, entirely my own responsibility.

The quotation in Section 2.4 is from *Osudy dobrého vojáka Švejka za světové války* by Jaroslav Hašek (Československý spisovatel, Praha, 1987). The English translation by Cecil Parrott (*The Good Soldier Švejk*, Penguin Books, 1974). A recording of Jan Werich reading extracts from this book was done in 1977-83; it was since then released on several LPs and CDs.

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1. Preliminaries

In this part we address some pre-descriptive and theoretical aspects of the analysis of Czech phonematic system. We discuss what we mean by Czech and what the inventory of Czech sounds is. In addition to that we introduce briefly the theory by which the analysis will be achieved and mention some of its concepts essential for the description of the phonematics of Czech.

1.1 Axiomatic Functionalism

Axiomatic Functionalism (henceforth: AF) is a semiotic paradigm developed by Jan W. F. Mulder in association with Sándor G. J. Hervey at the University of St. Andrews, Scotland since 1960s. It is a structuralist and functionalist approach having many affinities with the functionalism of André Martinet, which itself has many affinities with the functionalism of the Prague School, in particular with its pre-World War II era. There are naturally many differences between these three approaches but the details need not concern us here. It is, however, noteworthy that the differences are minimal or fewer in the domain of phonology than in other linguistic domains. It is particularly true for the phonological theory of Martinetian functionalism and Axiomatic functionalism; these theories are closest to the phonology of Nikolai S. Trubetzkoy of the classical era of the Linguistic Circle of Prague.

Detailed introductions to AF can be found elsewhere (Mulder 1989, 1998, Hervey 1996), and especially useful are treatments of phonology (Mulder 1968, 1987, Hervey 1978, Dickins 2007). We have tried restricting theoretical discussions to a necessary minimum, though the theoretical and methodological background is an essential part of every description. Some notions will be explained throughout this work but only the major points. We must refer to other works for fuller and detailed expositions of the theory and methodology of AF (in addition to the already mentioned, see also Mulder 1975, 1993, 1996).

1.2 Present Standard Czech

Czech is the language spoken by the majority of the inhabitants of the Czech Republic. It has many varieties, spoken, written, dialectal etc. Let it be mentioned straightforward that we do not strive for any precise sociolinguistic classification; we use intuitive terms for a description of stratification of Czech rather than a precise terminology. The variety to be analyzed here can be termed *Present Standard Czech*. There may be, however, some disputes as to what the term might actually comprise. With a risk that we will be charged with criticism, we regard Present Standard Czech to be the generally recognized orthoepic form of present-day Czech descriptions of which can be found in a number of works (Hála 1967, Hůrková 1995, Palková 1997, Krčmová 2006). It may be also queried what present-day Czech is. Such a question may also be hard to answer but let us regard this to be the form of Czech used for the past few decades and the one whose vocabulary (and implicitly also the phonetic realization of) has been described in several dictionaries of Czech, notably in four-volume *Slovník spisovného jazyka českého* [Dictionary of the literary Czech language] (1960-71) and one-volume *Slovník spisovné češtiny pro školu a veřejnost* [Dictionary of literary Czech] (3rd edition, 2003). In addition, there is a huge database of Czech texts, the Czech National Corpus, though it is not limited to standard Czech only. We are thus able to approximate the sound structure of Present Standard Czech and describe it phonologically. We are interested here only in the non-emotive form of Czech because our foremost goal is to examine the distinctive function of Czech phonemes, though we do not deny some speech phenomena may also have other functions.

One of the problems with Standard Czech is the fact that it is rather a literary language seldom used in actual speech. In casual situations Czechs use different, colloquial varieties, mostly dialectal or what is called *obecná čeština* [*Common Czech* (or *Common Bohemian*)]. The phonological systems of colloquial varieties, in particular of Common Czech, are different to that of Standard Czech and hence will not be described here. On the other hand, Common Czech cannot be completely ignored because, by being actually spoken, it is in fact the real Czech language. It remains the most used spoken variety of Czech, the consequence of which is its steady and increasing influence on opinions on what is acceptable as the correct form and correct pronunciation. The standard form of Czech was codi-

fied in 1950s and 1960s by the orthoepic committee of the Academy of Sciences but the committee was dissolved at the beginning of 1990s and there has since then been no any official organ that would prescribe and describe the standard form of Czech. This makes any description of Standard Czech even more difficult, because it cannot be sometimes decided what is correct or not, that is to say, what belongs to the phonological system of Standard Czech and what not. Yet, as mentioned, there are descriptions of the phonic form of Standard Czech and we will base our phonological description on them.

Note that in what follows when we speak about Czech, we mean Present Standard Czech unless mentioned otherwise.

1.3 Phonetic forms

The axiomatic-functionalist theory of the (linguistic) sign holds that a sign is a conjunction of expression and content. Both of these aspects being equivalent, a sign can be viewed from the angle of its expression and accordingly defined as a class of allomorphs, grouped into a class by having and by the capacity of having the same grammatically distinctive function. Every allomorph has a phonological form. The notions “allomorph” and “sign” belong to grammar and should be described there. Phonological form is a phonological notion, describable and accounted for in phonology. It is defined as a class of allophones, grouped into a class by having and by the capacity of having the same phonologically distinctive function. The specification “by the capacity of having a distinctive function” is a necessary one and applies for grammatical as well as phonological entities. Let us take the word *kreseb* “drawing (gen. pl.)” as an example; it may be pronounced as [krɛsɛp] or as [krɛzɛp] but this does not mean the difference between [s] and [z] is not functional. The opposition [s] ~ [z] has the *capacity* of being distinctive (cf. [kosa] *kosa* “scythe” and [koza] *koza* “goat”), even though [krɛsɛp] and [krɛzɛp] are identified as forms of the same sign.

Every allophone has a phonetic form. Naturally, only those phonetic forms with the same phonologically distinctive function are grouped under one phonological form. A phonetic form is a class of impressionistically similar (phonic) images (defined as models

for particular speech sounds pronounced *hic et nunc*). We will not deal especially with images (sc. with actual realizations) unless necessary.

An actual realization of sign is termed in AF *utterance*; it has a form and a reference. For the sake of simplicity the form of utterance can be equaled with the phonetic form as we have defined it here. We may therefore say that a sign has a phonetic form (it will be transcribed with the International Phonetic Alphabet (IPA) here). Phonetic forms are then generalized pronunciations of signs.

Although we speak about signs having phonetic forms, it does not mean that every phonetic form has to be a form of a sign. Phonetic form is a general term for phonetic models of speech events. Without trying to set a clear-cut terminology, we may say that phonetic forms are either single or complex. A single phonetic form is what is usually called a speech sound. Complex phonetic forms are conglomerations of sounds and other phonic features. There are different types of sounds. Some phonetic theories operate with the terms *vocoid* and *contoid* to differentiate the phonetically defined notions (sounds) from the phonologically defined ones (phonemes). Thus when we speak about vocoids and contoids, we mean the phonetically defined concepts of vowels and consonants. To this we will add a term *diphthongoid* standing for the phonetically defined concept of diphthong. It is purely a term of convenience and should not be confused with the meanings other conceptions assign to it. It allows us to use the terms *vowel*, *consonant* and *diphthong* for phonological notions which will be duly defined below.

1.4 Sounds of Czech

In Section 1.2 we mentioned that the orthoepic form of Present Standard Czech had been described in several works and that there were several dictionaries of literary (standard) Czech. There is in addition a huge database of Czech texts in the Czech National Corpus (ČNK), though the database is not restricted to literary (standard) Czech only. Since there are databases of Czech vocabulary and texts and since there are descriptions how these should be pronounced, we can take them as the data for our description, as protocols for

the description (*protocols* in the sense “direct statements of particular observational facts”, see Mulder 1989: 45-7).

The protocols we will in particular deal with are the sounds of Present Standard Czech. They are to be found in Figures 1.4a and 1.4b. The situation is naturally idealized because Czech words can be built of many more sounds but those in the figures are regarded as major contoids, vocoids and diphthongoids of Czech. We can call them *protocolized phonetic forms*. The presentation of Czech vocoids is based on Dankovičová 1999, though there may be other accounts using different IPA symbols (see Section 6.5).

	Bilabial		Labio-dental		Alveolar		Post-alveolar		Palatal		Velar		Glottal	
Nasal		m		ɱ		n				ɲ		ŋ		
Plosive/stop	p	b			t	d			c	ɟ	k	g		ʔ
Affricate					ts	dz	tʃ	ɟʃ						
Fricative			f	v	s	z	ʃ	ʒ			x	ɣ		ħ
Approximant										j				
Trill						r								
Fricative trill					ɾ̥	ɾ̣								
Lateral						l								

Figure 1.4a

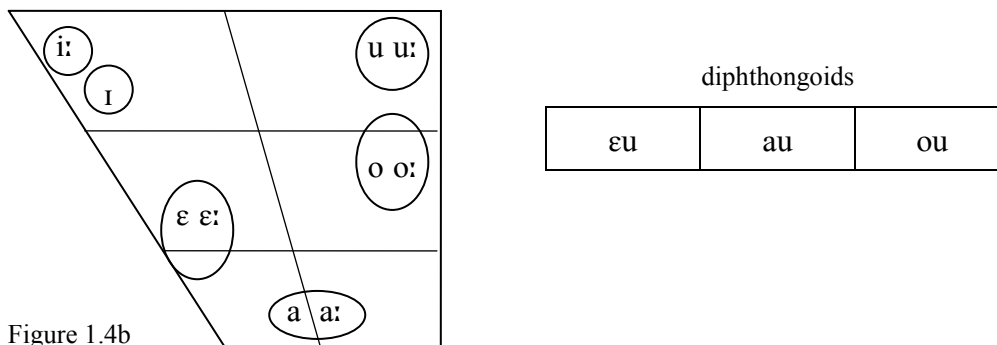


Figure 1.4b

Standard Czech has also several syllabic contoids, i.e. such contoids that constitute the nuclei of phonic syllables. They are [ɾ], [l] and [m]. They occur between two contoids or be-

tween a contoid and the end of a phonetic form, that is, in such positions where the adjacent segments allow for them to be syllabic. While [r] and [l] are fairly common, the status of [m̩] is special. The syllabic bilabial nasal is a very marginal sound in Czech. It occurs only in phonetic forms of *sedm* “seven”, *osm* “eight”, *sedmnáct* “seventeen”, *osmnáct* “eighteen”, *sedmdesát* “seventy”, *osmdesát* “eighty” and a place-name *Rožmberk* and their derivatives. In all of these words the sound is generally replaced by [um]; in fact, the pronunciation with [um] seems to be much commoner. It is then reasonable to posit phonetic forms of these words as [sɛdum], [ʔosum] and [roʒumberk] and to regard [sɛdm̩], [ʔosm̩] and [roʒm̩berk] as marginal phenomena. In other words, we can exclude [m̩] from our data. It will make the analysis simpler because we would otherwise have to group the phoneme /m/ among semiconsonants along with /l/, /r/ due to its capacity of standing in the nucleus of the syllable. Czech may also have a syllabic [n] in e.g. in a name *Trautenberk* (foreign proper name) but this is also only a marginal phenomenon, even more marginal than with the syllabic [m]; it will not be operated with in this analysis, either.

The sounds [r], [l] and [m] can also occur at the beginning of a phonetic form of a word before another contoid. Examples are [rtɪ] *rty* “lips”, [lpi:] *lpi* “(he) sticks to” and [msta] “vengeance”. From the point of view of the sonority scale, these phonetic forms contain two peaks of sonority, one formed by [r], [l] or [m] and the other by a vocoid. However, they are usually regarded as monosyllables by Czech phoneticians (see Hála 1956: 59-64, Palková 1997: 154, Duběda 2005: 132). The peaks of [r], [l] and [m] are said to constitute so-called “side-syllables” (in Czech: *pobočné slabiky*) or secondary syllables (the sounds may be called *extrasyllabic*). Distributionally, they are dependent on the “main” syllables.

From the viewpoint of the sonority scale, the sound [j] is also extrasyllabic when it occurs at the beginning of a phonetic form before a contoid as in [jdu] *jdu* “I go”. However, this is not always mentioned by phoneticians (but see Hála 1956: 63, Krčmová 2006: 159); probably because [j] cannot be syllabic, unlike [r] and [l], and the interpretation of [j] as the non-syllabic variant of [ɹ] is generally rejected.

The sound [ʔ], usually called a glottal or laryngeal stop (in Czech: *ráz*), is not a realization of any phoneme in Czech. It occurs, either optionally or obligatorily, before a vocoid at the beginning of a phonetic form of a word or moneme (morpheme). Because of its capacity of signaling a boundary between phonetic forms, it is interpreted as a realization of

diaereme (corresponding to so-called *junction* in other approaches). For details see Bičan forthcoming (a pre-print version is available, see References).

For the ease of reference we will sometimes speak about *obstruents*. This term includes in Czech all plosives, all fricatives and [r], [ř].

1.5 Definitions of phoneme

If we want to describe the phonematics of Czech, that is, to set the inventory of phonemes in Czech and state relations between them with the aid of the theory of AF, we must necessarily start from the definition of phoneme in the theory. Any description must be theory-based; otherwise it is haphazard and in fact useless.

In linguistic literature we find a number of different definitions of phoneme. One should realize that the definitions are not equivalent and mutually compatible. They generally refer to different entities of different theories, though motivations beyond the definitions tend to be the same. The whole situation is complicated by the fact that almost every linguistic approach calls the basic phonological entity *phoneme*. However, a phoneme of one approach need not and generally does not correspond to a phoneme of another approach. We tried to show this in an article of ours (Bičan 2006) by applying three approaches to the problem of neutralization of word-final obstruents in Czech, though a much more straightforward proof is at hand: in Mulder's axiomatic-functionalist analysis English is analyzed to have 25 phonemes whereas in analyses by approaches that view the phoneme as a family of sounds there are around 44 phonemes (see Mulder 1998: 144). It is fairly obvious that the concept of phoneme in the first approach cannot be identical with that in the second approach.

In AF the definition of phoneme is basically functionalist, that is to say, it goes in the same vein as that of Trubetzkoy's, Jakobson's and/or Martinet's which views phoneme as a bundle of distinctive features. Of course, the conceptions of distinctive features differ considerably, especially that of Jakobson and Martinet. The axiomatic-functionalist conception is closest to the Martinetian one (cf. Martinet 1957/1965).

In many approaches the phoneme is defined as a class of allophones or variants of the phoneme. Though both of the mentioned definitions are legible in their respective frameworks, they are mutually incompatible. If a phoneme is defined as a bundle of distinctive features, it cannot be, at the same time, defined as a class of allophones, as it is not logically feasible. In AF the controversy is forestalled by a distinction between a phoneme and a phonological form: it is the phonological form that is defined as a class of allophones. The phonological form *qua* entity of sign-theory corresponds to the phoneme *qua* entity of systemology. The structure of sign-theory has been sketched above (Section 1.3, see also Bičan 2007); simply said: sign-theory sets the nature of linguistic objects and mutual relation between them. Systemology is deals with internal deployment of linguistic objects, that is, with ways they are used in the system, covering mainly what is understood under classical phonology and grammar. Throughout this paper we will deal with systemology, in particular with phonology, and a description under it. There is only correspondence, not identity, between entities of sign-theory and entities of systemology; the correspondences are illustrated in Figure 1.5a.

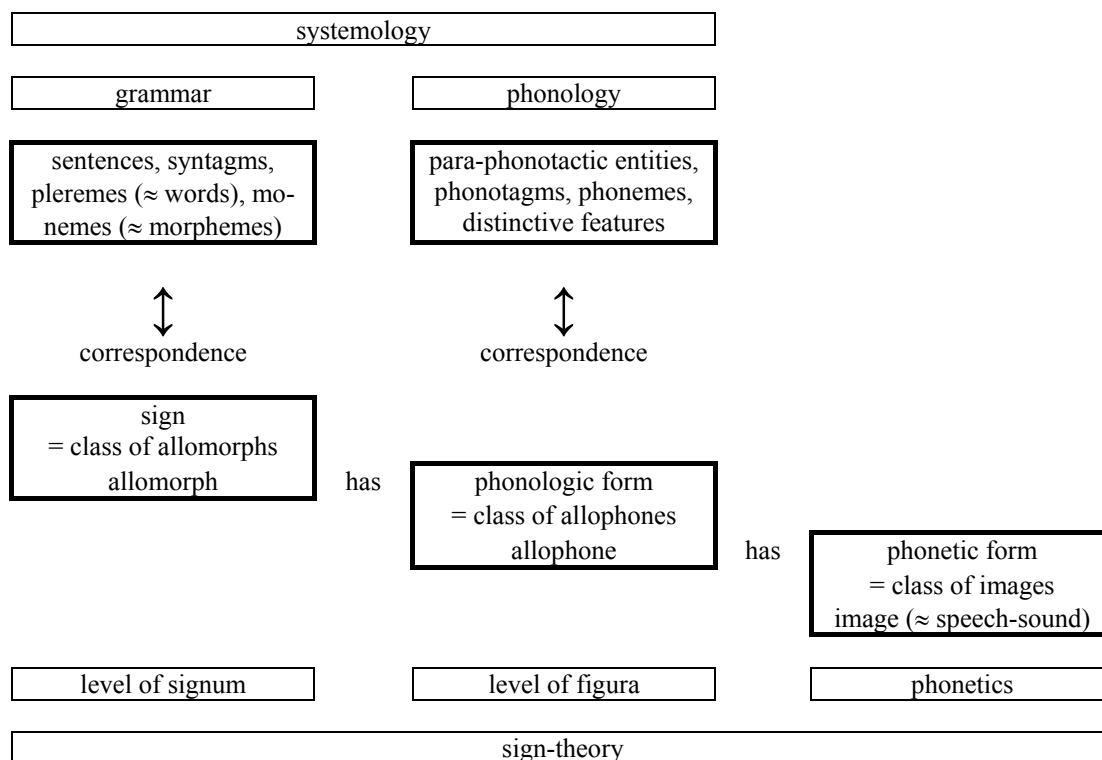


Figure 1.5a

Let us now move to the axiomatic-functionalist conception of phoneme. The definitions relevant for our purposes are the following. Unless mentioned otherwise all definitions are adopted from the so-called *Postulates for Axiomatic Functionalism*, the set of axioms and interpreting definitions forming the core of the theory of AF (see Mulder 1989: 435-57).

‘Phoneme’ for ‘self-contained bundle of one or more distinctive features as its immediate, and at the same time ultimate, constituents’. Alternative definitions: ‘minimum syntagmatic entity in phonological system’, ‘minimum phonotactic entity’.

‘Distinctive feature’ for ‘minimum phonological entity’.

‘Paradigm’ for ‘set of entities in functional opposition in a given context’.

‘Commutation’ for ‘alternation (or: choice) between semiotic entities (or ‘zero’ and semiotic entities) in functional opposition as immediate constituents, in a given context’.

‘Distinctive function’ for ‘the set of oppositions in which an entity may partake’.

‘Paradigmeme’ for ‘member of a paradigm’ (see also Mulder 1968: 118).

‘Syntagmeme’ for ‘paradigmeme in a particular position, and in its capacity of standing in that particular position’ (see also Mulder 1968: 118).

‘Positions’ for ‘divisions within a tactic construction, such that in every such division an entity, as an immediate constituent of that construction, can stand and alternate (i.e. commute) with other entities or with \emptyset ’.

‘Construction’ for ‘self-contained complex of entities in phonological or grammatical system’.

These definitions are very useful because a phoneme is both a paradigmeme and a syntagmeme. As a paradigmeme, a phoneme is a member of a paradigm, i.e. a member of a set of those phonemes commutable in a certain context. The paradigmatic identity of a phoneme is established on the basis of its distinctive function: paradigmemes with the same distinctive function correspond to the same phoneme. However, the distinctive function of a phoneme is not arrived at only in a given paradigm but in the set of all paradigms, i.e. on the basis of all commutations a phoneme may partake in. In other words: the identity of a phoneme is established on the basis of a commutation test, which is a standard functionalist procedure.

1.6 Distributional unit

As a syntagmeme, a phoneme is an entity that stands and/or has the capacity of standing in a particular position. A phoneme can stand in more positions, i.e. it may occupy more places in a construction. This is because any phoneme may be a member of more than one paradigm and thus correspond to more than one paradigmemes. A self-contained bundle of positions in phonology is called *distributional unit*. It is a model upon which the distribution of phonemes can be effectively described. In every position within a distributional unit a phoneme can stand and alternate with other phonemes or with zero.

We may define a special type of distributional unit and call it *syllable*. It is such a bundle of positions one of which is *nuclear*; it is such a position the other positions are dependent upon. The dependent non-nuclear positions are called *peripheral*. The notion “syllable” may be useful and convenient were it not for the danger of being confused with the phonetically defined notion “syllable”. There is of course a natural correspondence between the phonological syllable and the phonic syllable, as the nucleus of the former (i.e. vowel, see below) generally corresponds to the nucleus of the latter (vocoid). However, in AF the syllable is a notion of distribution whereas in phonetics the syllable is usually connected with the problem of syllabification of words. The latter aspect is not so relevant for the axiomatic-functionalist view of syllable *qua* distributional unit (see Bičan forthcoming)

An instance of distributional unit (that is, also of a syllable), i.e. an actual self-contained bundle of syntagmemes (sc. phonemes in particular positions) is called *phonotagm* (Mulder 1989: 444, Mulder 1998: 147). In Czech the distributional unit and hence phonotagms have the form of syllable. However, owing to the possible misunderstandings arisen from the use of the term “syllable”, we will try avoiding the term and will speak about phonotagms instead.

Distributional unit is therefore a self-contained bundle of positions. The bundle is simultaneous, that is there are no ordering relations between the positions within the bundle. The ordering relations exist only between a phoneme and the position in which it stands. The relation “phoneme x standing in a position y ” is ordered, because the phoneme x stands in the position y and not that the position y stands in the phoneme x . So, for a phoneme to be an orderable entity it means it enters into an ordering relation with more than one position.

The vowel phonemes represent an exception in this respect: by definition (see below) they are generally mapped onto one position only, namely the nuclear position, and there is only one nuclear position within the distributional unit.

Figure 1.6a presents an initial hypothesis of the distributional unit in Czech; some phonotagsms are included, too. “e” stands for an explosive, i.e. pre-nuclear peripheral position, “n” for the nuclear position, and “i” for an implosive, i.e. post-nuclear peripheral position; “∅” represents a position not filled but capable of being filled. ‘p’ stands for a pseudo-nuclear position and is set to take account for the so-called extrasyllabic phonemes, i.e. for the word-initial occurrences of /r/, /l/, /M/ and /j/. The capital letters stand for archiphonemes (see Part 5). The figure exemplifies distributional possibilities rather than the usual structure of Czech words. For instance, the words *vzkvět* and *boršč* are rare but belong among the very few where all pre-nuclear and post-nuclear positions were filled, respectively. Why the affricate is represented as /Tš/ will be explained in Section 2.4.

e1 / p	e2	e3	e4	e5	n	i1	i2	i3	i4	phonological form of
F	S	k	v	j	e	∅	T	∅	∅	<i>vzkvět</i> “prosperity”
∅	∅	t	∅	∅	e	∅	K	S	T	<i>text</i> “text”
F	S	h	∅	l	e	∅	T	∅	∅	<i>vzhled</i> “look”
∅	∅	∅	b	∅	o	r	Š	T	Š	<i>boršč</i> “borsch”
l	S	t̚			ī	∅	∅	∅	∅	<i>lstí</i> “trick (instr. sg.)”
r	∅	∅	v	∅	ā	∅	T	∅	∅	<i>rvát</i> “to tear”
j	∅	d	∅	∅	u	∅	∅	∅	∅	<i>jdu</i> “I go”
M	S	d	∅	∅	a	∅	∅	∅	∅	<i>mzda</i> “wage”

Figure 1.6a

Though it is hoped to be the topic of a separate future paper of ours, we may give here a table (Figure 1.6b) exemplifying distributions of Czech phonemes. The particular slots are positions; the slots equivalent to more slots of another row represent archipositions. The reason is that, for instance, the phoneme /t̚/ cannot be followed by any other phoneme except for vowels but can be preceded by two phonemes standing in positions ‘e1’ and ‘e2’. The figure is a result of the analysis yet to be offered in this work but it may, in retrospect,

be appreciated at points which may not be clear in our discussion. Let us note that in the position ‘e1’ there can stand archiphonemes as well as phonemes (e.g. /h/ in /hřmī/ for *hřmī* “(it) thunders” stands there).

e1 / p	e2	e3	e4	e5	n	i1	i2	i3	i4
P T K F S Š X r l j M	T S Š ř	k g x h t d s z š ž	p b f v M	m n ň r l j ř	a e i o u ā ē ī ō ū ä ë ö r, l	m n ň r l j ř	P T K F Š X	T S ř	K T Ě Š
				ť d'			m n ň		

Figure 1.6b

1.7 Types of phonemes

With the distinction between nuclear and peripheral positions settled down, we can sort phonemes to several classes. The following are the most basic ones (cf. Mulder 1989: 226-8):

- 1) A class of mutually commutable phonemes occurring in the nuclear position only. Labeled *vowels*.
- 2) A class of mutually commutable phonemes occurring in peripheral (i.e. non-nuclear) positions only. Labeled *consonants*.
- 3) A class of phonemes occurring in both the nuclear and any of the peripheral positions and thus commuting with the phonemes of the first and of the second class. Labeled *semivowels* or *semiconsonants*.

These classes provide a classification of phonemes which is based on purely phonological criteria. The terms *vowel*, *consonant* and *semivowel/semiconsonant* stand for phonological notions and are thus distinguished from the terms *vocoid* and *contoid*, which are purely phonetic notions. Whether we speak about *semivowels* or *semiconsonants* is irrelevant, because these are only terms, moreover only *phonological* terms. We may prefer the term *semiconsonants*—as we do here—if the class of such phonemes has more affinity to consonants in the given language. Naturally, there is a correlation between vowels and vocoids, between consonants and contoids, and between semiconsonants and syllabic contoids, because there is a natural correlation between the nuclei of phonotagms and the nu-

clei of phonic syllables just as there is a correlation between pre-nuclear and post-nuclear components of phonotagms and pre-nuclear and post-nuclear segments of phonic syllables. However, the correlations need not be absolute. For instance, in English the schwa sound [ə] can constitute the nucleus of a phonic syllable but does not correspond to the nucleus of a phonotagm, because its occurrence is largely predictable and hence non-functional (for details see Heselwood 2007). Similarly, the sound [l] is usually phonetically classified as a contoid but the phoneme /l/ to which it corresponds in Czech is phonologically classified as a semiconsonant, as it may stand in the nuclear position as well as in a peripheral position of the distributional unit.

In addition to this classification, we can sort out phonemes as to what distinctive features they contain. For instance, all phonemes characterized by a distinctive feature ‘occlusive’ can be termed *occlusives*. Since these terms may be both phonetic and phonological, we will use single quotation marks for the phonological terms, hence ‘occlusive’ phonemes and ‘occlusives’ as compared with occlusive sounds. Since we have termed phonetically defined diphthongs as *diphthongoids* for parallelism with the terms *vocoid* and *contoid*, we can restrict the term *diphthong* for all vocalic phonemes that contain the distinctive feature ‘diphthongal’.

2. The *un ou deux phonèmes* problem

In this part we will examine possible interpretations of the protocolized sounds as to whether they may correspond to a single phoneme or to a combination of two (or more) phonemes. There is no absolute correlation “one sound equals one phoneme” and hence such a question has to be raised and answered. The problem concerns mostly the interpretation of diphthongoids and affricates in addition to combinations of labials [p], [b], [f], [v], [m] with [j] or [ɲ].

2.1 Theoretical background

The question whether a group of more than one sound corresponds to one or two (or more phonemes) has bothered linguists for a long time. Numerous solutions have been offered (e.g. Trubetzkoy 1939: 50-9, Martinet 1939/1965) but these have usually suffered from inefficient reliance on purely phonological criteria and resorted to phonetic ones instead. A phonological approach should base its procedures on phonological criteria only, as the phonetic ones belong to phonetics, not to phonology. Moreover, a functionalist approach should use only functional criteria. The problem was addressed in AF, too (see Mulder 1968: 28-30, Hervey 1972: 355-9).

Whether a certain sound group corresponds to one or more phonemes, let alone whether a certain sound corresponds to a phoneme, must be decided on the grounds of the theory, in particular on the grounds of the definition of the phoneme. Without clearly delimiting what a phoneme is we cannot decide whether something corresponds to a phoneme or not. A phoneme, apart from being a self-contained bundle of distinctive features, must be capable of being orderable, because it is the minimum syntagmatic entity. If there is no capacity, there is no phoneme. A group of two sounds [xy] can correspond to two phonemes /ab/ if and only if both of /a/ and /b/ are capable of entering into ordering relations. As already mentioned, the ordering relations take place between phonemes and positions and so two

sounds [xy] can correspond to two phonemes /ab/ if it can be shown that at least one of the tentative phonemes is capable of standing in a different position and thus to enter in a different relation another than the one that applies for the construction /ab/.

In our analysis, however, we must start with a hypothesis that [xy] does not correspond to an ordered group of phonemes. In other words: we must hypothesize that [xy] corresponds to a single simultaneous (unordered) bundle of distinctive features until and unless we refute this hypothesis. We do so because the hypothesis of the absence of ordering relations is simpler than the hypothesis of the existence of ordering relations. It is simpler to assume that there is not something than to assume that there is something. Only if the hypothesis of the absence of ordering relations is refuted, we can say that [xy] corresponds to more than one phoneme. Every singular phoneme is, by definition, an unordered bundle and thus it cannot correspond to an ordered bundle. In practice the hypothesis is usually refuted by finding the reverse combination [yx] and by demonstrating that the reverse sequence is separately relevant. In most cases it will prove that the order of [x] and [y] is functional. An example when this is not so can be [lʒɪtʃka] and [ʒlɪtʃka], both being phonetic forms of the word *lžička* “spoon” in spoken Czech; here a more general strategy must be used.

From the general point of view, the hypothesis is refuted if the members of an alleged combination /ab/, to which [xy] might correspond, all comply with the definitions of phoneme. If not, they cannot be regarded as phonemes. To give an example: if we have a group [ps] in Czech (e.g. [psa:t] *psát* “to write”) the initial hypothesis is that it corresponds to a single phoneme /X/. However, by finding a group [sp] (e.g. [spa:t] *spát* “sleep”) we refute the hypothesis and state that the groups correspond to combinations of more than one phoneme, namely to the combinations /ps/ and /sp/ (or /Ps/ and /Sp/ as neutralization takes place here but this a minor point). A slightly complicated case is with [pt] in e.g. *ptát se* “to ask”: we do not find the reverse combination [tp] but we can still analyze [pt], on the basis of commutation test, as corresponding to /Pt/ because /P/ can be mapped onto a different position within the distributional unit and hence it enters into a different phonotactic relation with /t/, cf. /toP/, *top!* “make heat!”.

The distributional unit provides the field for stating syntagmatic (ordering) relations between positions (precisely, between entities and the positions in which they stand). This is

to say that relations within the whole distributional unit have to be considered for a statement of syntagmatic relations. The sequential order of contoid clusters in pre-nuclear or post-nuclear contexts usually follows some phonetic principles of sonority, and the clusters are usually not reversible. This is the case of English word-initial [str] (e.g. *strength*). However, by finding combinations [rst] (e.g. *first*) or [rts] (e.g. *parts*) within the same distributional unit, we can refute the hypothesis that the word-initially irreversible [str] corresponds to a single phoneme (see Mulder 1989: 296, but Heselwood 2008).

2.2 The case of [pj], [bj], [fj], [vj] and [mɲ]

In Czech the candidates for a monophonemic interpretation are [pj], [bj], [fj], [vj] and [mɲ]. The reason for this is first of all intuitive: from the diachronic point of view, these phonetic combinations arose basically from two sources. First, they are descendants of palatalized labials and are thus correlates of e.g. Russian palatalized labials. In this case they usually occur before [ɛ] and are spelled as *pě, bě, fě, vě* and *mě*, i.e. [pjɛ], [bjɛ], [fjɛ], [vjɛ] and [mɲɛ]. Of these *fě* is rare but nonetheless occurring. The reason *mě* is pronounced as [mɲɛ] is due to additional assimilation; in some dialects (including the present writer's one) it is pronounced [mjɛ] or rather there is free variation between [mɲɛ] and [mjɛ]. Only [mɲɛ] is standard pronunciation, though.

The second source of these sequences is simply from a combination of labials with [j] (or [ɲ]) in morphological processes. In this case they are spelled *pj, bj, fj, vj* and *mň*. Thus, for instance, words *obět'* "sacrifice" and *objet'* "go round!" are distinguished in spelling, though both are pronounced as [objɛc]. In those dialects where *mě* is pronounced as [mjɛ], the word *mě* "I, me (accusative)" can be distinguished from *mň* [mɲɛ] "I, me (dative)".

Though there may be intuitive reasons for regarding [pj], [bj], [fj], [vj] and [mɲ] as corresponding to single phonemes, this solution has been rarely proposed. There are only a few suggestions (Leška 1972, Šefčík 2004/2005) for such an interpretation but they have been based on morphological criteria, which, in the approach adopted for this paper, is a false criterion for a *purely phonological* analysis. For example, Šefčík pointed to the alternation processes reproduced in Figure 2.2a. The figure exemplifies variations between

nominative and locative forms of *chalupa* “cottage”, *palba* “firing”, *karafa* “carafe”, *slíva* “greengage”, *máma* “mummy”, *pata* “heel”, *vláda* “government” and *brána* “gate” (there are additionally alternations between [s] : [ʃ] and [z] : [ʒ] but not in this context).

[xalupa] :	[palba] :	[karafa] :	[sli:va] :	[ma:ma] :
[xalupjɛ]	[palbjɛ]	[karafjɛ]	[sli:vjɛ]	[ma:mjɛ]
<i>chalupa</i> :	<i>palba</i> :	<i>karafa</i> :	<i>slíva</i> :	<i>máma</i> :
<i>chalupě</i>	<i>palbě</i>	<i>karafě</i>	<i>slívě</i>	<i>mámě</i>

[pata] :	[vla:da] :			[bra:na] :
[pacɛ]	[vla:ʒɛ]			[bra:ɲɛ]
<i>pata</i> :	<i>vláda</i> :			<i>brána</i> :
<i>patě</i>	<i>vládě</i>			<i>bráně</i>

Figure 2.2a

The fact that such alternations exist is a strong intuitive reason for the monophonemic interpretation of [pj], [bj], [fj], [vj] and [mj] but not a valid reason for such an interpretation. In a phonological analysis only phonological criteria should be invoked. Variations between phonological forms of allomorphs of one sign are irrelevant for a phonological analysis, because allomorphs are grouped into a sign (as a class) by having the same *grammatically* distinctive function. But whether something has the same grammatically distinctive function is not retrievable from a phonological analysis, but only from a grammatical one.

For the reasons mentioned above, however, the initial hypothesis must be that the combinations [pj], [bj], [fj], [vj] and [mj] (henceforth symbolically as Pj) do indeed correspond to single phonemes, sc. to simultaneous bundles of distinctive features. The reason is that we must suppose that, for instance, the whole of [xalupjɛ] (*chalupě* “cottage (loc. sg.)”) corresponds to a single phoneme and we must maintain this hypothesis until and unless it is not refuted. In the case of [xalupjɛ] it is easily refutable by showing that it can be analyzed as a group of commutable and orderable entities. This analysis will be carried out until we arrive at [pj]. The hypothesis is still that it corresponds to a single phoneme.

An easy way to refute the one-phoneme hypothesis of a certain phonetic sequence is to find a reverse sequence and show that the order is separately relevant for communication. We can refute the hypothesis by attempting to find reverse sequences [jp], [jb], [jf], [jv]

and [ɲm] (symbolically: jP). Compare Figure 2.2b; it shows occurrences of the Pj and jP combinations.

	word-initially	word-medially	word-finally
[pj]	yes	yes	no
[bj]	yes	yes	no
[fj]	yes	yes	no
[vj]	yes	yes	no
[mp]	yes	yes	no
[jp]	no	yes	yes
[jb]	no	yes	no
[jf]	no	yes	yes
[jv]	no	yes	no
[ɲm]	no	yes	no

Figure 2.2b

All Pj combinations occur word-initially, i.e. at the beginning of a phonetic form of a word. Some of the jP combinations occur word-finally but are very rare: [sejf] *sejf* “safe (noun)”, [dʒajf] *džajv* “jive”, [drajf] *drajv* “drive”, [knajp] *knajp* “pub (gen. pl.)”; out of these only *sejf* may be regarded as commonly used (it belongs among the 18 000 most used Czech words according to FSC). Admittedly, the jP combinations occur in phonetic forms of words borrowed from other languages and/or words belonging rather to Common Czech than to Standard Czech. On the basis of these facts we might exclude these words from the set of protocols for the present analysis, that is to say, we can say that the words belong to a dialect of Czech different to the one analyzed here. Though such a decision may certainly be legitimated, the words are clear indicators of the potential of Czech for allowing the jP sequences, and we do not want to ignore this potential. Therefore the words *sejf*, *džajv* etc. are included in the analyzed data.

In the word-medial position, either of the Pj and jP sequences are allowed. Examples of both are very numerous, although the jP sequences are mostly a result of prefixation of the superlative *nej-* “most”: [nejpozɛjɪ] *nejpozději* “at the latest”, [nejboɦatʃi:] *nejbohatší* “richest”, [nejvi:tɛ] *nejvíce* “most of”, [nejfrekventovapejʃi:] *nejfrekventovanější* “most frequent”, [koɲmo] *koňmo* “on-horseback”. We also have [sejfu] *sejfu* “safe (gen. sg.)”,

[ɔʒajvu] *džajvu* “jive (gen. sg.)” and [knajpɪ] *knajpy* “pubs”. Furthermore, even sequences jPj occur, again as results of prefixation of *nej-*: [nejpjeknejʃi:] *nejpěknější* “most beautiful”, [nejbjɛlejʃi:] *nejbělejší* “most white”, [nejvjɛtʃi:] *největší* “biggest”. Cf. also [nejmpɛkʃi:] *nejměkší* “softest”.

These examples suggest that [pj], [bj], [fj], [vj] and [mp] correspond to more than one phoneme because both Pj and jP sequences occur and the order of [p], [b], [f], [v], [m] and [j] is thus functional. In the word-medial context the difference between the Pj and jP sequences is relevant and hence the hypothesis that [pj], [bj], [fj], [vj], [mp] as well as [jp], [jb], [jf], [jv] [jm] correspond to single phonemes, sc. to simultaneous bundles, is refuted.

However, we mentioned that the ordering relations should be stated only in the frame of distributional unit whose structure for Czech was sketched in Section 1.6. Because the distributional unit (i.e. any phonotagm) is characterized by the nuclear element, occupied by vowels, it follows that combinations of phonemes occurring between two vowels extend over two phonotagms. For stating the status of [pj], [bj], [fj], [vj], [mp] and [jp], [jb], [jf], [jv] [jm], we must examine the situation within a single syllable, because the syllable was set as the distributional unit of Czech and the hypothesis that this form of distributional unit is not sufficient for the distribution of Czech phonemes has not so far been refuted.

Because combinations of consonants between two vowels can be assigned to two phonotagms according to how we divide/syllabify forms of words, we cannot be sure whether the intervocalic [pj], [bj], [fj], [vj], [mp] and [jp], [jb], [jf], [jv] [jm] belong to the first or to the second syllable or to both syllables until we apply a calculus for syllabification. However, such a calculus is a product of a prior analysis, namely a prior phonotactic analysis which we could not have conducted yet at this phase of the analysis. Of course, there are ways, usually phonetically defined, how to syllabify words but these ways also result from a prior phonetic analysis and, what is more, phonetic syllabification need not coincide with phonological syllabification, as phonetics and phonology are ontologically and analytically different domains. We will hence not attempt any syllabification at this stage, but take recourse to what is retrievable from the available protocols. Since the beginning of a phonetic form of a word is necessarily the beginning of a phonic syllable and the end of a word is likewise the end of a phonic syllable, there is no reason for hypothesizing that the situation should be otherwise for phonological forms, that is, we can assume that the be-

ginning of a phonological form of a word is the beginning of a phonotagm and the end of a phonological form of a word is the end of a phonotagm. In other words, the context at the beginning of a word before the first nuclear element coincides with the pre-nuclear context in the distributional unit as well as the context at the end of a word after the last nuclear element coincides with the post-nuclear context in the distributional unit.

The ordering relations should be necessarily decided and set within the distributional unit. As to the Pj and jP sequences, the former occur only word-initially and the latter only word-finally in Czech. The jP sequences are limited due neutralization of the opposition between ‘voiceless’ and ‘voiced’ consonants at the end of phonological forms of words, but this is a minor problem now. The sequences Pj and jP are never confronted in the exactly same contexts. This might suggest the hypothesis of the order of the Pj and jP sequences not being functional cannot be refuted. In his analysis of English Mulder himself came across such a problem when analyzing the phonotactic structure of *strength*. He writes (Mulder 1989: 296):

One might say perhaps that, for instance, in /sTɹeŋθ/ ‘strength’, none of the phonemes allows for permutation. But this too is incorrect. Not only can /T/, and /ɹ/ and any of their commutants occur in at least one other position, i.e. in an implosive [= post-nuclear] position, but, also, in implosive position can one find the reverse order /ɹtS/. Admittedly there is no permutability in explosive [= pre-nuclear] position, but this is irrelevant, as one has to consider the whole of the phonotagm, not some part, in assessing ordering relations.

The problem is further discussed in Heselwood 2008 but there is no space to resume the discussion. Suffice it to say we agree with Mulder’s assertion that the ordering relations should be established within the frame of the whole distributional unit. Were it otherwise, analyses would get very complicated, as it is often the case that the sequence of pre-nuclear combinations of consonants (or contoids) mirrors that of post-nuclear combinations (no doubt for phonetic reasons). This is the situation of [pj], [fj] and [jp], [jf]. The sequences [jb] and [jv] are non-occurrent word-finally due to neutralization. The sequence [jɯm] is not attested word-finally; it is going to be discussed presently.

For reasons mentioned we regard the existence of the combinations [jp], [jf] in the post-nuclear context as a sufficient evidence for showing the sequence of [pj], [bj], [fj], [vj],

[mɲ] is communicatively relevant (i.e. functional) and they cannot correspond to simultaneous bundles. The existence of [jp], [jf] is a sufficient proof even for [bj] and [vj], because—as the commutation test will have shown—there is neutralization of the opposition between ‘voiced’ and ‘voiceless’ consonants in post-nuclear positions and hence [jp], [jf] are realizations of /jP/ and /jF/ where /P/ and /F/ are archiphonemes resulting from the neutralization. According to the axiomatic-functionalist view the archiphonemes are phonemes in a sub-system equivalent to two or more phonemes of the over-all system. This means that in the post-nuclear context the archiphonemes /P/ and /F/ are equivalent (note that equivalence does not mean identity!) to phonemes /p/, /b/ and /f/, /v/ of the over-all phonemic system. Hence the combinations /jP/ and /jF/ are in fact equivalent to /jp/, /jb/ and /jf/, /jv/. With this in mind, we can say that the hypothesis of simultaneity of /pj/, /bj/, /fj/ and /vj/ as well as of /jP/ and /jF/ is refuted, too.

A problem remains with [mɲ]: the reverse combination [ɲm] is not attested word-finally (though it is attested word-medially, cf. [koɲmo] *koňmo* “on-horseback”). The non-attestation of word-final [ɲm] may be either an accidental gap or a structural restriction. If it were the former case, it would mean that the word-final [ɲm] is structurally possible and a word containing it has not simply been found in our far-from-exhaustive data. In the latter case the non-attestation would be systematic by not being allowed by the phonological system of Czech. Because we do not want to make arbitrary guesses, we must assume that the non-occurrence is accidental until there is evidence it might not be so. In the case of [ɲm] we have not, however, been able to demonstrate this. Although we can find phonetic forms like [ʃarm] *šarm* “charm”, [jilm] *jilm* “elm” and [kupk] *kuňk* (sound of frog; admittedly, the combination [ɲk] is attested only in onomatopoeic words only but even these words can be included into the corpus of Czech, because they serve as the basis for further derivation, cf. [ˈkupkat] *kuňkat* “to croak”). In these examples either [m] can follow another contoid or [ɲ] can precede another contoid but this does not prove [ɲ] can follow [m]. However, by the lack of examples we cannot refute the hypothesis that a nasal cannot follow another nasal in the post-nuclear context. Two nasals can occur in close proximity in the pre-nuclear context (e.g. [mnoɦo] *mnoho* “a lot of”, [mɲesto] *město* “town”) but there is no such example in the post-nuclear context. We can regard this as evidence that the combination [ɲm] is impossible word-finally. Phonetically, this may perhaps be interpreted so that

[ɲ] is [ɲm] is more sonorous than [m], which is not the case of [r] and [l] in attested [ʃarm] and [jilm].

Yet the non-occurrence of word-final [ɲm] does not necessarily imply that the order of [mɲ] is not functional and that [mɲ] does not correspond to a combination of two phonemes /mň/ (better: /Mň/ as neutralization is taking place here, see Section 5.5). The situation with /Mň/ is similar to that of /Pt/ [pt] we have already discussed: the reverse combination /Tp/ [tp] is not attested but we can still regard it as a combination of two phonemes, because both /P/ and /t/ can stand in different position and thus enter into a different phonotactic relation with each other, cf. /toP/, *top!* “make heat!”. So is the case with /Mň/: both /M/ (or /m/) and /ň/ can stand in different positions and thus enter into different mutual phonotactic relations, cf. /MStňe/ [mstɲe] *mstně* “vengefully”, /mīň/ [mi:ɲ] *míň* “less” or the first syllable of *mínit* “to deem”, /ňim/ [ɲim] *nim* “them (dat.)”. On the basis of this evidence we can conclude that even [mɲ] corresponds to a combination of two phonemes and not to a single phoneme. This is indirectly supported by the fact the combinations [mɲ] and [ɲm] both occur word-medially.

2.3 The case of [au], [ɛu] and [ou]

The reason we spent a lot of space on the problem of [pj], [bj], [fj], [vj] and [mɲ] is because the discussion of other possible candidates for one-phoneme interpretation can be briefer. Among such candidates belong diphthongoids [au], [ɛu] and [ou]. The problem of the diphthongoids and their phonemic status has been one of the most discussed topics in phonematics of Czech. A summary of views can be found in Palková 1997: 196-8 (see also Vachek 1968, ch. III). Standpoints were various just as were the arguments for and against the monophonemic evaluation. However, it should be borne in mind that whether something is a phoneme or not (including whether something corresponds to one or two phonemes) must be solved on the grounds of the definition of phoneme in the theory adopted for the description! Arguments about the origin of the particular diphthongoids, about their phonic properties and/or about morphological alternations between alleged diphthongs

and simple vowels do not simply hold, because the definitions provided by the theory are prior to any of these stipulations.

If the diphthongoids are to correspond to combinations of more than one phoneme, we have to decide to what combinations that might be. From the phonetic point of view, the most adequate hypothesis is that they correspond to combinations of /a/, /e/, /o/ with /u/, sc. to /au/, /eu/ and /ou/. Though interpretations of the Czech diphthongoids differ, this is the analysis usually proposed. However, the hypothesis that the diphthongoids [au], [eu] and [ou] correspond to /au/, /eu/ and /ou/ cannot be defended, because it is not consistent with the theoretical principles we have adopted here. As /au/, /eu/, /ou/ are, by assumption, combinations of two phonemes, we should be able to show that each of the phonemes in the combinations complies with the definition of phoneme. A phoneme, by definition, should be functionally orderable, but the alleged phoneme /u/ in /au/, /eu/, /ou/ does not have this capacity: /u/ always follows either of /a/, /e/, /o/ *within one phonotagm* and hence the order of /au/, /eu/, /ou/ is not functional, as it is predictable. The condition “within one phonotagm” is important, because the phonotagm/syllable *qua* distributional unit is the field upon which ordering relations are postulated. The reverse combinations /ua/, /ue/, /uo/ do occur in Czech but not within one syllable. Though we view the syllable as a phonological notion, it has phonic correlates nonetheless: the nucleus of the phonological syllable (upon which other entities are dependent for their tactic functions) correlates with a vowel (or a syllabic contour) as the nucleus of the phonic syllable (upon which the very existence of the phonic syllable is dependent). The alleged combinations /au/, /eu/ and /ou/ would belong to one syllable whereas the combinations /ua/, /ue/ and /uo/ break up to two syllables (cf. [ʔaktu.alɪtɪ] *actuality* “current news”, [ʔɛmanu.ɛla] *Emanuela* (proper name), [vaku.ovi:] *vakuový* “vacual”). As the combinations /ua/, /ue/ and /uo/ do not occur within one syllable, they cannot be confronted with /au/, /eu/, /ou/ within the domain of one syllable and hence we cannot refute the hypothesis that /au/, /eu/, /ou/ are simultaneous bundles. If /au/, /eu/, /ou/ are simultaneous bundles, they are not combinations of two phonemes and hence the hypothesis that [au], [eu] and [ou] correspond to phoneme combinations /au/, /eu/ and /ou/ is refuted. Moreover, there exist genuine combinations /au/, /eu/, /ou/ which are, like /ua/, /ue/ /uo/, breakable into two syllables: [na.utʃɪt] *naučit* “to teach”, [nɛ.umɲɛt] *neumět* “not to know”, [do.utʃɪt] *doučit* “to finish teaching”.

Even if we supposed that [au], [ɛu] and [ou] correspond, not to /au/, /ɛu/ and /ou/, but, say, to /aX/, /eX/, /oX/ where X would be a certain phoneme distinct from others, we would have to abandon this hypothesis, because the reverse combinations /Xa/, /Xe/, /Xo/ would not be attested. This is not true for other combinations with vowels. Let us take the sequences [aj], [ɛj], [ɪj], [oj] or [uj], which are, from the phonetic view, very similar to the diphthongoids [au], [ɛu], [ou]. In the case of these segments we cannot maintain that they correspond to single phonemes, because we cannot refute the hypothesis of the absence of ordering relations. If we assume that they correspond to combinations /aj/, /ɛj/, /ij/, /oj/ and /uj/, we can immediately show that these are genuine combinations of phonemes because we can find, within one syllable, the reverse combinations /ja/, /je/, /ji/, /jo/, /ju/, cf. *kraj* “country” ~ *jak* “how”, *lej* “pour!” ~ *jel* “(he) went”, *pyj* “phallus” ~ *jim* “to them”, *boj* “fight” ~ *jo* “yeah” (combinations /j/ + /o/ are rare but cf. *Josef* (name) or *zbrojovka* “armory”), *junior* “junior”, *kupuju* “I buy” ~ *sluj* “cavern”. The examples prove that the order of /aj/, /ɛj/ etc. is functional. What is more, we can find /āj/, /īj/, /ōj/, /ūj/ (though not /ēj/, to be discussed in Section 5.6) and /jā/, /jē/, /jī/, /jō/, /jū/: *máj* “May” ~ *já* “I”, *října* “October (gen. sg.)” ~ *jídlo* “meal”, *bójka* “makefast” ~ *jód* “iodine”, *můj* “my” ~ *bojů* “fight (gen. pl.)”. The combination /jē/ is special; it appears to occur only in words of foreign origin such as *foyer*, pronounced in Czech as [foaje:] or *foxteriér* [foksterije:r]. We do not find /āu/, /ēu/ and /ōu/. Note also that the diphthongoids [au], [ɛu], [ou] cannot even be interpreted as /av/, /ev/, /ov/, i.e. the latter part of the diphthongs cannot be equaled with /v/ as it might be the case in Slovak. This analysis is not possible for Czech owing of the existence of the genuine combinations /av/, /ev/, /ov/: [ħavran] *havran* “raven” ~ [ʔaura] *aura* “aura”, [ʔevropa] *Evropa* “Europe” ~ [ʔeuro] *euro* “euro”, [povražʒit] *povraždit* “to massacre” ~ [fspoura] *vzpoura* “mutiny”.

All in all, the only appropriate hypothesis, and the one we will hold until refuted, is that [au], [ɛu] and [ou] correspond to single phonemes.

2.4 The case of [ts], [ɟ], [tʃ] and [dʒ]

The problem of the affricates [ts], [ɟ], [tʃ] and [dʒ] is different to the previous ones. In this case we will arrive at the conclusion that the hypothesis of their correspondence to single

phonemes can be maintained but that the solution according which they correspond to phoneme combinations /ts/, /dz/, /tš/ and /dž/ (better: /Ts/, /Tz/, /Tš/, /Tž/) will be much simpler. Such a solution has been seldom considered by analysts of Czech, though.

The initial hypothesis must nevertheless be such that [ts], [ɟ], [tʃ] and [dʒ] correspond to simultaneous bundles. To keep things simple we are going to discuss only [ts] and [tʃ], because their voiced counterparts [ɟ] and [dʒ] are very rare (for instance, [ɟ] occurs word-initially only in [ɟɪŋkat] *dzinkat* “to give a sound similar to [ɟ]” (we are not aware of any other example); [dʒ] occurs word-initially only in words of foreign origin: [dʒus] *džus* “juice”—note that the foreign origin does not exclude them from Czech!. If we want to refute the hypothesis that they correspond to simultaneous bundles, sc. to show that they correspond to combinations of two or more phonemes, we should be able to prove that the sequence of the alleged combinations is functional. The question is to what combinations of phonemes the affricate could correspond. According to the phonetic nature of the affricates the most appropriate candidates are combination /ts/ and /tš/ (or better /Ts/ and /Tš/ as neutralization would take place here, but for the sake of argument let us ignore it here). Admittedly, the initial occlusion of [tʃ] is post-alveolar whereas it is alveolar in [ts] but this is a minor point. Our task is now to find out whether the order of /ts/, /tš/ is functional. The existence of the following examples immediately proves it is: [stan] *stan* “tent”, [ʃta:p] *štáb* “headquarters”, [tsa:r] *cár* “rag”, [tʃa:p] *čáp* “stork”, [past] *past* “trap”, [baʃt] *bašt* “bastion (gen. pl.)”, [pets] *pec* “oven”, [petʃ] *peč!* “bake!”. These examples refute the hypothesis that the order of /ts/ and /tš/ is not functional. It is functional and in this regard there is no obstacle for not assuming [ts] and [tʃ] as corresponding to /ts/ and /tš/, respectively. But let us now examine whether it is an adequate hypothesis.

Most analysts of Czech, especially those with Czech as the mother tongue, regard [ts] and [tʃ] as corresponding to single phonemes /c/ and /č/, distinct from the other phonemes. The reasons for this are various and are summarized by Palková (1997: 240-1). First, the reasons are phonic: the affricates behave like single sounds, albeit with two phases, the occlusive one and constrictive one but the two phases cannot be separated by explosion. This is unlike real combinations /ts/, /tš/ (and /tc/, /tč/) where the occlusive and constrictive phases are clearly distinguished. It should be mentioned that phonic criteria are not necessarily decisive in a phonological analysis. The fact that the affricates [ts], [tʃ] have similar

characteristics like single sounds does not mean that they must correspond to single phonemes. There is no a priori correlation “one sound = one phoneme”, because phonemes are entities of a quite different dimension and nature than sounds, that is to say, a phoneme in functionalist phonology is not a generalized family of sounds but an abstract model accounting for certain speech phenomena. Hence a combination of two phonemes /ts/ may be a model for a single speech sound [ts] if the model is appropriate and can be applied to the given speech event.

What is more important is the fact that the affricates [ts], [tʃ] can be confronted with genuine combinations of sounds [t.s], [t.ʃ] (and also with [t.ts], [t.tʃ]). If so, we cannot maintain that [ts], [tʃ] correspond to /ts/, /tʃ/, because we would fail to account for a functional difference between [ts], [tʃ] and [t.s], [t.ʃ]. Cf. the following examples (see Kučera 1961: 32, Vachek 1968: 71, Palková 1997: 240):

[klatsku] *klacku* “stick (gen. sg.) ~ [klat.sku] *Kladsku* (place-names, loc. sg.)

[pra:tʃe] *práce* “work” ~ [pra:t.se] *prát se* “to fight”

[vjɛtsem] *věcem* “thing (dat. pl.)” ~ [vjet.sem] *vjet sem* “to come here”

[ra:tʃe] *ráce* “race” ~ [ra:t.se] *rád se (dívá)* “(he) likes to (watch)”

[potʃi:t] *počít* “to conceive” ~ [pot.ʃi:t] *podšít* “to underline”

[ɦrɛtʃi:] *hrčí* “(he) clatters” ~ [ɦrt.ʃi:] *hrdší* “prouder”

[mratʃi:] *mračí* “(he) frowns” ~ [mlat.ʃi:] *mladší* “younger”

[ritʃi:] *řičí* “(he) howls” ~ [rit.ʃi:] *řidší* “scarcer”

These pairs are strong evidence that there is a communicational (functional) difference between the affricates [ts], [tʃ] and the combinations [t.s], [t.ʃ]. However, the examples have to be carefully examined before any conclusion is stated. First of all, the difference between some of the forms is somewhat artificial or rather potential: although the words *Kladsku*, *hrdší*, *mladší*, *řidší* may be pronounced with a sequence occlusive + constrictive, the pronunciation with an affricate seems to be much more common (cf. Novotná 1962) and is in addition recognized as standard pronunciation (Hála 1967: 56, Hůrková 1995: 32-3, Palková 1997: 334). The pronunciation with [t.s], [t.ʃ] occurs in careful speech and apparently when a speaker wants to indicate the morpheme boundary (cf. *hrdý* “proud” vs. *hrdší* “prouder”, *mladý* “young” vs. *mladší* “younger”). The situation with *prát se*, *rád se*, *podšít* is slightly different. The pronunciation with an affricate is not recognized as correct

in this case, though it appears to be rather common (Jan Werich reading from *The Good Soldier Švejk* pronounced *prát se* in the sentence *Kam se serete, vy a prát se*. “You fight? Who d’you think you bloody well are?” as *práce* [pra:tse] “work”; it does not prove anything, it only shows it is possible). The codification requires pronunciation with occlusive + constrictive to highlight the morphemic boundary (cf. Palková 1997: 334 but Hůrková 1995: 33 where it is said that such pronunciation is *recommended*, not *required*). If the pronunciation with [t.s] and [t.ʃ] is used to indicate the boundary between forms, it follows that it is a so-called boundary signal (Grenzsignale). For that reason we find it reasonable to postulate a para-phonotactic (prosodic/suprasegmental) feature diaereme (roughly: juncture) accounting for such “highlighted” boundaries (for details see Bičan forthcoming). The consequence of this is such that the opposition between [ts], [tʃ] and [t.s], [t.ʃ] does not obtain within the same syllable but across two syllables, as the phonetic forms [t.s], [t.ʃ] occurs only across syllable boundaries. It is irrelevant that the boundary coincides with a word boundary in the examples like *prát se* but with a morpheme boundary in the cases like *hrdší, podšít*. For a phonological analysis it is irrelevant between which grammatical entities the boundary exists; relevant is only the fact that there are phonetically salient boundaries between certain forms. Phonology is to account for phonic data, not for grammatical. Kučera (1961: 32) considered our solution for *hrdší*, i.e. with a marked syllable boundary, but rejected it saying that “[i]t is considerable simpler to add two phonemes [i.e. /c/, /č/] to the inventory than to mark all syllabic boundaries”. He operated with junctures but was apparently reluctant to analyze *hrdší* as containing a juncture, because his junctures correlated with grammatical boundaries but this is not necessarily the case for our diaereme. Our diaereme accounts for boundaries between phonological forms such that these boundaries are not marked phonotactically but para-phonotactically (a phonotactic boundary is e.g. between /T/ and /h/ in *nádherný*, because the combination /Th/ does not occur within one and the same phonotagm). Hence we analyze *hrdší* as /#hrT#šĩ#/ just as we analyze *prát se* as /#prāT#se#/ where ‘#’ stands for diaereme.

To conclude this we can say that the alleged difference between the affricates [ts], [tʃ] and occlusive + constrictive combinations [t.s], [t.ʃ] will not be, in our analysis, explained on the phonematic level by postulating separate phonemes /c/, /č/ but on the para-phonotactic (suprasegmental) level by regarding [t.s], [t.ʃ] as boundary signals. Hence the

difference between *prát se* and *práce* will be phonologically represented as a difference between /#prāT#se#/ and /#prāTse#/. If *prát se* is pronounced as [pra:tse], the boundary was neglected and the word is homophonous with *práce*. Phonologically, this is quite simple: the second diaereme in /#prāT#se#/ was “erased” and the form became /#prāTse#/. However, this fact should not play the decisive role in the evaluation of the affricates [ts], [tʃ] as combinations /Ts/, /Tš/. It only hints the analysis is adequate to the data but the analysis must be first of all consistent with the principles of the theory adopted for the analysis. We have shown that the analysis follows the principles.

Having—he hope convincingly—dismissed one of the objections why the affricates [ts], [tʃ] cannot be represented by two-phoneme combinations /Ts/, /Tš/, we can discuss another point. The other objection against the two-phoneme interpretation is distributional (see Palková 1997: 240): the distribution of the affricates parallels that of other single phonemes. Cf. the following examples:

[ra:t.tse] *rádce* “advisor” (cf. *race* and *rád se* above)

[vjet.tsem] *vědcem* “scientist (instr. sg.)” (cf. *vjet sem* and *věcem* above)

[rats.tsɪ] *racci* “sea-gulls”

[křetʃ.tʃi:] *křečči* “hamster’s”

If the affricates were represented as /Ts/ and /Tš/, this means we would get these combinations: /TTs/, /TTš/, /TSTs/, /TŠTš/ (there is again neutralization taking place). However, this is not such a major problem because the combinations are across syllable boundaries, not within one phonotagm (this is to say: neither of the combinations occurs at the beginning or at the end of a phonotagm, but always between two phonotagms). Admittedly, the combinations, in particular /TSTs/, /TŠTš/, would be quite peculiar in the system of combinations of Czech phonemes. The affricates seem indeed to behave as single phonemes in this situation but we can go along with this as long as we can show that our proposed analysis is still simpler than the one where [ts] and [tʃ] are interpreted as separate phonemes /c/ and /č/. Let it be also noted that [t.ts] in [ra:t.tse] *rádce* “advisor” is likely to be simplified to [ra:tse] in casual speech, though it would not be recognized as correct pronunciation. A similar simplification that is, however, acceptable is that of [sřt.tse] to [sřtse] *srdce* “heart”.

A note ought also to be dedicated to geminates [ts.ts] and [tʃ.tʃ]. The form [rats.tsɪ] *racci* “sea-gulls” can be confronted with [ratsɪ] *raci* “crabs”. It has been argued that the difference between [ts.ts] and [ts] has no real communicative significance because even we pronounced *racci* as [ratsɪ], it would be clear from the context we meant *racci* not *raci*. This being certainly a possibility, we have nonetheless overheard a person consistently saying [luts.tɛ] as a realization of *Lucce*, the dative form of a proper name *Lucka* even though the conversational situation did not allow for confusion for [lutɛ] which is not even a phonetic form of any Czech word.

We hold that the analysis in which the affricates are represented as two-phoneme sequences /Ts/, /Tš/ is simpler than the one that analyzes them as single phonemes /c/, /č/. We have demonstrated that there is no structural constrain for not postulating /Ts/, /Tš/: the hypothesis is both consistent and adequate.

The proposed solution is, first, phonematically simpler. If we operate with /c/, /č/, the inventory of the Czech phonemes will have two more members than in an analysis where the affricates would correspond to /Ts/, /Tš/. In our proposed analysis the inventory of phonemes in Czech is therefore smaller. In fact, we would also have had to postulate in total four additional phonemes in order to account even for the voiced affricates [ɟ] and [ʤ]. Though the first is rather marginal (word-initially probably only in *dzinkat*), the other occurs in a number of words like *džus* (it does not matter they are of foreign origin). In our analysis they are represented as /Tz/ and /Tž/. So instead of positing four additional phonemes /c/, /č/, /ɟ/, /ʤ/ accounting for [ts], [tʃ], [ɟ], [ʤ], we make do with combinations of phonemes already established, namely with /Ts/, /Tš/, /Tz/, /Tž/.

The simplicity of our analysis also manifests itself on the phonotactic level. Cf. Figure 2.4a which show some interesting patterns. If the affricates were represented by separate phonemes /c/, /č/, we would have to conclude that within the field of one syllable the combinations /Ts/, /Tš/ are non-occurrent, because they would, as said above, occur only across syllable boundaries. Our analysis hence fills up some lacunae.

The figure shows attested combinations of ‘occlusives’ with /s/, /z/, /š/ and /ž/; the combinations with /g/ are virtually non-occurrent due to the marginal status of /g/; the combinations /Pž/, /Ks/ and /Šd/ are admittedly very rare. The relevant examples are: *spát* “to sleep”, *psát* “to write”, *zbořit* “to destroy”, *bzučet* “to buzz”, *stát* “to stand”, *zdát se* “to

seem”, *skála* “rock”, *xilofón* (i.e. *ks-*) “xylophone”, *špatný* “bad”, *pšenice* “corn”, *džbán* “jug” (pronounced [ʒba:n]), *bžunda* “fun”, *štáb* “headquarters”, *ždanovský* “Ždanov (adj.)” (derived from the proper name *Ždanov*), *škola* “school”, *kšandy* “braces”.

/Sp/	/Sb/	/St/	/Sd/	/Sk/	(/Sg/
[sp]	[zb]	[st]	[zd]	[sk]	[zg])
/Ps/	/Pz/	?	?	/Ks/	(/Kz/
[ps]	[bz]			[ks]	[gz])

/Šp/	/Šb/	/Št/	/Šd/	/Šk/	(/Šg/
[ʃp]	[ʒb]	[ʃt]	[ʒd]	[ʃk]	[ʒg])
/Pš/	/Pž/	?	?	/Kš/	(/Kž/
[pʃ]	[bʒ]			[kʃ]	[gʒ])

Figure 2.4a

We can also examine combinations of phonemes at the end of phonotagms. We have /PS/ in *zips* “zipper”, /KS/ in *koks* “coke” but we will not have /TS/ unless we analyze *pec* “oven” as /peTS/. Similarly, we have /PŠ/, though only in a name *Hybš*, /KŠ/ in *jakžtakž* “so so” but we will not have /TŠ/ unless we analyze *peč* “bake!” as /peTŠ/. Moreover, we have /PST/ in *zábst* “to freeze” and /KST/ in *text* “text” and we can also have /TST/ in *péct* “to bake”.

The pre-nuclear /Ts/, /Tš/ and post-nuclear /TS/, /TŠ/ follow a general pattern for combinations and a statement of this fact simplifies the phonotactic analysis because we do not have to postulate any restrictions on distribution. If we analyzed the affricates as separate phonemes /c/, /č/, /dʒ/, /dž/, we would have to set a restriction on the occurrence of /t/ and /d/ (better: on their archiphoneme /T/), as they/it could not be followed by /s/, /z/, /š/, /ž/, though other ‘occlusives’ would have this capacity. So even on the phonotactic level our analysis is simpler.

Finally, let us note that we mention intuition here and there in this work but we also always hasten to add that intuition has no decisive role in our analysis, though we naturally welcome intuitive solutions. The analysis of the affricates to two-phoneme combination is, however, certainly not intuitive for many analysts of Czech. Yet it is preferred here, because it simplifies the description.

3. Phonemes of Czech

Having gone through certain problems in the data, we can now step to the postulation of the set of phonemes in Czech in terms of their distinctive features. A way to calculate compositions of phonemes into distinctive features is by setting phoneme tables on the grounds of commutation test. They provide a convenient arrangement of phonemes, express relations and proportions between them and serve as a basis for further deductions. The goal of a phonematic analysis is to decompose phonemes into bundles of distinctive features which, first, show distinctive functions of phonemes, and, second, allow for specifying mutual proportional relations between phonemes.

3.1 Paradigms

The traditional functionalist method by which phonemes of a given language are set is generally called *commutation test*. This test calculates the distinctive function of a phoneme by establishing the set of distinctive features it consists of. The distinctive features in addition express various proportional relations of the phoneme within the system. AF has its own calculus for conducting the commutation test (see Mulder 1968, ch. III; see also Akamatsu 1992, ch. 6, 2000, ch. 7 for traditional accounts). For the ease of reference let us introduce these definitions:

‘Commutation class’ for ‘the sum of all paradigms in which a certain item occurs’.

Alternative definition: ‘the set of consisting of an item together with all the items which commute with it’ (Mulder 1968: 128).

‘Paradigm’ for ‘a set of phonemes which commute in equivalent contexts’ (*op. cit.*: 119; alternative definition to the one quoted in Section 1.5).

‘Functional identity’ for ‘functionally the same in every respect’ (*op. cit.*: 119).

‘Functional equivalence’ for ‘functionally identical or representing the same’ (*ibid.*).

The distinctive function of an item is calculated on the commutation class which is the sum of all paradigms the item occurs in. This is because the distinctive function of an entity is the set of oppositions in which the entity may partake (see Section 1.5 and Mulder 1989: 441) and the commutation class is the set of a certain items together with the items that commute with it. For establishing the commutation class of a certain item, it is necessary to list the paradigms of the item, that is, to have the set of equivalent contexts where the given item occurs. Equivalent contexts are those which are either identical or which are characterized by qualities that can be regarded as representing the same. For instance, the context “before [a]” is functionally equivalent to the context “before [ɛ]”, because all the items that can precede [a] can apparently precede [ɛ].

Enumerating the set of items which commute in equivalent contexts is, however, not an easy task because these sets are usually very numerous in any language. But the procedure can be simplified if we adopt the convention of not regarding two-position sequences (i.e. clusters like [st]) as members of a paradigm but only single sounds like [s] or [t]. For dealing with the items like [st] we should consider other paradigms, e.g. the paradigm for the context “before [t]”.

In practice it is not necessary to operate with all the paradigms but only with such a number that would sufficiently cover all the protocolized data. We should first of all consider all the contexts in which the sounds we have protocolized occur. This means we should account for all the sounds we have set as the input data for Czech (see Section 1.4). In addition we should include those contexts we think relevant for the analysis. It is well-known that the distribution of Czech sounds is subject to certain restrictions of the occurrence, one of these being the absence of voiced obstruents word-finally before an absolute pause. Such contexts of limited occurrence are often the contexts of neutralization and we should examine them.

Figures 3.1a and 3.1b list some paradigms for Czech. The first table concentrates on contoids in non-nuclear contexts; the second on contoids and vocoids in the nuclear context. All instances have been taken from forms of Czech words. ‘+’ stands for “occurrent”, ‘-’ for “non-occurrent” in given contexts. The [au], [ɛu] and [ou] sequences have been included as they correspond to single phonemes whereas [ts], [ɽ], [tʃ] and [dʒ] have not for the reasons discussed in Section 2.4. The sound [ɣ] has not been included either; it will be

discussed in Section 6.1 s.v. /h/. The following contexts are numbered to correspond to Figure 3.1a. We use these symbols: ‘_’ for the context in question, ‘C’ for any contoid, ‘V’ for any vocoid, ‘#’ for the beginning or the end of a phonetic form of a word, ‘T’ for any voiceless obstruent, ‘D’ for any voiced obstruent.

1. #_V: pre-nuclear context, i.e. the context before the nucleus. This context coincides with the beginning of a phonological form of a word. Most of the segments occur here; the same values are for the context V_V, i.e. between two nuclei (not included in the table).

Examples: [mɛs] *mez* “limit”, [pɛs] *pes* “dog”, [bɛs] *bez* “without”, [fɛn] *fen* “bitch (gen. pl.)”, [vɛn] *ven* “outside”, [nɛs] *nes* “carry!”, [tɛn] *ten* “that”, [dɛn] *den* “day”, [rɛk] *Řek* “Greek”, [sɛn] *sen* “dream”, [zɛm] *zem* “soil”, [rɛs] *rez* “rust”, [lɛs] *les* “forest”, [ʃɛl] *šel* “(he) went”, [ʒɛn] *žen* “woman (gen. pl.)”, [nɛj] *něj* “him (gen.)”, [cɛl] *těl* “body (gen. pl.)”, [jɛl] *děl* “work (gen. pl.)”, [jɛn] *jen* “only”, [kɛř] *keř* “bush”, [gɛn] *gen* “gene”, [xat] *chat* “cottage (gen. pl.)”, [ɦɛr] *her* “game (gen. pl.)”.

2. C_C: nuclear context, coinciding with the nucleus of the syllable. Vocoids and syllabic contoids occur here; syllabic [m] has been excluded for the reasons explained.

Examples: [prst] *prst* “finger”, [plst] *plst* “felt hair”, [past] *past* “trap”, [pa:st] *pást* “to shephard”, [pɛs] *pes* “dog”, [pɛ:tst] *péct* “to bake”, [pɪsk] *pysk* “lip”, [pi:st] *píst* “piston”, [post] *post* “post”, [po:s] *póz* “pose (gen. pl.)”, [pusc] *pust’* “let go!”, [pu:st] *půst* “shrove”, [paus] *pauz* “pause (gen. pl.)”, [ʔeuro] *euro* “euro”, [pout] *pout* “handcuff (gen. pl.)”.

3. V_#: post-nuclear context, i.e. the context after the nucleus. This context coincides with the end of a phonological form of a word.

Examples: [lɛm] *lem* “bead”, [lɛp] *lep* “adhesive”, [lɛf] *lev* “lion”, [lɛn] *len* “linen”, [lɛt] *let* “flight”, [kɛř] *keř* “bush”, [lɛs] *les* “forest”, [ɦɛr] *her* “game (gen. pl.)”, [ʃɛl] *šel* “(he) went”, [lɛʃ] *lež* “lie”, [ʒɛɲ] *žeň* “rush!”, [rɛk] *Řek* “Greek”, [plɛx] *plech* “metal plate”.

4. V_T: before any voiceless obstruent. It is true that not all segments occur before all voiceless obstruents but what we are interested in here is the capacity of the sounds to occur before at least one voiceless obstruent.

Examples: [rampa] *rampa* “ramp”, [zɛptat] *zeptat* (*se*) “to ask”, [nɪmjfa] *nymfa* “nymph”, [nafta] *nafta* “gas”, [pɪnta] *pinta* “pint”, [dviřka] *dviřka* “little doors”, [pasta] *pasta* “tooth-paste”, [parta] *parta* “company”, [malta] *malta* “mortar”, [bařta] *bařta* “bas-

tion”, [baŋka] *baňka* “flask”, [vɛctɛ] *ved'te* “lead!”, [krajta] *krajta* “python”, [ʔakta] *akta* “acta”, [buxta] *buchta* “pie”.

5. V_D: before any voiced obstruent except for [v]. Once again the occurrence before at least one voiced obstruent is relevant here. The occurrences before [v] are special and are dealt with in a separate paradigm.

Examples: [bomba] *bomba* “bomb”, [ʔobzor] *obzor* “horizon”, [pravda] *pravda* “truth”, [sonda] *sonda* “probe”, [tʃtɪrdɛni:] *čtyřdenní* “four-day”, [fivɛzda] *hvězda* “star”, [horda] *horda* “horde”, [malba] *malba* “painting”, [vrazda] *vražda* “murder”, [piŋʒa] *Piňďa* (name), this is rare, [ʃ] before a voiced obstruent has not been found in our data, [najdɛ] *najde* “(he) will find”, *hangar*, *ekzém*, *tehdy* “then, that time”.

6. V_v: before [v], i.e. a voiced labio-dental fricative.

Examples: [tramvaj] *tramvaj* “tram” (only as a variant pronunciation of *tramvaj*), [kapverdi] *Kapverdy* “Cape Verde”, [ʔobvas] *obvaz* “bandage”, [tramvaj] *tramvaj* “tram”, [konvalɪŋka] *konvalinka* “lily of the valley”, [kotva] *kotva* “anchor”, [dva] *dva* “two”, [rval] *řval* “(he) cried”, [sval] *sval* “muscle”, [zval] *zval* “(he) invited”, [rval] *rval* “(he) tore”, [lva] *lva* “lion (gen. sg.)”, [ʃva:p] *šváb* “cockroach”, [ʒvapit] *žvanit* “to babble”, [nejvi:tɛ] *nejvíce* “most, mostly”, [kvas] *kvas* “fermentum”, [gvatemala] *Guatemala*, [poxva] *pochva* “vagina”, [la:fivɛ] *láhve* “bottles”.

7. T_V: after any voiceless obstruent. The occurrences after at least one voiceless obstruent are relevant here.

Examples: [smat] *smát* (*se*) “to laugh”, [spa:t] *spát* “to sleep”, [sfɛ:ra] *sféra* “sphere”, [sval] *sval* “muscle”, [snat] *snad* “maybe”, [stan] *stan* “tent”, [křitʃɛt] *křičet* “to shout”, [psa:t] *psát* “to write”, [sra:s] *sráz* “precipice”, [slat] *slad* “malt”, [pʃɛnitɛ] *pšenice* “wheat”, [spi:t] *snít* “to dream”, [scal] *sťal* “(he) cut off”, [sjɛl] *sjel* “(he) went down”, [skal] *skal* “rock (gen. pl.)”, [sxot] *schod* “step”.

8. D_V: after any voiced obstruent except for [v]. The occurrences after at least one voiced obstruent are relevant here. Again, the occurrences after [v] are accounted for in a separate paradigm.

Examples: [zmatek] *zmatek* “confusion”, [zbavit] *zbavit* (*se*) “to get rid off”, [zvat] *zvat* “to invite”, [zna:t] *znát* “to know”, [zdar] *zdar* “success”, [zřeknout] *zřeknout* (*se*) “to renounce”, [bzukot] *bzukot* “buzz”, [zrak] *zrak* “sight”, [zlato] *zlato* “gold”, [zʒɛŋʃcili:]

zženštilý “womanish”, [zɲi:t] *znít* “to sound”, [zʒɛjɪt] *zdědit* “to inherit”, [zʒɛf] *zjev* “vision”, [zgalvanizovat] *zgalvanizovat* “to galvanize”, [zʃion] *shon* “rush”.

9. v_V: after [v], i.e. after a voiced labio-dental fricative.

Examples: [vma:tʃknout] *vmáčknout* “to coop in”, [vbalit] *vbalit* “to pack in”, [vnaɖni:] *vnadný* “tempting”, [vda:t] *vdát (se)* “to marry”, [vri:t] *vřít* “to boil”, [vzal] *vzal* “(he) took”, [vraχ] *vrah* “murderer”, [vlak] *vlak* “train”, [vʒiti:] *vžítý* “ingrained”, [vɲi:mat] *vnímat* “perceive”, [vʒɛtʃni:] *vděčný* “grateful”, [vjem] *vjem* “percept”, [novgorot] *Novgorot* (admittedly, a foreign place-name), [vhodni:] *vhodný* “appropriate”.

10. m_V: after [m], i.e. after a voiced bilabial nasal. At least one occurrence counts here. The group [mj] is rare, occurrent apparently only in foreign names like *Semjonov*, in Czech there is only *kolemjdoucí* “passer-by”.

Examples: [vemmɛ] *vemme* “let us take”, [rampa] *rampa* “ramp”, [bomba] *bomba* “bomb”, [tramvaj] *tramvaj* “tram” (only as a variant of [tramɤvaj]), [mnoɦo] *mnoho* “a lot of”, [vemtɛ] *vemte* “take! (pl.)”, [přimda] *Přimda* (place-name), [mřɛŋka] *mřenka* “loach”, [ri:msa] *řimsa* “moulding”, [kamzi:k] *kamzík* “chamois”, [mʃɛ] *mše* “mass”, [mʒik] *mžik* “twinkle”, [mɲix] *mnich* “monk”, [xamcivost] *chamtivost* “cupidity”, [přimda] *Přimď* (place-name, loc.), [přimɦouřit] *přimhouřit* “to wink at”.

11. ɲ_V: after [ɲ], i.e. after a voiced labio-dental nasal.

Examples: [nɲɤfa] *nymfa* “nymph”, [tramɤvaj] *tramvaj* “tram”.

12. n_V: after [n], i.e. after a voiced alveolar nasal. Again, at least one occurrence counts here.

Examples: [mnoɦo] *mnoho* “a lot of”, [ɦanba] *hanba* “shame”, [konferentɛ] *konference* “conference”, [konvička] *konvička* “can”, [konto] *konto* “account”, [ʔondatra] *ondatra* “muskrat”, [ʃanson] *šanson* “chanson” (cf. also [japonsko] *Japonsko* “Japan”), [penzɛ] *penze* “pension”, [ʒa:nru] *žánru* “genre (gen. sg.)”, [zda:nlivjɛ] *zdánlivě* “apparently”, [menʃi:] *menší* “smaller”, [manʒɛl] *manžel* “husband”, [plɲɲɛ] *plynně* “fluently” (only when pronounced extra carefully, otherwise as [plɲɲɛ]), [koncɛ] *kontě* “account (loc. sg.)” (it can also be pronounced as [koɲcɛ]), [poɲjɛli:] *pondělí* “Monday” (again, it can be pronounced as [poɲjɛli:]), [ʔɲjektɛ] *injekce* “injection”, [ʔɲɦalovat] *inhalovat* “inhale”.

13. ɲ_V: after [ɲ], i.e. after a voiced palatal nasal. At least one occurrence counts here.

Examples: [kɔɲmo] *koňmo* “on-horseback”, [ɦɔɲtɛ] *hoňte* “pursue!”, [ɲs] only if followed by another contoid as in [loɲski:] *loňský* “last-year (sg.)”, [ɲʃ] only if followed by another contoid as in [loɲʃci:] *loňšti* “last-year (pl.)”, [kɔɲɕɛ] *kontě* “account (loc. sg.)” (it can also be pronounced as [konɕɛ], see above), [pɔɲʃɛli:] *ponděli* “Monday” (again, it can be pronounced as [pɔɲʃɛli:], see above), [baɲka] *baňka* “flask”, [daɲɦɛl] *Daňhel* (surname).

14. ɲ_V: after [ɲ], i.e. after a voiced velar nasal.

Examples: [baɲka] *banka* “bank”, [ɦaɲɡa:r] *hangár* “hangar”, [mɛlaɲxɔliɛ] *melancholie* “melancholy”.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	#_V	C_C	V_#	V_T	V_D	V_v	T_V	D_V	v_V	m_V	ɲ_V	n_V	ɲ_V	ɲ_V
m	+	-	+	+	+	(+)	+	+	+	+	-	+	+	-
p	+	-	+	+	-	+	+	-	-	+	-	-	-	-
b	+	-	-	-	+	+	-	+	+	+	-	+	-	-
ɲ	-	-	-	+	-	+	-	-	-	-	-	-	-	-
f	+	-	+	+	-	-	+	-	-	-	+	+	-	-
v	+	-	-	-	+	-	+	+	-	?	+	+	-	-
n	+	-	+	+	+	+	+	+	+	+	-	-	-	-
t	+	-	+	+	-	+	+	-	-	+	-	+	+	-
d	+	-	-	-	+	+	-	+	+	+	-	+	-	-
ɨ̇	-	-	+	+	-	-	+	-	-	-	-	-	-	-
ɹ̇	+	-	-	-	+	+	-	+	+	+	-	-	-	-
s	+	-	+	+	-	+	+	-	-	+	-	+	(+)	-
z	+	-	-	-	+	+	-	+	+	+	-	+	-	-
r	+	-	+	+	+	+	+	+	+	+	-	+	-	-
l	+	-	+	+	+	+	+	+	+	+	-	+	-	-
ʃ	+	-	+	+	-	+	+	-	-	+	-	+	(+)	-
ʒ	+	-	-	-	+	+	-	+	+	+	-	+	-	-
ɲ	+	-	+	+	+	-	+	+	+	+	-	(+)	-	-
c	+	-	+	+	-	-	+	-	-	+	-	+	+	-
ʃ	+	-	-	-	-	-	-	+	+	+	-	+	+	-
j	+	-	+	+	+	+	+	+	+	(+)	-	+	-	-
ɲ	-	-	-	+	+	-	-	-	-	-	-	-	-	-
k	+	-	+	+	-	+	+	-	-	+	-	-	+	+
g	+	-	-	-	+	+	-	+	+	-	-	-	-	+
x	+	-	+	+	-	+	+	-	-	+	-	-	-	+
ɦ	+	-	-	-	+	+	-	+	+	+	-	+	+	-

Figure 3.1a

Though an analyst should naturally consider more contexts before setting down the final hypothesis about the phonematic system Czech, it seems that the listed contexts are sufficient for the initial hypothesis. Additional partial paradigms will be introduced in due time. It is especially the pre-nuclear and the nuclear contexts that are most relevant for the initial hypothesis, because they represent that which is sometimes called *the position of maximum differentiation of phonemes* (see Vachek 2005: 108). Here most of the protocolized sounds occur.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	#_V	C_C	V_#	V_T	V_D	V_v	T_V	D_V	v_V	m_V	ŋ_V	n_V	ɲ_V	ŋ_V
ɾ	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ɹ	-	+	-	-	-	-	-	-	-	-	-	-	-	-
a	-	+	-	-	-	-	-	-	-	-	-	-	-	-
a:	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ɛ	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ɛ:	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ɪ	-	+	-	-	-	-	-	-	-	-	-	-	-	-
i:	-	+	-	-	-	-	-	-	-	-	-	-	-	-
o	-	+	-	-	-	-	-	-	-	-	-	-	-	-
o:	-	+	-	-	-	-	-	-	-	-	-	-	-	-
u	-	+	-	-	-	-	-	-	-	-	-	-	-	-
u:	-	+	-	-	-	-	-	-	-	-	-	-	-	-
au	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ɛu	-	+	-	-	-	-	-	-	-	-	-	-	-	-
ou	-	+	-	-	-	-	-	-	-	-	-	-	-	-

Figure 3.1b

3.2 Interpreting the data

With the data from the paradigms and following the conclusions from Part 2 of this paper, we can set the inventory of phonemes in Czech, calculate their distinctive function and arrange them into phoneme tables. A detailed account on the use of phoneme tables is to be found elsewhere (Mulder 1978/1980, see also Hervey 1984). The method we arrive at these tables is by launching and refuting hypotheses about the phonematic system. The theory upon which we base our description (an axiomatic-functionalist one in this case)

equips us with firm tools for producing consistent, adequate and simple descriptions. Whereas consistency can be internally tested, adequacy and simplicity may sometimes be a matter of degree and common sense. The theory itself does not tell us whether a description is simple and adequate, it only enables us to produce simple and adequate descriptions.

Let us speak in concrete terms. The theory of AF and the methodology behind it enables us to set 21 consonantal phonemes in Czech. It is exactly the theory and methodology which ensure that we set 21 consonants and no more because more are not needed. We should not postulate more phonemes unless necessary and hence we should hypothesize that sounds from different paradigms do not correspond to separate phonemes. This, for instance, prevents us from postulating two different phonemes /n/ and /ŋ/ if [n] and [ŋ] never commute with one another (as is the case of the protocolized data of Czech here) and if the hypothesis “[n] and [ŋ] do not correspond to two separate phonemes” has not been refuted. The data suggest this is an adequate hypothesis and we, failing to refute it, will integrate it into our description as a descriptive statement.

Similar hypotheses of this kind will, however, be judged inadequate and will not be proposed. For instance, the hypothesis “[ɪ] and [j] do not correspond to separate phonemes in Czech”, though a valid hypothesis, will be judged as inadequate. We will discuss this question in detail in Section 4.9. For the moment it suffices to say that we find it more adequate to have two separate phonemes /i/ and /j/ than one phoneme whose allophones would be [ɪ] and [j]. Therefore we launch a different hypothesis: “[ɪ] and [j] do not correspond to phonemes that have the same distinctive and tactic functions”. This hypothesis is—as all valid hypotheses should be—in principle refutable, because it can be refuted by enumerating the distinctive function of and by setting the tactic function of a phoneme to which [ɪ] would correspond and of the distinctive and tactic function of a phoneme to which [j] would correspond. However, if we launched the same hypothesis about [n] and [ŋ] (sc. “[n] and [ŋ] do not correspond to phonemes that have the same distinctive and tactic functions”), we could refute it by listing the set of oppositions in which a tentative phoneme /n/ partakes and the set of oppositions in which the tentative phoneme /ŋ/ partakes. As the sets turn out as identical (cf. paradigms 1 and 14 in Figure 3.1a above), the distinctive function of the tentative phoneme /n/ is same as that of the tentative phoneme /ŋ/. But this is not possible, because no two or more phonemes can have the same distinctive function. The

hypothesis is refuted and its outcome is a descriptive statement saying that [n] and [ŋ] are allophones of one phoneme /n/. A similar hypothesis will, however, remain unrefuted for the phonemes /i/ and /j/, because the distinctive function and the tactic function of /i/ is different to the distinctive function and the tactic function of /j/ (the discussion on /i/ and /j/ will continue in Section 4.9 below).

Apart from hypotheses of this kind, we launch hypotheses about distinctive features of particular phonemes. Because distinctive features express, as it were, distinctive functions and because the distinctive function of an entity is the set of oppositions in which the entity partakes, hypotheses about distinctive features should be based on and tested against the commutation test. Our hypotheses here are based on paradigms in Figure 3.1a. We can put forth a hypothesis like “[p] of the paradigm 1 (i.e. in pre-nuclear context) corresponds to a phoneme which cannot be decomposed to a bundle of no more and no less than five distinctive features ‘labial occlusive non-nasal non-aspirated voiceless’”. By showing that ‘non-nasal’ and ‘non-aspirated’ are in fact not distinctive, because all ‘occlusives’ are non-nasal and non-aspirated in Czech, we reject this hypothesis and replace it with a new one “... to a bundle of no more and no less than three distinctive features ‘labial occlusive voiceless’” which remains unrefuted and which is subsequently adopted as a descriptive statement.

The same hypothesis is launched about the [p] the in inter-nuclear context and it again remains unrefuted. Because the [p] in pre-nuclear context is opposed to the same items like the [p] in the inter-nuclear context, they thus have the same distinctive function and we can conclude that they correspond to the same phoneme we call /p/. However, the very same hypothesis is refuted for the [p] of the paradigm 3 (sc. [p] in post-nuclear context). On the basis of this paradigm we refute the hypothesis that [p] here corresponds of a bundle of distinctive features ‘labial occlusive voiceless’ by showing that ‘voiceless’ is not distinctive. It is because it cannot be functionally confronted with the distinctive feature ‘voiced’ here. Hence the distinctive function of the [p] in the paradigm 3 is different to the distinctive function of the [p] in the paradigm 1 and they cannot correspond to identical phonemes, namely to the phoneme /p/. As will be seen, the post-nuclear context is a context of neutralization and the [p] corresponds here to an archiphoneme /P/ ‘labial occlusive’.

3.3 Consonants

The table in Figure 3.3a is a result of various hypotheses, their refutations and/or failures of refutations about the consonantal systems of Czech. It shows that most of the consonants can be decomposed to bundles of two or more distinctive features. We regard the table as simple as and as adequate to the data as possible. It is, however, inconsistent with the general principles of the theory; the question of consistency is going to be discussed in the next section.

over-all system of consonants	<i>occlusive</i>		<i>constrictive</i>		<i>nasal</i>
	<i>voiceless</i>	<i>voiced</i>	<i>voiceless</i>	<i>voiced</i>	
<i>labial</i>	p	b	f	v	m
<i>alveolar</i>	t	d	s	z	n
<i>palatal</i>	tʃ	dʃ	š	ž	ň
<i>velar</i>	k	g	x	h	

Phonemes outside the system of proportions: /j/ ‘approximant’, /ʃ/ ‘spirant’.

Figure 3.3a

The backbone of the system is formed by proportions forming so-called dimensions: ‘labial’ ~ ‘alveolar’ ~ ‘palatal’ ~ ‘velar’ and ‘occlusive’ ~ ‘constrictive’ ~ ‘nasal’. In addition there is a proportion/dimension ‘voiceless’ ~ ‘voiced’ which is, however, not applicable to ‘nasals’. It should be remembered that names of distinctive features are merely descriptive labels and though motivated they are completely arbitrary. The fact that a phoneme is, say, ‘constrictive’ suggests that it is realized by a constrictive/fricative sound but this is not as relevant as the fact that is opposed to phonemes that are ‘occlusive’ and ‘nasal’. This is to say: it is ‘constrictive’ because it is not ‘nasal’ or ‘occlusive’ and because it is an appropriate model accounting for certain speech phenomena in Czech.

The phonemes /p/, /b/, /f/, /v/, /m/ are all grouped together as ‘labials’ even though the ‘labial occlusives’ /p/, /b/ together with the ‘labial nasal’ /m/ are bilabial in realization and ‘labial constrictives’ /f/, /v/ are labio-dental in realization. As we see the place of articulation is interconnected with the manner of articulation and there is no need to postulate separate distinctive features ‘bilabial’ for /p/, /b/, /m/ and ‘labio-dental’ for /f/, /v/. A hy-

pothesis that the tentative distinctive features ‘bilabial’ and ‘labio-dental’ are separately relevant is thus refuted.

The phonemes /s/ and /z/ are grouped together with /t/, /d/ and /n/ under ‘alveolar’; the same holds for /š/ and /ž/ which are grouped together with /tʰ/, /dʰ/ and /ň/ under ‘palatal’. Even though in some phonematic systems it might be useful to introduce separate distinctive features ‘hissing’ and ‘hushing’ for /s/, /z/ and /š/, /ž/, in particular in systems where there are additional alveolar fricatives like [θ], [ð] (e.g. in English, see Mulder & Hurren 1968), such a solution is not necessary for Czech. There are no other ‘constrictive’ counterparts of /t/, /d/ or of /tʰ/, /dʰ/. It is thus appropriate to interpret the relation between /t/, /d/ and /s/, /z/ on the one hand, and the relation between /tʰ/, /dʰ/ and /š/, /ž/ on the other, as proportional to the relations between /p/, /b/ and /f/, /v/, and /k/, /g/ and /x/, /h/. The system will thus be nicely compact. Note that [ʃ] and [ʒ] are, from the phonetic point of view, not palatal fricatives, but postalveo-dorsal fricatives, yet this fact is no hindrance for interpreting /š/, /ž/ as ‘palatals’. Like in the case of labio-dental [f], [v], we can see that the place of articulation is interconnected with the manner of articulation.

The phonemes /k/, /g/, /x/, /h/ are all interpreted as being ‘velar’. In realization these phonemes are characterized by articulation in the back of the month, ranging from velar for /k/, /g/, /x/ to laryngeal for /h/. Even though /h/ is realized as a voiced laryngeal fricative and it is thus not the real phonetic correlate of /k/, /g/ and /x/, it functions in the system of Czech consonants as the ‘voiced’ counterpart of /x/. Of course, it would be possible to exclude the phoneme from the set of proportions as an isolated phoneme but such an analysis would not be the simplest, not even the most adequate one. Once set as the counterpart of /x/, the opposition /x/ ~ /h/ is proportional to all other oppositions between ‘voiceless’ and ‘voiced’ consonants and is, as will be seen in Part 5, liable to neutralization of voice. Doing so adequately accounts for phonic processes in Czech.

The phonemes /p/, /b/, /t/, /d/, /tʰ/, /dʰ/, /k/, /g/ have all been interpreted as ‘occlusives’; the phonemes /f/, /v/, /s/, /z/, /š/, /ž/, /x/, /h/ have all been interpreted as ‘constrictives’; and the phonemes /m/, /n/, /ň/ have been interpreted as ‘nasals’. This is an adequate interpretation which correlates with the phonetic scope of these phonemes: all ‘occlusives’ are realized as plosives, all ‘constrictives’ as fricatives, and all ‘nasals’ as nasals. There is no justification of interpreting /p/, /b/, /t/, /d/, /tʰ/, /dʰ/, /k/, /g/ as ‘oral occlusives’ and /m/, /n/, /ň/ as

‘nasal occlusives’. First of all, even though from the phonetic perspective nasals are also formed by an occlusion like plosives but unlike fricatives, the phonic characteristics of nasals are markedly different to the articulation of plosives and it is thus more appropriate to distinguish three basic manners of articulations, occlusive, fricative and nasal. From the phonological perspective it adds no advantage to our description if /m/, /n/, /ň/ are interpreted as ‘nasal’/‘non-oral’ ‘occlusives’. Because all ‘nasal’/‘non-oral’ consonants are always ‘occlusives’ in Czech, the hypothesis that the feature ‘occlusive’ is separately relevant for these phonemes is refuted and thus /m/, /n/, /ň/ must be defined only as ‘nasal’. If ‘occlusive’ is not functional for ‘nasals’, the phonemes /p/, /b/, /t/, /d/, /tʰ/, /dʰ/, /k/, /g/ cannot, too, be defined as ‘oral occlusives’ and hence the distinctive feature characterizing these phonemes is ‘occlusive’.

In addition to these proportions there is a proportion ‘voiceless’ ~ ‘voiced’. It pertains to all the phonemes so far mentioned except for ‘nasals’ which are indifferent to this distinction. Even though ‘nasals’ are in realization always voiced in Czech, they cannot be distinctively (i.e. phonologically) ‘voiced’—just because they are always voiced in realization. Unless a phoneme is opposed to its ‘voiceless’ or ‘voiced’ counterpart, it cannot be defined as either ‘voiceless’ or ‘voiced’. This condition, however, is met in the case of the ‘occlusive’ and ‘constrictive’ phonemes; the oppositions /p/ ~ /b/, /f/ ~ /v/, /t/ ~ /d/, /s/ ~ /z/, /tʰ/ ~ /dʰ/, /š/ ~ /ž/, /k/ ~ /g/ and /x/ ~ /h/ are all mutually proportional in the sense that the former phonemes are ‘voiceless’ and the latter are ‘voiced’.

Outside the system stand two phonemes: /ř/ ‘spirant’ and /j/ ‘approximant’, both characterized by one distinctive feature. The label ‘spirant’ is an arbitrary one; it was chosen for the lack of a better one-word term. The sound [r] is very unique in the world’s languages and there is probably no other language where it would so distinctively used like in Czech. Its phonetic definition has been a matter of dispute (not to mention the way it is to be represented in the IPA). It might be defined as a voiced constrictive vibrant (cf. Duběda 2005: 71). It has also a voiceless counterpart [r̥]. The paradigms in Figure 3.1a clearly show that the distribution of the two sounds is perfectly complementary. The voiceless variant occurs only before and after a voiceless sound and/or at the end of a phonetic form before a pause. This suggests that it is adequate to launch a hypothesis “[r] and [r̥] do not correspond to

separate phonemes” which remains refuted (it might be in principle refuted if the sounds were mutually opposed).

3.4 Hyperphonemes

Among the deficiencies that may be pointed out by prospective reviewers, there is one serious problem in the presentation of the Czech consonants in the previous section. It is not easily spotted out and, once highlighted, many analysts would not still view it as serious or even as problematic at all. The deficiency concerns the phoneme tables used as a device for classifying phonemes as to their distinctive features. When analyzing Pekingese Chinese (Mulder 1968) or English (Mulder & Hurren 1968), Mulder did not initially perceive the problem. In a later article (Mulder 1978/1980) he explained why the traditional phoneme tables were defective (like that in Figure 3.3a). The article raised a discussion (see Walter 1982, McCalla 1983) expressing disapproval and the inconsistency of the traditional phoneme tables was later re-explained by Sándor Hervey (Hervey 1984) and further discussed by Mulder (1989: 220-8). We understand Mulder’s and Hervey’s points and approve of their proposed solutions. It is, however, not up to this paper to sum up the discussion and the arguments; this is—we are convinced—sufficiently done at the places referred to.

We will discuss the problem with reference to the table of Czech consonants. The whole problem comes down to the gap in the table, i.e. to the non-existence of a phoneme /ŋ/ that might be defined as ‘velar nasal’. Though Czech has a sound [ŋ] occurring before [k], [g] or [x], it is a realization of the phoneme /n/, which is the most adequate interpretation of the fact.

Czech has therefore only ‘nasals’ /m/, /n/, /ň/ and ‘velars’ /k/, /g/, /x/, /h/. This means that if a phoneme is ‘nasal’, it is differentiated as to being either ‘labial’ or ‘alveolar’ or ‘palatal’. Likewise, if a phoneme is ‘velar’ it is differentiated either to ‘occlusive’ or ‘constrictive’. No phoneme is both ‘velar’ and ‘nasal’.

At the same time, however, we can register the following oppositions in other contexts: ‘occlusive’ ~ ‘constrictive’ ~ ‘nasal’ for ‘labial’, ‘alveolar’ and ‘palatal’ phonemes, and ‘labial’ ~ ‘alveolar’ ~ ‘palatal’ ~ ‘velar’ for ‘occlusive’ and ‘constrictive’ phonemes. If, for

instance, in the universe of ‘labial’ phonemes the feature ‘occlusive’ is opposed to ‘constrictive’ and ‘nasal’ (cf. /f/, /v/ and /m/), in the universe of ‘velar’ phonemes it is opposed only to ‘constrictive’ due to the non-existence of /ŋ/. Since the value of distinctive features (and in turn the whole concept of distinctive function) is derived from the set of oppositions they enter in, it should be obvious that the value of ‘occlusive’ in the universe of ‘labial’ is different to the value of ‘occlusive’ in the universe of ‘velar’. If something is different, it is not same and hence ‘occlusive’ in the ‘labial’ universe does not equal ‘occlusive’ in the ‘velar’ universe. But this is not only true for ‘occlusive’ but also for ‘constrictive’, ‘labial’, ‘alveolar’ and ‘palatal’.

	voiceless	voiced	labial	alveolar	palatal	velar	occlusive	constrictive	nasal
p	+	-	+	-	-	-	+	-	-
b	-	+	+	-	-	-	+	-	-
f	+	-	+	-	-	-	-	+	-
v	-	+	+	-	-	-	-	+	-
m	∅	∅	+	-	-	∅	-	-	+
t	+	-	-	+	-	-	+	-	-
d	-	+	-	+	-	-	+	-	-
s	+	-	-	+	-	-	-	+	-
z	-	+	-	+	-	-	-	+	-
n	∅	∅	-	+	-	∅	-	-	+
ʃ	+	-	-	-	+	-	+	-	-
ʒ	-	+	-	-	+	-	+	-	-
ň	∅	∅	-	-	+	∅	-	-	+
k	+	-	-	-	-	+	+	-	∅
g	-	+	-	-	-	+	+	-	∅
x	+	-	-	-	-	+	-	+	∅
h	-	+	-	-	-	+	-	+	∅

Figure 3.4a

To illustrate the different values, Mulder introduced a special type of table adopted for Czech in Figure 3.4a. The ‘+’ sign stands for the distinctive feature a given phoneme possesses and ‘-’ for the oppositions it partakes in. The symbol ‘∅’ indicates the lack of oppo-

sition. The table is divided by bold lines to various dimensions. As the opposition ‘voiceless’ ~ ‘voiced’ does not obtain for ‘nasal’, there are zeros in both cells. The phonemes /ř/ and /j/ were not included because they do not participate in the major set of oppositions. The figure shows oppositional values for all distinctive features in the table. The value of ‘labial’ is ‘-alveolar -palatal -velar’ for the phoneme /p/, but it is ‘-alveolar -palatal Øvelar’ for the phoneme /m/; it means there are two different oppositional values of the feature ‘labial’ and hence the feature ‘labial’ in /p/ cannot be the same feature as the feature ‘labial’ in /m/. This is true for all features having a ‘Ø’ in their oppositional values. The consequence is that we cannot call the features by the same name and in fact the whole presentation of Czech consonants falls down. It is logically inconsistent and hence invalid.

The inconsistency of the phoneme table for Czech consonants is not irredeemable and can be mended. Mulder introduced notions *hyper-features* and *hyperphoneme* to do the job. Their definitions are:

‘Hyper-feature’ for ‘distinctive feature in a particular phonematic context, equivalent to two or more distinctive features in at least one other phonematic context’.

‘Hyperphoneme’ for ‘phoneme consisting of, or containing, one or more hyper-features’.

A distinctive feature is opposable to other distinctive features in various phonematic contexts. Since the phoneme is defined as an unordered bundle of distinctive features, it is the presence of the distinctive features within the bundles which creates the phonematic contexts. A different constituency of distinctive features implies a different context.

We saw that in the context of ‘nasal’ the features ‘labial’, ‘alveolar’ and ‘palatal’ had different values than in the contexts of ‘occlusive’ and ‘constrictive’ owing to their non-opposability to ‘velar’ in the former context. Likewise, in the context of ‘velar’ the features ‘occlusive’ and ‘constrictive’ have different values than in the contexts of ‘labial’, ‘alveolar’ and ‘palatal’ as a result of their non-opposability to ‘nasal’ in the former context.

In order to do away with the inconsistency we may either posit different sets of distinctive features for ‘nasal’ and ‘velar’ phonemes or try to mend the system by an introduction of hyper-feature(s) and hyperphoneme(s). The first solution is possible but is arguably less economical (i.e. simple), because it excludes the phonemes /m/, /n/, /ň/, /k/, /g/, /x/ and /h/ from the main system of proportions. We have therefore chosen the path of hyper-features

and hyperphonemes. There are several possibilities how to adjust the phoneme table by hyper-features. We can regard all of the phonemes /m/, /n/, /ɲ/, /k/, /g/, /h/, /x/ as hyperphonemes because the distinctive features ‘nasal’ and ‘velar’ have, for these phonemes, different values than for the other phonemes. This solution prevents us from making arbitrary decisions, which is a thing we should avoid in a description in order not to make the analysis run riot. Another solution is to choose one phoneme to be a hyperphoneme, which would set right oppositional values for the rest of the phonemes. It is always up to the particular situation in a description which solutions we choose. In our case we will opt for the second solution and choose only one phoneme. We should, however, be able to show our choice of the phoneme to be reasonable, justifiable and adequate.

The phoneme to be assigned with the status of a hyperphoneme is /n/; it is re-interpreted as consisting of the distinctive features ‘alveolar \cup velar nasal’. The feature ‘alveolar \cup velar’ is a hyper-feature corresponding to the distinctive features ‘alveolar’ and ‘velar’ in other phonematic contexts. The symbol ‘ \cup ’ stands for a set-theoretical relation ‘union of’, hence the hyper-feature ‘alveolar \cup velar’ is a union of the distinctive features ‘alveolar’ and ‘velar’. Mulder does not use this notation (he would prefer ‘alveolar/velar’ instead); the use of ‘ \cup ’ has been suggested by Dickins (2007: 67-8), though our interpretation may differ from that of Dickins’s (and of Mulder’s). Be it as it may, the definition of /n/ as ‘alveolar \cup velar’ implies that the hyper-feature is, in the phonematic context ‘nasal’, equivalent to the features ‘alveolar’ and ‘velar’ in the phonematic contexts ‘occlusive’ and ‘constrictive’.

It remains to explain why the phoneme /n/ has been chosen as the hyperphoneme. We could have, for instance, defined /m/ as ‘labial \cup velar nasal’ or even the phonemes /k/ and /g/ as ‘velar occlusive \cup nasal voiceless’ and ‘velar occlusive \cup nasal voiced’, respectively. We have preferred the phoneme /n/ to the other possibilities because there is some adequacy in defining it as ‘alveolar \cup velar nasal’, i.e. as having the characteristics of ‘alveolar’ as well as of ‘velar’ phonemes. The reason is that /n/ is realized as an alveolar nasal [n] before ‘alveolar’ /t/, /d/ but as a velar nasal [ŋ] before ‘velar’ /k/, /g/, /x/ (the /h/ is an exception). As such the phonetic scope of /n/ ranges from the alveolar nasal to the velar nasal and the hyper-feature ‘alveolar \cup velar’ is thus an adequate model for capturing this phonic fact.

Figure 3.4b presents a better phoneme table for the consonants of Czech. One should not be misled by its layout. It is immaterial that the dimensions are given in the order ‘labial’, ‘palatal’, ‘alveolar’ and ‘velar’. The order has no functional implications. The consonant /n/ is a hyperphoneme with the features ‘alveolar∪velar nasal’. The table is as adequate as the former one (perhaps even more) and is, in addition, fully self-consistent. The oppositional values for the particular distinctive features are identical or equivalent. The proof is easy; it can be demonstrated with the use of the set-theory.

over-all system of consonants	occlusive		constrictive		nasal
	voiceless	voiced	voiceless	voiced	
labial	p	b	f	v	m
palatal	tʃ	dʒ	š	ž	ň
alveolar	t	d	s	z	n
velar	k	g	x	h	

Phonemes outside the system of proportions: /j/ ‘approximant’, /ɣ/ ‘spirant’.

Figure 3.4b

The oppositional value for the feature ‘labial’ is ‘labial’ ~ ‘palatal’ ~ ‘alveolar’ ~ ‘velar’ in /p/. The symbol ‘~’ is borrowed from the set-theory. We use it here in the sense “is opposed to” whereas in the set-theory it means “negation of”. However, the second meaning is in fact applicable to phonology, too. If we write that there is an opposition ‘labial’ ~ ‘palatal’ ~ ‘alveolar’ ~ ‘velar’, we may be read it as “‘labial’ and the negation of ‘palatal’ and the negation of ‘alveolar’ and the negation of ‘velar’”. This is because ‘labial’ phonemes are defined as ‘labial’ just for the fact that they are neither ‘alveolar’ nor ‘palatal’ nor ‘velar’. There is nothing surprising about that because it is the very nature of phonemes in structuralist conceptions, perhaps first expressed by Ferdinand de Saussure (cf. “Dans la langue, il n’y a que des différences”, de Saussure 1931: 166). In the set-theoretical terms we can make the following calculation. The symbol ‘∩’ stands for “intersection”; it may simply be read as “and”. We will use only the initial letter for the features. We have these two oppositions:

$$L \cap \sim P \cap \sim A \cap \sim V \text{ for 'labial' in /p/}$$

$$L \cap \sim P \cap \sim (A \cup V) \text{ for 'labial' in /m/}$$

We will show that the second opposition equals the first. It is extremely easy because by de Morgan's theorem the formula $\sim(A \cup V)$ equals $\sim A \cap \sim V$ and hence $L \cap \sim P \cap \sim(A \cup V)$ equals $L \cap \sim P \cap \sim A \cap \sim V$, which is the first opposition. The same can be applied to the feature 'palatal'; the following two formulae equal:

$$P \cap \sim L \cap \sim A \cap \sim V$$

$$P \cap \sim L \cap \sim(A \cup V).$$

For the feature 'alveolar \cup velar' we have only one opposition, because it does not pertain for any other phonematic context:

$$(A \cup V) \cap \sim L \cap \sim P$$

By the so-called distributive law the formula $(A \cup V) \cap \sim L \cap \sim P$ equals $(A \cap \sim L \cap \sim P) \cup (V \cap \sim L \cap \sim P)$. Let us compare the last formula with the oppositions for 'alveolar' and 'velar' in other phonematic contexts:

$$A \cap \sim L \cap \sim P \cap \sim V$$

$$V \cap \sim L \cap \sim P \cap \sim A$$

If we realize that there is no opposition between 'alveolar' and 'velar' for the 'nasal' phonemes, we see that $(A \cap \sim L \cap \sim P) \cup (V \cap \sim L \cap \sim P)$ is actually the sum of (i.e. the union of) $A \cap \sim L \cap \sim P \cap \sim V$ and $V \cap \sim L \cap \sim P \cap \sim A$:

$$(A \cap \sim L \cap \sim P) \cup (V \cap \sim L \cap \sim P) = (A \cap \sim L \cap \sim P \cap \sim V) \cup (V \cap \sim L \cap \sim P \cap \sim A)$$

on the condition $(A \cap \sim V) = \emptyset$ and $(V \cap \sim A) = \emptyset$

In other words: the oppositional value of the feature 'alveolar \cup velar' for the phonematic context 'nasal' is the sum of oppositional values for the features 'alveolar' and 'velar' in the other phonematic contexts. It proves that the table of consonants in Figure 3.4b is consistent and is the one to be preferred.

3.5 Vowels

The vowels are those phonemes that occur in the nuclear position only. On the basis of the paradigms in Section 3.1 we have launched various hypotheses about the phonemes in the nuclear position and we have arrived at the systems of vowels as schematized in Figure 3.5a.

over-all system of vowels	<i>front</i>		<i>central</i>	<i>back</i>	
	<i>high</i>	<i>mid</i>		<i>high</i>	<i>mid</i>
<i>short</i>	i	e	a	u	o
<i>long</i>	ī	ē	ā	ū	ō
<i>diphthongal</i>	ě		ä	ö	

Figure 3.5a

The Czech vowel system is traditionally (see Palková 1997: 170, Krčmová 2006: 114) sorted to ‘high’ vowels (/i/, /u/), ‘mid’ vowels (/e/, /o/) and ‘low’ vowels (/a/). ‘High’ and ‘mid’ vowels are distinguished as to being either ‘front’ (/i/, /e/) or ‘back’ (/u/, /o/) which distinction is irrelevant to the /a/ vowels. Furthermore, a distinction between ‘short’ and ‘long’ is made for all vowels, though sometimes the phonemic status is denied for /ō/ due its prevalent occurrence in phonological forms of the so-called foreign words.

The traditional classification turns out, however, as problematic if diphthongs are to be included. We have shown that the diphthongoids [au], [eu], [ou] correspond to single phonemes, and we should set the identity of these phonemes. We have therefore chosen a different classification. If we, for the moment, ignore the vertical and horizontal movement of the tongue, we can see that Czech has three types of vowels: /a/, /e/, /i/, /o/, /u/ realized as short vocoids [a], [ɛ], [ɪ], [o], [u], /ā/, /ē/, /ī/, /ō/, /ū/ realized as long vocoids [a:], [ɛ:], [i:], [o:], [u:], and /ä/, /ě/, /ö/ realized as diphthongoids [au], [eu], [ou]. It is therefore adequate to posit an opposition ‘short’ ~ ‘long’ ~ ‘diphthongal’ for these differences. There is a qualitative difference between short [ɪ] and long [i:] and there may be other qualitative difference between short and long vocoids in some varieties of Czech. Long vocoids tend to be higher and closer than short ones. It is, however, obvious that this is a concomitant feature of long vocoids and therefore not a functional feature.

In some languages it may be preferable to analyze long vocoids as corresponding to a sequence of two (short) vowels, for instance, to interpret [a] as corresponding to /a/ and [a:] as corresponding to /aa/. Such a solution is economical because it does away with a phonological opposition between ‘short’ and ‘long’ vowels. However, we deem it more adequate to posit an opposition ‘short’ ~ ‘long’ for the difference in Czech. Such an analysis may be arguably phonematically less simple as we have to introduce more phonemes but we are

entitled to sacrifice simplicity in favor of adequacy. That it is more adequate we judge, first, from the ability to analyze so-called shortenings of vowels taking place in Czech by neutralization of the opposition between ‘short’ and ‘long’ vowels. Second, we can maintain a distributional rule that no two identical phonemes can stand in close proximity within a single phonotagm (see below, Section 4.9). Lastly, it is intuitively a better analysis and though intuition does not any decisive role, it is a virtue of descriptive statements to be intuitively satisfactory (cf. Mulder 1968: 197).

We have posited an opposition ‘front’ ~ ‘central’ ~ ‘back’ to account for the difference between ‘front’ /i/, /e/, ‘central’ /a/ and ‘back’ /u/, /o/. The same opposition obtains for the difference between ‘front’ /ī/, /ē/, ‘central’ /ā/ and ‘back’ /ū/, /ō/ as well as for ‘front’ /ě/, ‘central’ /ä/ and ‘back’ /ö/. In other words, the opposition is proportional for ‘short’, ‘long’ and ‘diphthongal’ vowels.

Finally, the difference between /i/ and /e/, /ī/ and /ē/, /u/ and /o/, /ū/ and /ō/ will be expressed by an opposition ‘high’ ~ ‘mid’. This opposition is relevant only for ‘front short’, ‘front long’ and ‘back short’, ‘back long’ vowels. It is not relevant to vowels that are ‘diphthongal’ or ‘central’. From the phonetic point of view [a] is of course low but we cannot define /a/ as ‘short central low’ because the hypothesis that ‘low’ is distinctive has been refuted by the very fact that ‘central’ vowels are always ‘low’. Likewise, we cannot define the diphthong /ě/ as ‘diphthongal front high’, even though it is in phonic realization very similar to the realization of the phoneme /e/ ‘short front high’. The hypothesis that ‘diphthongal front high’ are the distinctive features of the phoneme /ě/ has been refuted because there is no phoneme with the distinctive features ‘diphthongal front low’. The tentative feature ‘high’ is therefore not a distinctive feature at all. It is a truism that only distinctive features are distinctive features.

Note that the diphthongs are here transcribed with a dieresis as /ě/, /ä/, and /ö/ rather than /eu/, /au/ and /ou/, because they are, by functional necessities, single phonemes and there is a functional difference between the diphthongs /ě/, /ä/, /ö/ and two-phoneme combinations /eu/, /au/, /ou/. Cf. /pöTšeK/, [poutʃek] *pouček* “little puck” and /pouTšeK/, [po.utʃek] *pouček* “theorem (gen. pl.)”.

3.6 Semiconsonants

Semiconsonants are those phonemes that can stand both in the nuclear position and a peripheral position. Czech has two such phonemes: /l/ characterized by only one distinctive feature ‘lateral’ and /r/ characterized by a distinctive feature ‘vibrant’ (once again the names are arbitrary; they might as well be ‘l-ness’ and ‘r-ness’ or anything else). The phonetic counter-domains of the semiconsonants are syllabic contoids [l̩] and [r̩] for the nuclear position and non-syllabic [l], [r] for peripheral positions. Czech has another syllabic contoid [m̩] but for the reasons discussed above it was excluded from the analyzed data.

In the nuclear position the semiconsonants /l/ and /r/ are commutable with vowels and in peripheral positions they commute with consonants. A question might be asked why we unite peripheral [l]/[r] with nuclear [l̩]/[r̩] if we have rejected the equation of [j] with [ɪ] (see Section 4.9). After all it must be phonetic similarity that speaks for it but phonetic similarity is rather a subjective matter. However, in all contexts where the l-sound and r-sound appear, they are distinguished from other sounds by their lateral and vibrant articulations, respectively. Moreover, there is no hindrance in the distribution of the sounds [l] and [l̩] and of the sound [r] and [r̩] as is to be pointed in the case of [j] and [ɪ]. Neither of the sounds of the two pairs occurs in close proximity with its syllabic or non-syllabic counterpart. In other words, a syllabic [l̩] can never be preceded or followed by a non-syllabic [l] as well as [r̩] is never preceded or followed by [r]. All in all, the hypotheses “[l] and [l̩] do not correspond to separate phonemes”, “[r] and [r̩] do not correspond to separate phonemes” are adequate, have withstood attempted refutations and have been adopted as descriptive statements about the phonematic system of Czech.

4. Dubious phonemes

In this part we want to discuss some dubious cases in the phonematics of Czech. It concerns several phonemes whose status has been a subject of dispute. First, it has been argued that certain phonemes do not belong to the phonematic system of Czech because they occur in phonological forms of words of foreign origin only. Second, we will consider several alternative interpretations of the phonematic system.

4.1 The phoneme /f/

One of the phonemes treated as a non-native element of Czech is /f/. It is a model accounting for the sound [f]. The phonetic forms of words in which this sound occurs are either words of foreign origin (e.g. [filozofijɛ] *filozofie* “philosophy”), words of onomatopoeic origin and hence stylistically colored (e.g. [foukat] *foukat* “to blow”) or words perhaps belonging rather to dialects and/or non-standard varieties ([fjertoʃɛk] *fěrtošek* “apron”, [flaʃka] *flaška* “bottle”). The objections as to the origin are, however, irrelevant for a synchronic analysis, which most analysts seem to forget.

We hold the place of /f/ in the phonematic system of Czech as indisputable. A large number of words of “foreign” origin are commonly used in communication (e.g. *film* “film, movie”, *fotografie* “photo”, *fakulta* “faculty”, *Francie* “France”, not to mention quite common proper names *František*, *Josef*, genitive *Josefa*). Although these words may be regarded as stylistically marked, it is of no relevance for phonology as long as the sound [f] in their phonetic forms has a distinctive function. Moreover, there exists a minimal pair [zouvat] *zouvat* “to pull off shoes” ~ [zoufat] *zoufat* “to despair” in which both of the words are of “domestic” origin. The pair is well-known but it is argued that it is a marginal phenomenon, because there are actually only two such words of “domestic” origin with [f]: *zoufat* “to despair” and *doufat* “to hope”, and both were derived in the past from the same stem. But once again the diachronic facts of the origin are not decisive in a synchronic

phonological analysis. Furthermore, we deal with the capacity, i.e. the *potential* to differentiate forms and the difference between [f] and [v] certainly has this potential! It is a common objection against certain minimal pairs such as [zouvat] ~ [zoufat] that these pairs would hardly be confused in actual communication and hence the communicational difference between [v] and [f] is dubious. However, as the reader may check himself in Section 1.3 above, we have said that any phonological form (hence also any phoneme) is endowed with a distinctive function and with the *capacity* of having a distinctive function. This capacity cannot be disputed for the phoneme /f/.

To the sphere of diachrony and hence outside the interests of a synchronic analysis, also belongs the statement that the words like *foukat* “to blow” are onomatopoeic in origin (the sound [f] resembles the blowing of wind) and are thus stylistically marked. We do not deny that there might be a stylistic difference between *foukat* and *vát*, both meaning “to blow”, but we are interested only in their phonological forms. That is to say: we do not deny that [f] may have an expressive function in Czech but it has first of all a distinctive function which is the function we are interested here in. It is also worth pointing out that there is a word *výfuk* “tail pipe (of a car)”, derived from *foukat*, which is definitely stylistically neutral.

4.2 The phoneme /g/

Another phoneme claimed to be non-native in the phonematics of Czech is /g/ as a model for the sound [g]. The situation with [g] need not be so straightforward, because there are no words containing it which would be of “domestic” origin and/or would not belong to dialects rather than to standard Czech. This, however, does not mean that words like *guma* “gum”, *guláš* “goulash”, *garáž* “garage”, *gymnázium* “grammar school”, *gram* “gram” are not commonly used in everyday communication. Because there are many more such words, the number of attested phonetic forms containing the sound [g] is sufficiently large for postulating the phoneme /g/ as a part of the phonemic system of Czech. What has been said about the distinctive potential of /f/ also applies to /g/.

4.5 The phoneme /ō/

In the vocalic system the phonemic status of /ō/ is often questioned. The argument is again that [o:] occurs only in (phonetic forms of) words that of foreign origin. In “domestic” words it occurs only in phonetic forms stylistically colored, e.g. [mo:ɾɛ] for *moře* “sea; a lot of” instead of “neutral” [moɾɛ]. Though there are minimal pairs such as [loʒɛ] *lože* “bed” ~ [lo:ʒɛ] *lože* “lodge”, [domu] *domu* “house (loc. sg.)” ~ [do:mu] *dómu* “dome (loc. s.g.)” or [bojɛ] *boje* “fights” ~ [bo:jɛ] *bóje* “buoys”, it is claimed that the words *lože*, *dómy*, *bóje* et al. are borrowed from foreign languages and the occurrence of [o:] in their phonetic forms is a feature of foreignness. This is certainly true as regards the origin of the words but it is irrelevant for a synchronic analysis. Because there are many forms with [o:], we regard the phoneme as a firm part of the phonematic system of Czech. Some further forms are: [go:l] *gól* “goal”, [sko:ɾɛ] *skóre* “score”, [sezo:na] *sezóna* “season”, [mo:da] *móda* “fashion”, [to:n] *tón* “tone”, [zo:na] *zóna* “zone”, [ko:t] *kód* “code”, [so:lo] *sólo* “solely, alone”.

In the case of the pair [domu] *domu* “house (loc. sg.)” ~ [do:mu] *dómu* “dome (loc. sg.)” we can imagine a sentential context for this difference:

[jdu 'do_domu] *Jdu do domu* “I go into the house”

[jdu 'do_do:mu] *Jdu do dómu* “I go into the dome”

We have heard an objection that this difference is rather artificial because in actual communication one would know if the speaker means “house” or “dome”. This is certainly true, yet the argument is false. In actual communication we are capable of understanding many things from the situational context but it does not mean the phonological and grammatical differences cease to be operative at all. Imagine a situation if someone said [jtu 'to_tomu] instead of [jdu 'do_domu]. It is more than likely that a Czech would, in a concrete situation but even without any context, be able to identify the utterance as *Jdu do domu* “I go into the house”. But does it mean that the difference between [t] and [d] is not functional?

4.6 The phoneme /ä/

The feature of foreignness is also ascribed to the diphthongs /ä/, /ë/ accounting for the diphthongoids [au], [eu]. Though it has some reason in the case of [eu], it is completely unwarranted for the diphthong [au]. The diphthongoid occurs in [ʔauto], a phonetic form of *auto* “car”, which is one of the most used words in Czech (the 552th most used word according to the word-frequency dictionary of Czech, see FSČ), not to mention that Czech does not have any other word for “car”. In addition, there are these words: *aura* “aura”, *aukce* “auction”, *restaurace* “restaurant”, *pauza* “pause”, *kauza* “cause” and many others. Once again the phoneme /ä/ is a distinctive entity in Czech, because it can be used to differentiate and has the capacity of differentiating phonological forms of words.

4.7 The phoneme /ë/

The situation is different with [eu]. The diphthong /ë/ is most marginal of all the phonemes of Czech. As the spelling of Czech tends to mirror its phonemic structure, we can discuss the problem from the perspective of spelling. Like other diphthongs, /ë/ is spelled by a digraph (*eu*). However, not each and every instance of *eu* in spelling corresponds to the diphthong. It may correspond to a group of two vowels /eu/ if the word whose phonological form we are speaking of is a product of derivation, cf. *neurčitý* “uncertain”, derived from *ne-* “un-“ and *určitý* “certain”. In such cases we have the group /eu/ rather than the diphthong /ë/.

The sequence *eu* in writing does not emerge only from morphological processes but is also present in words borrowed from foreign languages. For these words there is, however, variation in pronunciation between diphthongal [eu] and two-vocoid [e.u]. In words like *eufemismus* “euphemism”, *eufonie* “euphony”, *eukalypt* “eucalyptus”, *eunuch* “eunuch”, *euro* “euro”, it is probably the diphthongoid [eu] that is always pronounced. On the other hand, in words like *muzeum* “museum”, *jubileum* “anniversary”, *terapeut* “therapist” it is most likely the two-vocoid sequence [e.u] that is pronounced. There are in addition words which seem to allow either of the pronunciations: *feudální* “feudal”, *leukocyt* “leukocyte”,

zeugma “zeugma”, *pneumatika* “pneumatic tire”. Though an official handbook for pronunciation of foreign words (Romportl 1978) recommends diphthongal pronunciation for these words (except for *pneumatika* for which no pronunciation is given), it seems that these words may be pronounced either with [ɛu] or [ɛ.u], or at least there is variance in speech of some speakers. To the best of our knowledge no research has been done as to find out which pronunciation is commoner.

A detailed discussion of the problem of *eu* belongs to a different study than is the present one. For our purposes it suffices to say that the diphthongoid [ɛu] occurs in the corpus of present standard Czech, even though only in phonetic forms of words of so-called foreign origin. As such it enters in oppositions with other vocoids and diphthongoids and the set of commutations thus arisen is a firm basis for postulating the diphthong /ě/ as a part of the vocalic system of Czech phonemes. That it is statistically the least occurring phoneme is merely a statement of fact, not an argument against its phonematic status.

4.8 The phonemes /ř/ and /r/

In this and the following section we want to discuss, not foreignness of the phonemes /r/, /ř/, /j/ and /i/ but possible re-interpretations of the relations between [r] and [r̥] on the one hand, and between [j] and [j̥] on the other.

As regards /r/ and /ř/, there might be reasons for setting a closer relationship between them. Phonetically at least the sounds [r] and [r̥] are related, both being rhotic vibrants. However, it is not certain what kind of relation between /r/ and /ř/ should be postulated. The phoneme /r/ a semiconsonant, because it commutes with both vowels and consonants, but /ř/ is a consonant, as it is commutable with consonants only. Therefore /r/ and /ř/ are mutually commutable only in peripheral positions, not in the nuclear position. If we postulated a closer relationship between /r/ and /ř/ in peripheral positions, the relationship cannot be valid in the nuclear position. As only the sound [r] occurs in the nuclear position, it is not opposed to [r̥] here and hence the relation that exists between [r] and [r̥] in non-nuclear context is not operative in the nuclear context. The nuclear [r] would have to correspond to a different phoneme than the non-nuclear [r]. An alternative solution would be to interpret

the nuclear [r] as a realization of the archiphoneme resulting from neutralization of the opposition between /r/ and /ř/. This would not be such an obstacle, perhaps except for reasons of simplicity.

What is more problematic is how to formulate the relationship between /r/ and /ř/. If both are defined as ‘vibrant’, there must be something that differentiates them. The difference cannot be well fitted into the system of oppositions so far postulated for the Czech consonants. If, for instance, we set /r/ to be ‘alveolar vibrant’ and /ř/ to be ‘palatal vibrant’, which is a possible analysis, we would have to deal with the fact that the distinctive features ‘alveolar’ and ‘palatal’ have different oppositional values in the context of ‘vibrant’ than in the other contexts (see the discussion of hyperphonemes, Section 3.4). The hyperphonemic analysis is thus arguably complicated and less elegant.

If we wanted to avoid postulating hyperphonemes and yet to posit a closer relationship between /r/ and /ř/, we would conclude that it is not possible. It is not functionally feasible to posit a new opposition just for the two phonemes. But let us suppose the contrary. We posit an opposition ‘non-spirant’ ~ ‘spirant’ for the difference between /r/ and /ř/. The phonemes are then defined as ‘vibrant non-spirant’ and ‘vibrant spirant’, respectively. However, because there are no other ‘spirant’ phonemes that would not be ‘vibrant’, the distinctive feature ‘vibrant’ is not in fact separately relevant (functional, i.e. distinctive). The phoneme that is either ‘non-spirant’ or ‘spirant’ is automatically ‘vibrant’, and hence the hypothesis that ‘vibrant’ is a distinctive feature is refuted. Now, if ‘vibrant’ is actually not distinctive, we are left with ‘non-spirant’ for /r/ and ‘spirant’ for /ř/. The opposition ‘non-spirant’ ~ ‘spirant’ has not been set for any other phonemes except for /r/ and /ř/ (it is not proportional to use one of Trubetzkoy’s terms), which all comes down to saying there is a certain distinctive feature characterizing the phoneme /r/ and a certain other distinctive feature characterizing the phoneme /ř/. However, this is exactly the analysis we have proposed at the beginning. We have only used different labels, namely ‘spirant’ for /ř/ and ‘vibrant’ for /r/. The bottom line is that the difference between /r/ and /ř/ cannot be conveniently fitted into the set of oppositions so far established, and it is therefore better (consistent, simpler and—we think—more adequate) to leave the phonemes without any closer relationship.

4.9 The phonemes /j/ and /i/

Like /ř/ ‘spirant’, the phoneme lies outside the system of proportions is /j/; it is defined by one distinctive feature ‘approximant’ only. The name is again arbitrary. In fact, it could be called ‘j-ness’ or anything else. The phoneme cannot be incorporated into the system of consonantal proportional oppositions or if it were, the incorporation would considerably complicate the presentation. It is simpler to let it stand outside the system of proportions. As such it is opposed to other consonants and their distinctive features *qua* sets. The same holds in fact for /ř/, too.

There are reasons—and it seems to be an adequate solution for e.g. English—for joining up the contoid [j] and the vocoid [ɪ] under one phoneme as its allophones. The resulting phoneme is then a semiconsonant, because it occurs in both nuclear and peripheral positions within a phonotagm. Though it certainly simplifies the phonematic analysis by having only one phoneme instead of two, it may, on the other hand, complicate the phonotactic analysis. Moreover, adequacy of such a solution for Czech can be questioned.

If [j] and [ɪ] corresponded to one phoneme, the phonological form of the word *pj* “drink!” (realized [pjɪ]) would be /pɪj/ (the underlining indicates the nuclear position). If we recalled one of Trubetzkoy’s rules for deciding whether two sounds correspond to one phoneme or not, we would have to reject the analysis, because as Trubetzkoy has it, no two sounds correspond to one phoneme if they can occur in close proximity (1939: 50-9). Trubetzkoy seems not to have ever explained why this should not be so. In fact, there is no a priori reason why two allophones of one phoneme could not follow each other. Geminated sounds normally occur in the world’s languages and they are usually interpreted at allophones of one phoneme.

Nevertheless, there is some point in Trubetzkoy’s rule but it should be differently interpreted, and it is probably not universal for every language. Let us return to the form /pɪj/ of Czech *pj* “drink!”. The form is one phonotagm, hence one distributional unit. Though once in the nuclear position and once in a peripheral position, there are two identical phonemes standing in close proximity within the phonotagm. Furthermore, due to the existence of /iɪ/, phonological form of *ji* “her” (realized [jɪ]), it is possible to extrapolate the form /iɪj/ (written most likely as *jij*), unattested but possible. The tentative phoneme /i/ (re-

alized once as [j] and once as [ɪ]) would then be the only phoneme in Czech that could, within the phonotagm, occur in close proximity with itself. In other words, it would be the only phoneme which could be doubled or tripled within one and the same phonotagm. There is nevertheless one exception to this as it is the phonological form of *dcera* “daughter”: if affricates are combinations of two phonemes as we have analyzed them, the phonological form of *dcera* is /TTsera/, realized as [ttsera]. However, it should be said that such a realization of *dcera* is felt as hypercorrect or as a mark of a higher style (Palková 1997: 335); in normal and casual speech it is realized as [tsera]. We will hence ignore this exception and propose the following distributional rule in Czech: no phoneme can follow itself within one phonotagm/syllable (note that forms *nejjemnější* “softest”, *racci* “sea-gulls” etc. are of course examples of geminates but not *within one and the same syllable*).

It is this reason we have chosen not to group [j] and [ɪ] under one phoneme: we can maintain the distributional rule and thus make the phonotactic analysis simpler. There are also other reasons. Some of them were discussed by other linguists (see Vachek 1968: 52-7) but there is also a methodological reason. The sounds [j] and [ɪ] are grouped together because they are, first, phonetically similar, and second, they are in complementary distribution (at least according to the approaches which distinguish between nuclear and marginal positions within the syllable). These facts make the hypothesis “[ɪ] and [j] do not correspond to separate phonemes” adequate. However, what prevents us from grouping, say, [a] and [k] together? They are surely in complementary distribution and they are phonetically similar, though perhaps not as similar as [j] and [ɪ] but we should remember that similarity is subjective. And in fact Kučera (1961: 24) characterizes both sounds by a Jakobsonian distinctive feature ‘+compact’. We do not see why such an analysis should be a priori ruled out. It would simplify the phonematic analysis, though the phonotactic analysis would be complicated because the distributional rule about the impossibility of two phonemes standing in close proximity within one phonotagm would be violated (cf. [kat] *kat* “executioner”).

In order to make the phonotactic analysis simpler, we have chosen not to follow such an analysis and are regard [j] and [ɪ] as corresponding to different phonemes. It should be noted that it is perfectly legitimate to opt for having a simpler analysis on one phonological (or grammatical) level at the expense of having a more complicated analysis on another

phonological (or grammatical) level. It is thus legitimate to postulate two phonemes instead of one if it makes the phonotactic analysis simpler. What is, however, not legitimate at all is to complicate a phonological (or grammatical) analysis if doing so simplifies the statement of realizations of phonological (or grammatical) entities. In other words, it is not legitimate to postulate two phonemes instead of one if the description of realizations of these phonemes would be made simpler as a consequence of this. For instance, it is not legitimate to postulate two separate phonemes /n/ and /ŋ/ for Czech even though the statements “/n/ is always be realized with [n]” and “/ŋ/ is always with [ŋ]” are simpler than a statement “/n/ is realized with [n] except before /k/, /g/ and /x/ where it is realized with [ŋ]”. More on so-called legitimate and illegitimate trade-offs can be found in Dickins 1998: 42-6.

5. Neutralization and archiphonemes

In this part we discuss the concepts *neutralization* and *archiphoneme*, a functionalist view thereof, and their application on the phonematic system of Czech.

5.1 A functionalist view of neutralization and archiphoneme

Functionalist phonology (and not only axiomatic-functionalist) recognizes opposition as one of the basic relations in the language system. It is a paradigmatic relation between items in a certain syntagmatic environment. Although other functionalist approaches define the notion “opposition” (see e.g. Trubetzkoy 1939: 60, Akamatsu 1992: 25-7), it does not receive a separate definition in the Postulates for AF. This is because the approach operates with set- and relation-theoretical terms and so an opposition is a relation of negation or complement which is usually symbolized as ‘~’. The formula $a \sim b$ means “*a* and the negation/complement of *b*” but for linguistic purposes it may be read as “*a* as opposed to *b*”. With the notion “opposition” is closely connected the notion “commutation”. Its formal definition has been already given above but is reiterated here for convenience.

‘Commutation’ for ‘alternation (or: choice) between semiotic entities (or ‘zero’ and semiotic entities) in functional opposition as immediate constituents, in a given context’.

The definition says that commutation is an oppositional relation between entities in a given context. The context is here of crucial importance. A relation taking place in one context need not necessarily obtain in another context. We say then that the relation is operative in certain contexts but inoperative in other contexts. As regards the relation of opposition in linguistics, the inoperability of opposition is called *neutralization*. Its formal definition is:

‘Neutralization’ for ‘suspension of opposition between members of a correlation in given contexts, and governed by those contexts’.

‘Correlation’ for ‘set of tactic entities which have an immediate constituent in common’.

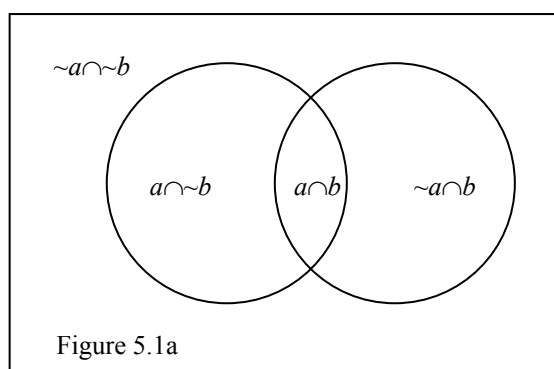
Neutralization *qua* concept is operated with by many linguistic approaches, though it is generally variously defined and in many cases the only thing the multiple definitions have in common is the term *neutralization*. Even in functionalist linguistics there is no uniformity and mutual agreement. We will not go into details here, as the problem was extensively discussed elsewhere (Davidsen-Nielsen 1978, Akamatsu 1988).

Though there is again no mutual agreement—there is in fact less agreement than in the case of neutralization—, axiomatic functionalists and some other functionalists (see Akamatsu 1988 for an overview) hold that the concept “neutralization” necessarily implies another concept: *archiphoneme*. It is an entity resulting from neutralization and occurring in the context of neutralization. We maintain that archiphoneme is a logical consequence of neutralization, which is itself implied from the concept of opposition (commutation). If there is an oppositional relation between two or more distinctive features characterizing certain phonemes in one context (context A) but the relation cannot be postulated in another context (context B), because the characterization is redundant there, it follows that the entity occurring in the context B cannot be equated with any of the phonemes of the context A. It follows from a definition of phoneme as a bundle of distinctive features. Let us suppose a phoneme X, defined as a bundle of distinctive features ‘x y z’, occurs in a context A. If there is a certain context B where one of the features, say, the feature ‘z’ would be redundant, it cannot be functional in that context and hence ‘z’ is in fact not a distinctive feature at all in that context. If it is not distinctive, then the entity occurring in the context B can only be defined as a bundle of ‘x y’. It is obvious that the bundle of ‘x y z’ of the context A is something different than the bundle ‘x y’ of the context B and thus the entities cannot be equated. This is simple mathematics: a set of a certain number of members cannot be equated with a set of a different number of members. Though many seem to forget it, this simple mathematics must hold in linguistics, too: a bundle of distinctive features cannot be equated with a bundle of fewer or more distinctive features!

As mentioned, the entity resulting from neutralization is called *archiphoneme*. In AF it is defined as follows:

‘Archiphoneme’ for ‘phonotactic entity resulting from neutralization’. Alternative definition: ‘Simultaneous bundle of distinctive features in particular contexts, common to two or more phonemes in other contexts, i.e. equalling the intersection of those phonemes’.

Archiphoneme is an entity occurring in a certain phonotactic context and defined as an intersection of the sets of distinctive features *qua* sets defining two or more phonemes in the other contexts. Being the intersection, an archiphoneme is logically included in the phonemes from which it results and is functionally *equivalent* to (not identical with) the phonemes. It means that an archiphoneme is “a phoneme is a sub-system which, when projected into the over-all system, is represented there by two or more phonemes” (Mulder 1968: 114). It may be expressed by a Venn diagram as in Figure 5.1a (adapted from Mulder 1968: 98). The formula $a \cap b$ (in Mulder’s notation: ab) is an intersection of a set a and a set b ; it is the archiphoneme.



The axiomatic functionalist view of archiphoneme was criticized by Akamatsu (1988: 303-6). He writes (*op. cit.*: 305-6, italics original):

One *can* say from a point of view of mathematical logic that ab [i.e. $a \cap b$] (the archiphoneme) can be identified with a (one member phoneme) as well as b (the other member phoneme) without being the whole of a or b , but one *cannot* say from a point of view of functional phonology that the archiphoneme can be viewed (as is done by axiomatic functionalists) as *part of* one phoneme as well as of the other member phoneme and is yet identified with one as well as the other member phoneme; the archiphoneme (ab) has not the phonological function of either one member phoneme (a) or the other member phoneme (b).

Akamatsu is right that the archiphoneme has a different phonological (i.e. distinctive) function than the member phonemes. From this necessarily follows that the archiphoneme cannot be identified with, i.e. is not identical with any of the member phonemes. It seems to us, however, that there is a misunderstanding between Akamatsu and Mulder. If we understand Mulder correctly, he does not claim that the archiphoneme, by virtue of being the intersection of two or more phonemes, is identified with these phonemes. He says that an archiphoneme is “a phoneme is a sub-system which, when projected into the over-all system, is *represented* there by two or more phonemes” (Mulder 1968: 114, emphasis ours). The archiphoneme is functionally equivalent to the member phonemes, not functionally identical with them. Items are functionally identical if they are “functionally the same in every respect” (*op. cit.*: 119). On the other hand, items are functionally equivalent if they are “functionally identical or representing the same” (*ibid.*). Because the archiphoneme has a different phonological content (i.e. a different distinctive function) than the member phonemes, it is not functionally same in every respect with the member phonemes and cannot hence be identified with them. However, since the archiphoneme is the intersection of (i.e. contains all distinctive feature common to) the member phonemes of a neutralizable opposition, and since it occurs in contexts where the member phonemes do not, it *represents* the member phonemes in those contexts and is therefore functionally *equivalent* to them in these contexts.

5.2 Neutralization of voice

Like phonemes, even archiphonemes are postulated on the basis of the commutation test. Paradigms in Figure 3.1a provide the input for the postulation. Upon the evidence of commutation test an analyst should launch hypotheses, even the hypotheses about neutralization. In this section we will discuss one instance of neutralization of consonantal phonemes in Czech.

Paradigms in Figure 3.1a show that in the context before a pause only phonetically voiceless contoids occur. If voiceless contoids cannot be confronted with the voiced ones, we cannot operate here with a distinction we have postulated in other contexts, namely the

functional distinction between ‘voiceless’ and ‘voiced’ consonants. The opposition ‘voiceless’ ~ ‘voiced’ is irrelevant word-finally before a pause, because it does not have the capacity to differentiate any phonemes in this situation; we say the opposition between ‘voiced’ and ‘voiceless’ phonemes is neutralized. From what follows we will see that if there is no functional difference between voiceless and voiced obstruents in certain context, this type of neutralization takes place. The non-functionality of the opposition need not only be the result of the exclusive occurrence of voiceless obstruents to the exclusion of the voiced ones. On the contrary: even voiced contoids may occur in the contexts of neutralization but the condition is that in none of these contexts is there a functional difference between voiceless and voiced obstruents. It may be that only voiceless contoids occur there or that only voiced contoids are occurrent but they must not be confronted with each other in these contexts. In such cases we will speak about neutralization of the opposition between ‘voiceless’ and ‘voiced’ consonants. For the ease of reference let us call this neutralization *neutralization of voice*.

As the opposition ‘voiceless’ ~ ‘voiced’ is pertinent to the pairs /p/ and /b/, /f/ and /v/, /t/ and /d/, /s/ and /z/, /tʃ/ and /dʒ/, /ʃ/ and /ʒ/, /k/ and /g/, and /x/ and /h/, it follows neutralization of voice must involve these phonemes. Furthermore, as only [p], [f], [t], [s], [ç], [ʃ], [k] and [x] occur before a pause, we see that the neutralization affects all of the pairs and we must thus postulate eight different archiphonemes as the intersections of the member phonemes of these pairs. They are these:

/P/ ‘labial occlusive’ (as the intersection of /p/ ‘labial occlusive voiceless’ and /b/ ‘labial occlusive voiced’)

/F/ ‘labial constrictive’ (as the intersection of /f/ ‘labial constrictive voiceless’ and /v/ ‘labial constrictive voiced’)

/T/ ‘alveolar occlusive’ (as the intersection of /t/ ‘alveolar occlusive voiceless’ and /d/ ‘alveolar occlusive voiced’)

/S/ ‘alveolar constrictive’ (as the intersection of /s/ ‘alveolar constrictive voiceless’ and /z/ ‘alveolar constrictive voiced’)

/Tʃ/ ‘palatal occlusive’ (as the intersection of /tʃ/ ‘palatal occlusive voiceless’ and /dʒ/ ‘palatal occlusive voiced’)

/š/ ‘palatal constrictive’ (as the intersection of /š/ ‘palatal constrictive voiceless’ and /š/ ‘palatal constrictive voiced’)

/K/ ‘velar occlusive’ (as the intersection of /k/ ‘velar occlusive voiceless’ and /g/ ‘velar occlusive voiced’)

/X/ ‘velar constrictive’ (as the intersection of /x/ ‘velar constrictive voiceless’ and /h/ ‘velar constrictive voiced’)

We have stated that neutralization of voice takes place before a pause which in fact coincides with the end of a phonological form of a word. As the end of a word is necessary the end of a phonotagm, we can generalize this by saying that neutralization of voice takes place in the last non-empty position of a phonotagm. If we have phonetic forms like [let] *led* ‘ice’, [ʔaʃ] *až* ‘till, until’, [potok] *potok* ‘rivulet’, they will be interpreted as /leT/, /aŠ/ and /potoK/. Furthermore, as can be easily verified, only voiceless obstruents can precede voiceless obstruents (and only voiced obstruents can precede voiced ones) as suggested by paradigms 4, 5, 6 in Figure 3.1a, neutralization of voice takes also place before any word-final (phonotagm-final) archiphoneme. If the word-final archiphoneme is realized as voiceless, the preceding archiphoneme is also realized as voiceless; in situations when the word-final archiphoneme is realized as voiced, the preceding archiphoneme is also realized as voiced. Forms like [zips] *zips* ‘zipper’, [takt] *takt* ‘tact’, [za:pst] *zábst* ‘to freeze’ are thus interpreted as /ziPS/, /taKT/, /zāPST/.

As already mentioned, the paradigms in Figure 3.1a shows that if a contoid is in close proximity with another contoid (excluding [v], [l], [r], [j] and nasals), the combination is either voiceless or voiced. In other words, voiceless contoids can only be combined with voiceless contoids, and voiced contoids can only be combined with voiced contoids. The exceptions are [v], [l], [r], [j] and nasals before which both voiceless and voiceless contoids can occur. To give an example: we can have only [sp] and [zb], never [sb] or [zp]. There are three possibilities how this could be interpreted:

1. There is neutralization of voice *before* a ‘voiceless’ or ‘voiced’ phoneme.
2. There is neutralization of voice *after* a ‘voiceless’ or ‘voiced’ phoneme.
3. There is no neutralization of voice at all in the contexts.

For deciding which of the three possibilities is to be preferred we should use the commutation test but the test will not help us in deciding non-arbitrarily whether neutralization

of voice takes place before or after ‘voiceless’ or ‘voiced’ phonemes. It would therefore seem that the flawless solution is to avoid arbitrary decisions, that is, if we cannot decide non-arbitrarily whether there is neutralization of voice before ‘voiceless’ or ‘voiced’ phonemes or whether it is after ‘voiceless’ or ‘voiced’ phonemes, it would be sounder not to postulate any neutralization at all.

This is a reasonable solution and it can be followed but it need not be the most adequate one. Speaking in phonetic and intuitive terms, descriptions of the sound structure of Czech generally state that assimilatory processes are mostly regressive (anticipatory) in Czech. When an obstruent is combined with another obstruent, the voicing of the first obstruent is assimilated to the voicing of the second one, the only exception being [v] before which both voiced and voiceless obstruents can occur. Examples: [ʒa:ba] *žába* “frog”, but [ʒapka] *žabka* “little frog”, [prosi:] *prosí* “(he) pleads”, but [prozba] *prosba* “plea”; but there can be [tvu:j] *tvůj* “your” as well as [dva] *dva* “two”.

This suggests it is intuitively more adequate to operate with the neutralization after all and to postulate it as taking place *before* a ‘voiceless’ or ‘voiced’ phoneme. It must be admitted, however, that this solution is not the only one possible and that we could lead a phonological analysis following the third of the mentioned solutions. Such a solution would arguably avoid making an arbitrary, though motivated choice between the first and the second solution for the situation in question. We are perfectly aware of the alternative possible analyses but it is our decision to operate with the first of the proposed solutions, because we regard it more adequate to the data of Czech. From now on we will hold that neutralization of voice takes place in the context before a phoneme that is either ‘voiceless’ or ‘voiced’. From this premise we will derive further contexts for this type of neutralization. N.B. The condition that the phoneme triggering the neutralization is either ‘voiceless’ or ‘voiced’ is a necessary one. Neutralization of voice does not take place before /m/, /n/, /r/, /l/, /j/ and /ř/ in some situations (all of these phonemes being indifferent to the ‘voiceless’ and ‘voiced’ distinction). The exception to be discussed shortly is the phoneme /v/; although it is phonologically ‘voiced’, neutralization of voice does not take place before it.

If neutralization of voice takes place before a ‘voiceless’ or before a ‘voiced’ consonant, it follows that the examples mentioned earlier should be interpreted accordingly: /ʒaPka/ for [ʒapka] *žabka* “little frog”, /proSba/ for [prozba] *prosba* “plea”. Further examples are:

/Starī/ for [stari:] *starý* “old”, /Sdar/ for [zdar] *zdar* “success”, /Ptāk/ for [pta:k] *pták* “bird”, /Kdo/ for [gdo] *kdo* “who” etc. As already suggested, neutralization of voice does not take place only before a ‘voiceless’ or ‘voiced’ consonant but also before an archiphoneme resulted from this neutralization. To say it in other words: neutralization of voice is transitive. Examples are /evroPSkī/ for [ʔevropski:] *evropský* “European”, uŠTKnouT/ for [ʔuʃtknout] *uštknout* “to bite”, /leTSKdo/ for [lɛɟgdo] *leckdo* “whoever” or /lěTŠba/ for [lɛ:ɟba] *léčba* “medical treatment” (affricates have been interpreted as two-phoneme combinations and so they also undergo neutralization).

Neutralization of voice does not necessarily take place immediately before a ‘voiced’ or ‘voiceless’ consonant. It occurs also before /ř/, which is indifferent to the phonological distinction between ‘voiceless’ and ‘voiced’, in case the immediately following phoneme is either ‘voiceless’ or ‘voiced’. Though not included in the paradigms in Figure 3.1a, one can easily verify this statement. A phonetic reason for this lies in the fact that /ř/ can be realized both by a voiceless [ř̥] and by a voiced [ř], hence if there is a combination CřC (where C = any obstruent), the whole will be voiceless provided that the last obstruent is voiceless, and voiced provided that the last obstruent is voiced. Examples are: [xřta:n] *chřtán* “scrag”, [křci:nɪ] *křtiny* “christening party”, [řpi:t] *řpyt* “gleam”, [řbet] *hřbet* “spine”. The phoneme /ř/ serves, so to speak, as a transition of the quality of voice. Once we have opted for neutralization of voice taking place before a ‘voiceless’ or ‘voiced’ phoneme, the described situation should be interpreted phonologically as another instance of the neutralization. The phonological forms of the mentioned examples are, respectively: /Xřtān/, /Křřini/, /řpiT/ and /XřbeT/.

Neutralization of voice apparently does not take place before /ř/ if followed by a consonant indifferent to the ‘voiceless’ ~ ‘voiced’ distinction. Cf. forms [řmɲet] *hřmět* “to roar”, [řmi:] *hřmí* “(it) roars” and [řmen] *řmen* “stirrup”. Although we do not find [xřm] (spelled *chřm-*) or [dřm] (spelled *dřm-*), the forms shows that both ‘voiceless’ and ‘voiced’ consonants can stand before /řm/, hence /hřmī/ for *hřmí* and /řmen/ for *řmen*.

We will now return to the situation at the end of a phonological form, i.e. at the end of a phonotagm. We have already explained that neutralization of voice takes place at the end of a phonotagm and before any phonotagm-final archiphoneme (cf. /leT/ for *let* “flight”, /lěST/ for *lézt* “to climb”). Neutralization of voice also occurs in post-nuclear positions be-

fore a final /ř/. The phoneme /ř/ is realized as a voiceless [ř̥] word-finally and for that reason only voiceless obstruents can precede it. Examples are /pePř/ for [pepř̥] *pepř* “pepper”, /vePř/ for [vepř̥] *vepř* “pig” and /dovňiTř/ for [dovňitř̥] *dovnitř* “into, inside”.

It has already been mentioned that neutralization of voice does not take place in the context before [v], [r], [l], [j] and nasals. From the phonological perspective this is to say that neutralization of voice does not occur before the phonemes /v/, /r/, /l/, /j/, /m/, /n/ and /ň/. All of them aside from /v/ do not participate in the opposition ‘voiceless’ ~ ‘voiced’. The situation with this phoneme is peculiar. The sound [v] is usually characterized as a voiced labio-dental fricative, being a counterpart of [f], a voiceless labio-dental fricative. However, the friction of [v] is acoustically very small compared to other fricatives (cf. Krčmová 2006: 138, Palková 1997: 211, see also Section 6.1 s.v. /v/). From the historical point of view this peculiarity is usually explained by assuming that the v-sound was originally a labial-velar approximant [w] (cf. Romportl 1973b). If true, it was a sound with similar characteristics like [r], [l] and [j], before which both voiceless and voiced sounds can generally stand. However, in Present Standard Czech the origin of the sound is blurred because [v] loses, in morphological processes, its voicing at the end of a phonetic form and before a voiceless sound, cf. [pa:vi] *pávi* “peacocks” vs. [pa:f] “peacock”, [sli:va] *slíva* “plum” vs. [sli:fka] *slívka* “little plum”. Though of limited occurrence, the phoneme /f/ is still a distinctive phonematic entity of Czech, and it is reasonable to express the relation between /f/ and /v/ in terms of an opposition ‘voiceless’ ~ ‘voiced’. Alternative analyses are of course possible but this one seems to be simplest. The opposition /f/ ~ /v/ is operative word-initially before a vowel and word-medially between two vowels. It is not operative word-finally, sc. at the end of a phonotagm where the archiphoneme /F/ occurs (e.g. /pāF/ for *páv*). It is also neutralized before a ‘voiceless’ or ‘voiced’ phoneme like in the case of the other ‘voiceless’ or ‘voiced’ phonemes (e.g. /slīFka/ for *slívka*).

Because of the peculiar character of [v], a problem arises with the context “before [v]”. In this situation both voiceless and voiced contoids occur, which proves that there is no neutralization of voice. On the other hand, in the context “before [f]” there can only be voiceless contoids, which points to neutralization. Moreover, in the context “after a voiceless contoid” both [f] and [v] can occur, but in the context “after a voiced contoid” only [v] can occur. The situation is summarized in Figure 5.2a. The table suggests we could postu-

late neutralization before [f], because only voiceless contoids occur here, but not before [v]. The combination [sf] is then interpreted as /Sf/. The combinations [sv] and [zv] are, respectively, interpreted as /sv/ and /zv/ with no neutralization taking place. Finally, [fs] and [vz] are interpreted as /Fs/ and /Fz/.

	before [f]	before [v]	after [f]	after [v]
voiceless con- toids	yes [sfɛ:ra] <i>sfěra</i> “shere”	yes [sval] <i>sval</i> “mus- cle”	yes [fsa:t] <i>vsát</i> “to suck in”	no
voiced contoids	no	yes [zval] <i>zval</i> “(he) invited”	no	yes [vzal] <i>vzal</i> “(he) took”

Figure 5.2a

Let us now summarize. Neutralization of voice, i.e. neutralization of the opposition between ‘voiceless’ and ‘voiced’ consonants takes place in the following contexts. The entities standing in there are archiphonemes resulted from the neutralization.

1) In post-nuclear positions of a phonotagm, sc. in a position before the end of a phonotagm. Examples: /peS/ for [pɛs] *pes* “dog”, /leT/ for [lɛt] *led* “ice”.

2) Before a ‘voiceless’ consonant in any position. Examples: /Stül/ for [stu:l] *stül* “table”, /FsaɟiT/ for [fsaɟit] *vsadit* “to bet”.

3) Before a ‘voiced’ consonant in any position with the exception of /v/ before which the opposition ‘voiceless’ ~ ‘voiced’ is operative. Examples: /SdāT/ for [zda:t] *zdát (se)* “to dream”, /Kdo/ for [gdo] *kdo* “who”; exceptions: /tvūj/ for [tvu:j] *tvŭj* “yours”, /dva/ for [dva] *dva* “two”.

4) Before an archiphoneme resulted from neutralization of the ‘voiceless’ ~ ‘voiced’ opposition: /FStāT/ for [fstɑ:t] *vstát* “to get up”, /lĕTŠba/ for [lɛ:ɟba] *lěčba* “medical treatment”, /adjunKT/ for [ʔadjunɟt] *adjunkt* “adjunct”.

5) Before /ř/ followed by a ‘voiceless’ consonant. Examples: /Křtu/ for [křtu] *křtu* “christening (gen. sg.)”, /Třřina/ for [třřina] *třřina* “sugar-sane”.

6) Before /ř/ followed by a ‘voiced’ consonant. The exception is probably again /v/ (sc. the context before /řv/), though we do not have sufficient examples, only a place-name [pɛřřvalt] *Petřřvald* but probably no example of a voiced contoid preceding [řv]. Example: /XřbeT/ for [řřbet] *hřřbet* “spine”.

7) Before a post-nuclear /ř/. Examples: /pePř/ for [pepř̩] *pepř* “pepper” (but not /pepře/ for [pepř̩ɛ] *pepře* “pepper (gen. sg.)”, cf. /dobře/ for [dobř̩ɛ] *dobře* “well, good”), /dovňiTř/ for [dovňitř̩] *dovnitř* “into, inside”.

a sub-system of consonants	<i>occlusive</i>	<i>constrictive</i>	<i>nasal</i>
<i>labial</i>	P	F	m
<i>palatal</i>	ř̩	š̩	ň̩
<i>alveolar</i>	T	S	n
<i>velar</i>	K	X	

Phonemes outside the system of proportions: /j/ ‘approximant’, /ř̩/ ‘spirant’.

Figure 5.2b

The consonantal sub-system resulting from the neutralization of voice is reproduced in Figure 5.2a. The reason we write the archiphonemes with capitals is just for the sake of convenience. There are many ways to transcribe them but the strategy chosen by us (and in fact quite a common strategy) is to indicate the relationship of the archiphonemes to the phonemes from which they, as it were, arose. As already mentioned, an archiphoneme is a phonematic entity in a particular sub-system equivalent to two or more phonemes of the over-all system.

5.3 Alternative interpretations of neutralization of voice

Having discussed at length neutralization of voice, we would now like to add a couple of notes on alternative solutions that have been proposed for the problem discussed in the previous section.

The process behind the so-called neutralization of voice is a fairly well-known phenomenon, and it is certainly not confined to Czech only. First, the occurrence of homorganic contoid clusters only (that is: the clusters being only voiceless or voiced) is a characteristic of most of the world’s languages, not only of Czech, though some languages are

reported to allow clusters of different voicing (e.g. Zhu|’hōasi, see Ladefoged & Maddieson 1996: 63). The prevalent occurrence of homorganic clusters is no doubt a result of articulatory economy. Second, the occurrence of voiceless contoids to the exclusion of voiced contoids word-finally is also not a phenomenon peculiar to Czech; it has been recorded in many other languages (including German, Polish, Russian but see below).

The fact that only voiceless contoids occur word-finally was perhaps the very inspiration for the introduction of the concept “neutralization”, which, as is well-known, was mostly advanced by the Prague School. It is particularly true of the pre-World War II era and of Trubetzkoyan phonology. Trubetzkoy interpreted the non-opposability of ‘voiceless’ and ‘voiced’ phonemes in certain contexts as resulting from neutralization of the opposition between ‘voiceless’ and ‘voiced’ consonants. The same interpretation has been taken over by André Martinet and his school which has in fact continued in Trubetzkoy’s tradition of functional phonology. After the WWII the Prague School abandoned the concept of neutralization, though not the term. Or better: the term *neutralization* has acquired a different meaning than it apparently had for Trubetzkoy (though there are several interpretations). Although Praguian phonologists spoke about neutralization, the non-opposability of the ‘voiceless’ or ‘voiced’ phonemes in certain situations was actually re-interpreted as defective distribution of certain phonemes (cf. Trnka 1966: 29-30, Vachek 1968: 61, Horálek 1986: 114). So Czech *let* “flight” and *led* “light”, both pronounced [let], were interpreted as /let/ with the same phoneme /t/ like in /ten/, [ten] *ten* “that” where it is confronted with /d/ in /den/, [den] *den* “day”. We do not agree with this interpretation, because the phoneme /t/ is *not* opposed to /d/ in the case of /let/ and hence cannot be distinctively ‘voiceless’ (in our analysis it would be /leT/ for both *let* and *led* and /ten/ for *ten*, /den/ for *den*, see also Bičan 2006).

That such an approach is inadequate and even inconsistent with the principles of functionalist phonology has been repeatedly demonstrated (see Akamatsu 1988), though apparently only a few linguists have been convinced. So the fact that only voiceless obstruents can, in Czech, occur at the end of phonetic forms of words before a pause is generally interpreted as a result of defective distribution of ‘voiced’ consonants. Such an interpretation may be justified in non-functionalist approaches (e.g. in Kučera’s analysis of Czech, Kučera 1961) but not in a functionalist approach which views the phoneme as a bundle of

distinctive features and as an entity opposed to other entities (the latter is in fact one of the principles of de Saussurean structuralism). The analysts proposing such a description forget that ‘voiced’ consonants are ‘voiced’ just because they are in opposition with ‘voiceless’ phonemes. If there is no such opposition, there is no difference between ‘voiceless’ and ‘voiced’ phonemes. For instance, if we declare that the alleged phoneme /t/ in /let/ possesses a *distinctive* feature ‘voiceless’, we should be able to prove that the feature is indeed *distinctive*. If distinctive, it should be capable of distinguishing, which is certainly not in the case of word-final /t/ in /let/: it is never confronted with ‘voiced’ /d/ in this context and thus to say that the feature ‘voiceless’ is distinctive for word-final /t/ is senseless. Because ‘voiceless’ and ‘voiced’ are not distinctive for word-final phonemes, the phonemic entities in that position cannot be identified with any phoneme of the ‘voiceless’ ~ ‘voiced’ correlation. It is for that reason we have to posit an archiphoneme as an entity indifferent to such a distinction.

This simple logical reasoning is shadowed in phonology by the fact that the word-final archiphonemes are realized as *phonetically* voiceless sounds. But this is irrelevant as long as we are doing *phonology* not *phonetics*! Moreover, we should not forget that qualities exist only in comparison with other qualities. If there are two persons, one being 1.8 m tall, the other 1.9 m tall, we can compare their heights and say that the second person is taller than the first. However, if we have only one person of the height 1.8 m and cannot compare him with anyone, we cannot say the person is taller or smaller, even though he has a certain absolute value of height. The same applies to phonology: even though the word-final obstruents in Czech have the absolute *phonetic* value of voicelessness, we cannot say they are phonologically ‘voiceless’ (“taller”) or ‘voiced’ (“smaller”) if we cannot compare them with anything else. The absolute value of phonetic voicelessness is as irrelevant as the height of a singular person.

There is yet another solution proposed for how to interpret the non-occurrence of voiced contoids before a pause. It can be conveniently sketched on the already mentioned pair of words *let* “flight” and *led* “ice”. Though both are pronounced as [let] and there is thus no phonic difference between them, the words are differentiated from each other when inflected. Hence the genitive singular forms of these words are, respectively: [letu] *letu* and [ledu] *ledu*. This fact has led some analysts (implicitly Krčmová 2006, expressly Šefčík

2007) to postulate phonologically different forms for [let] which realizes *let* and for [lɛt] which realizes *led*: /let/ and /led/, respectively. The form /led/ is realized as [let] before a pause, because [t] is declared to be a positional variant/allophone of /d/ if word-final.

This type of analysis is clearly based on morphological criteria, not on phonological. It is in fact not different to generativist approaches to phonology where, for instance, German words *Bunt* and *Bund*, homophonous in this form, are phonologically interpreted as /bunt/ and /bund/ because of the existence of *Bunte* and *Bunde*. We do not deny that such an analysis may be perhaps justified in approaches openly interested in a description of variations of phonological forms of signs (which Šefčík's and the others' approaches apparently are), but not in an approach aiming to describe the structure of the phonic aspect of a given language (our approach). It is unfortunate that both types of approaches are called *phonology*. It is especially true of generativist phonology, because this type of phonology corresponds rather to what has been called *morphonology* (we would prefer the term *allomorphy*). We do not want to go here in a detailed discussion of this problem, though. We are going to confine ourselves to explaining why the proposed analysis is also invalid in a functionalist analysis.

First, for functionalists (at least for Martinetian and axiomatic functionalists) phonology is limited to the study of the structure of the phonic aspect of languages, in particular to descriptions of how phonic elements are utilized in languages, that is: what function they convey. The most important function is of course the distinctive function: a phonic element is distinctive if it is distinguished from another element and the difference is relevant to communication. Thus if the phonetic form [let] is never opposed to a phonetic form [lɛd], the difference between [t] and [d] cannot be functional in this case. The fact that there are forms [letu] and [lɛdu] is only relevant to such an extent that the difference between [t] and [d] is functional between two vocoids but not word-finally. That [lɛdu] is related to [let] by the fact of both being phonetic forms of allomorphs of the word *led* "ice" is irrelevant for phonology. The reason is simple: it is only the grammatical analysis that can ascertain some phonetic forms are forms of allomorphs of one sign. Only when we find out that [lɛd] in e.g. [ˈbɛz_lɛdu], *bez ledu* "without ice" has the same grammatically distinctive function like [let] in e.g. [ˈstudɛni: ˈlet], *studení led* "cold ice" (more precisely: when we refute the hypothesis that they do not have the same grammatically distinctive function, by which we

may understand “meaning”), we can regard [lɛd] and [lɛt] as forms of allomorphs of the sign *led* “ice”. However, what we describe here is a grammatical analysis, not a phonological one. In phonology our goal is to determine whether the phonic difference between [t] and [d] we have found to be relevant for communication between two vocoids (which the opposition between [lɛtu] and [lɛdu] clearly shows) is also relevant for communication before a pause. As only [t] can occur before a pause as in [lɛt], we can never show the difference between [t] and [d] is relevant to communication before a pause.

The second reason why the analysis of /let/ for *let* and /led/ for *led* must be rejected lies in nothing else but in what has already been written: if there is no functional difference between [t] and [d] before a pause, we cannot postulate two different phonological forms /let/ and /led/. It is absurd to say two things are different if they are not.

Another problem with this type of analysis lies in the treatment of forms that do not alternate. It concerns words like [ʔaʃ] *až* “until”, [nɛxc] *necht* “may it be”, [pɔjɛvatʃ] *poněvadž* “because” and others. If we are to say they end in a ‘voiceless’ consonant, our analysis would be arbitrary, as we have seen both ‘voiceless’ (/let/) and ‘voiced’ (/led/) consonants can stand word-finally. So *až* may be /aʃ/ as well as /až/, because both /š/ and /ž/ are realized as [ʃ] word-finally.

The archiphonemic analysis avoids arbitrariness, is consistent with the principles of functionalism (and structuralism) and is appropriate, because if we say that *let* and *led* have both the same phonological form /leT/, we imply they are indistinguishable on the phonic level, which is generally agreed to be true.

5.4 A note on incomplete neutralization

There is a reason the last sentence of the previous section was formulated the way it was. It is generally agreed *let* and *led* are indistinguishable in this form on the phonic level. However, there is a phenomenon that might require confirmation of this generally agreed-upon assertion.

The so-called neutralization of voice taking place word-finally is not restricted to Czech only. The same process has been registered for German, Polish or Russian. Simply said,

even in these languages only phonetically voiceless obstruents occur word-finally and there is thus no difference between ‘voiceless’ and ‘voiced’ phonemes here. Nevertheless, this generally acknowledged fact has been disputed at least since 1980s. It has been argued that even though phonetically voiceless obstruents do occur word-finally before a pause in the mentioned languages, the opposition ‘voiceless’ ~ ‘voiced’ is not always neutralized completely here, because the phonological distinction is sometimes implemented by other phonic characteristics, e.g. by the length of the vocoids preceding the absolutely final consonants: they tend to be slightly longer in duration if preceding an “underlying” voiced consonant. Furthermore, it has been suggested, on the basis of experiments, that the listeners are capable of consistently recognizing the underlying word-final consonants with better-than-chance accuracy. Since the distinction is not always maintained by the speakers and the listeners are not always capable of recognizing it (but it has been suggested they are not simply guessing), the phenomenon has been called *incomplete neutralization*. The term is used to say that the neutralization is not complete because some small degree of difference between the neutralized segments is maintained in certain contexts and situations.

The incomplete neutralization of voice has been claimed to occur in Catalan (Dinnsen & Charles-Luce 1984), German (Port & O’Dell 1985) and Polish (Slowiaczek & Dinnsen 1985)—the alleged word-final neutralization in these languages were subjected to several experiments which confirmed the phenomenon of incomplete neutralization. The results of the experiments were disputed and alternative interpretations were suggested (e.g. Mascaró 1989 for Catalan, Fourakis & Iverson 1984 for German, Jassem & Richter 1989 for Polish), though further experiments and evidence were offered, too (Charles-Luce & Dinnsen 1987 for Catalan, Port & Crawford 1989 for German, Slowiaczek & Szymanska 1989 for Polish). It is not our desire to summarize this discussion here (a summary can be found in Warner et al. 2004).

What we want to point out is this: if neutralization of voice has been said to be incomplete in Catalan, German, Russian and Polish, is neutralization of voice also incomplete in Czech? Are, in certain situations, Czech speakers capable of maintaining and listeners capable of recognizing the difference between ‘voiceless’ and ‘voiced’ consonants word-finally? If the phenomenon of incomplete neutralization is claimed to occur in the languages such as German, Polish and Russian, i.e. in those languages traditionally thought to

exhibit neutralization of voice, does the same apply to Czech? To give an example: can Czech speakers produce phonic differences that would distinguish such pairs of words traditionally thought to be homophonous, the words like *let* “flight” ~ *led* “ice”, *plot* “fence” ~ *plod* “fruit”, *les* “forest” ~ *lez!* “climb!”, *mák* “poppy” ~ *mág* “magician” etc., to such a degree that the listeners would be able to recognize the particular word?

At the moment we are not able to answer this question; it must be left to more competent people who could experimentally confirm or refute it. To the best of our knowledge, no such experiment has been carried out. However, if it were the case neutralization of voice in Czech be also incomplete, our account would require some modifications (for a discussion of incomplete neutralization in an axiomatic-functionalist context see Dickins 1998: 90-8). For the time being we will stick to the traditional view.

5.5 Other possible and actual neutralizations of consonants

The process behind neutralization of voice is a well-known phenomenon in Czech and any analysis of Czech openly or implicitly deals with it, though the actual interpretations differ. What we are going to consider now is whether there are any other neutralizations. Logically speaking, there are three possible types of neutralization for Czech (cf. table in Figure 3.4b):

1. Neutralization involving the dimension ‘voiceless’ ~ ‘voiced’.
2. Neutralization involving the dimension ‘labial’ ~ ‘palatal’ ~ ‘alveolar’ ~ ‘velar’.
3. Neutralization involving the dimension ‘occlusive’ ~ ‘constrictive’ ~ ‘nasal’.

The first type is what we have already discussed; we have called it *neutralization of voice*. The second might be termed *neutralization of place* (of articulation); the third as *neutralization of manner* (of articulation). Let it be noted that these are logically possible neutralizations but this does not mean they are necessarily linguistically feasible neutralizations. It may sometimes be more appropriate not to postulate a neutralization at all even though differences between particular distinctive features in certain context are suspended.

A possible candidate for a neutralization of place may be the context before a ‘palatal’ consonant. Although the paradigms in Figure 3.1a suggest that consonants of every place

of articulation can occur before a ‘palatal’ consonant, the situation should be carefully examined. Every time an alveolar contoid ([t], [d] or [n]) occurs before a palatal contoid ([c], [j] or [ɲ]) in a phonetic form of a word, the alveolars [t], [d], [n] may be replaced by palatals [c], [j], [ɲ] without a change of the grammatically distinctive function. What is this to say is that Czech speakers may pronounce [c] instead of [t], [j] instead of [d] before [ɲ], and [ɲ] instead of [n] before [c] or [j] in words like *špatně* “unwell” ([ʃpatɲɛ] or [ʃpacɲɛ]), *hodně* ([ɦodɲɛ] or [ɦoɲɲɛ]), *studenti* “student” ([studɛncɪ] or [studɛɲcɪ]), *anděl* “angel” ([ʔanɲɛl] or [ʔaɲɲɛl]). This variation in pronunciation is valid for all occurrences of *tň*, *dň*, *nt’* and *nd’* and is recognized as acceptable by the standard pronunciation of Czech. It affects only combinations of plosives and nasals, not of nasals and fricatives or plosives and fricatives, though the latter changes may occur in non-standard Czech (e.g. *menší* “smaller” pronounced as [mɛɲʃi:] (or [mɛɲʃʃi:] with an affricate) instead of [mɛnʃi:]).

The consequence of what has just been mentioned is the fact that there is no functional difference between palatal [c], [j], [ɲ] and alveolar [t], [d], [n] before palatal [c], [j], [ɲ], as the difference is not endowed with any communicative function. Since all other contoids can occur before palatals (cf. [pɲi:] *pní se* “(it) towers”, [fɲukat] *fňukat* “to whimper”, [sni:] *sní* “(he) dreams”, [ʃɲerovat] *šněrovat* “to string (shoes)”, [kɲiɦa] *kniha* “book”, [ɦɲi:t] *hnít* “to rot”), it might mean that the oppositions /t/ ~ /tʲ/, /d/ ~ /dʲ/ and /n/ ~ /nʲ/ are neutralized before /tʲ/, /dʲ/, /nʲ/. What is more, the palatals [c], [j], [ɲ] do not in fact occur before any contoid except for in forms of imperatives like [buɲmɛ] *bud’me!* “let us be!” or [ɦoɲtɛ] *hod’te!* “throw!” but this is a peculiarity of imperative suffixes *-me* and *-te* (they behave as if they were separate words, not monemes/morphemes). We can therefore generalize it and say that the oppositions /t/ ~ /tʲ/, /d/ ~ /dʲ/ and /n/ ~ /nʲ/ are neutralized before any consonant. The consonantal sub-system resulting from these neutralizations is represented in Figure 5.5a.

The archiphonemes of these neutralizations have been marked by Greek letters as /τ/, /δ/ and /ν/. In the case of /ν/ the neutralization involves the phoneme /nʲ/ and the hyperphoneme /n/. The distinctive features of the particular archiphonemes are: ‘non-labial non-velar occlusive voiceless’ for /τ/, ‘non-labial non-velar occlusive voiced’ for /δ/ and ‘non-labial nasal’. The oppositions /s/ ~ /š/ and /z/ ~ /ž/ are not affected (in standard Czech!).

	<i>occlusive</i>		<i>constrictive</i>		<i>nasal</i>
	<i>voiceless</i>	<i>voiced</i>	<i>voiceless</i>	<i>voiced</i>	
<i>labial</i>	p	b	f	v	m
<i>palatal</i>	τ	δ	š	ž	v
<i>alveolar</i>			s	z	
<i>velar</i>	k	g	x	h	

Phonemes outside the system of proportions: /j/ ‘approximant’, /ř/ ‘spirant’.

Figure 5.5a

The alleged neutralizations of /t/ ~ /t'/, /d/ ~ /d'/ and /n/ ~ /ñ/ are interesting both from the theoretical as well as from the practical perspective. We see that the difference between ‘alveolar’ and ‘palatal’ consonants is not operative before any consonant for ‘occlusive’ and ‘nasal’ consonants but is operative for ‘constrictive’ consonants. The question remains whether we should postulate neutralization of a certain opposition even if it does not affect all the phonemes participating in that opposition. In the case of the neutralization of voice we have seen that the difference between ‘voiceless’ and ‘voiced’ consonants is not operative for any consonant participating in this opposition. The alleged neutralization of the oppositions between ‘alveolar’ and ‘palatal’ phonemes do not involve all ‘alveolar’ and ‘palatal’ phonemes; yet the condition triggering the neutralization is obvious: it is the feature ‘non-constrictive’ that is responsible for the neutralization (it is to be remembered that the feature ‘non-constrictive’ is implied in ‘occlusive’ and ‘nasal’ because an ‘occlusive’ or ‘nasal’ phoneme is always ‘non-constrictive’ simply because neither ‘occlusives’ nor ‘nasals’ are ‘constrictives’). Mulder (1968: 205-7) dealt with a similar problem in English and concluded we can introduce a requirement that neutralization of an opposition should be postulated if and only if all phonemes participating in the opposition are affected by the neutralization. On the other hand, says Mulder, there does not seem to be “any logical, nor any intuitive, reason for excluding features within the same phoneme as a possible context for neutralization, where [we] admit other features such as ‘position’ and ‘prosodic features’ to that status” (*op. cit.*: 207). To apply it at our case: it is to say that even though the neutralization does not involve all phonemes participating in the opposition ‘alveolar’ ~ ‘palatal’, there is no reason why we should not think it is the feature ‘non-constrictive’ that annuls the opposition ‘alveolar’ ~ ‘palatal’ before any consonant.

We see that it is justifiable, from the theoretical point of view, to postulate neutralization of /t/ ~ /tʰ/, /d/ ~ /dʰ/ and /n/ ~ /ɲ/ before any consonant as a phonological process accounting for the non-occurrence (or non-distinctiveness) of palatal contoids before any contoid. Nevertheless, it does not mean that if something is theoretically or logically possible, it should be possible descriptively. In other words: even though the neutralization of /t/ ~ /tʰ/, /d/ ~ /dʰ/ and /n/ ~ /ɲ/ is theoretically and logically possible, it need not be the most adequate and simplest solution in the actual description. We should not forget that when doing a description we can choose from among several equally consistent solutions. From the available solutions we should choose the solution that would be most adequate and simplest. However, whether something is more adequate and/or simpler than something else cannot usually be judged without appealing to intuition, common-sense and agreement of the fellow linguists.

So, on the one hand, we can postulate neutralization to account for the non-occurrence of palatal [c], [tʃ], [ɲ] before any contoid. The resulting archiphonemes /τ/, /δ/, /ν/ will be realized as [t], [d], [n] (respectively) in all contexts except for the context before [c], [tʃ], [ɲ] where the realizations can indifferently be either [t], [d], [n] or [c], [tʃ], [ɲ]. On the other hand, we can account for these peculiarities by a different statement: by saying that the distribution of /tʰ/, /dʰ/, /ɲ/ is defective because these phonemes can only occur before a vowel but never before a consonant within the same phonotagm. The contoids [t], [d], [n] occurring before any contoid will be identified as corresponding to /t/, /d/, /n/ even though they are not opposed to /tʰ/, /dʰ/, /ɲ/ in these contexts. It is legitimate to do so. We should not forget that paradigms (i.e. the sets of entities occurring in a certain context) are always defective, because no paradigm would ever contain all phonemes of the given phonematic system and thus the distributions of phonemes are always somehow restricted. We will therefore adopt this solution and introduce the following two statements to our description:

1. The phonemes /tʰ/, /dʰ/, /ɲ/ can be preceded by a consonant but never followed by a consonant. If followed by a consonant, there is a phonotactic boundary in-between corresponding to a boundary between words (including imperative *–me*, *–te*; on phonotactic boundaries see Bičan forthcoming).
2. The combinations /ntʰ/, /ndʰ/, /tɲ/, /dɲ/ can be realized either as [nc], [nʃ], [tɲ], [dɲ] or [ɲc], [ɲʃ], [cɲ], [tʃɲ], i.e. /n/, /t/, /d/ have two allophones in free variation before /tʰ/,

/d'/, /ň/. The allophones [t], [d], [n] are, in this situation, marks of more careful pronunciation (cf. Palková 1997: 333).

We believe these two descriptive statements are simpler than the following two statements:

1. The oppositions /t/ ~ /t'/, /d/ ~ /d'/, /n/ ~ /ň/ are neutralized before a consonant; the resulting archiphonemes are /τ/ 'non-labial non-velar occlusive voiceless', /δ/ 'non-labial non-velar occlusive voiced', /ν/ 'non-labial nasal' realized, respectively, as [t], [d], [n] in most cases.
2. The combinations /vt'/, /vd'/, /τň/, /δň/ can be realized either as [nc], [nɟ], [tɲ], [dɲ] or [ɲc], [ɲɟ], [cɲ], [ɟɲ], i.e. /v/, /τ/, /δ/ have two allophones in free variation before /t'/, /d'/, /ň/. The allophones [t], [d], [n] are, in this situation, marks of more careful pronunciation.

We regard the defective distribution solution simpler than the neutralization solution. It is first of all because it is intuitively simpler to operate with defective distribution of phonemes than with archiphonemes (as many analysts are apparently against archiphonemic descriptions); this, of course, only on the condition that the postulation of defective distribution of phonemes is feasible. It is certainly not a valid solution in the case of the non-occurrence of voiceless obstruents word-finally in Czech. In this case we cannot justify the statement that the 'voiced' phonemes are restricted from occurring word-finally, because we cannot prove the difference between 'voiceless' and 'voiced' to be valid for any phoneme occurring in any post-nuclear position.

Secondly, once we have postulated neutralization of voice to take place before any consonant that is either 'voiceless' or 'voiced', we have to take it into account here, too. So not only is the opposition between 'alveolar' and 'palatal' consonants neutralized before a consonant, the opposition between 'voiceless' and 'voiced' consonants is also neutralized before a 'voiceless' or 'voiced' consonant. Hence the contour [t] in [tka:t] *tkát* "to weave" has to correspond to an archiphoneme resulting from the neutralization of the 'alveolar' ~ 'palatal' and 'voiceless' ~ 'voiced' oppositions because [t] is never opposed to a voiced alveolar [d], a voiceless palatal [c] or a voiced palatal [ɟ]. The consequence of this is that we have to posit an additional archiphoneme /Δ/ 'non-labial non-velar occlusive' occurring before any 'voiceless' or 'voiced' consonant. We see that the description gets more complicated and differs significantly from a relatively simple statement "/t'/, /d'/, /ň/ are non-

occurrent before any consonant”. We therefore reject the neutralization of the opposition between ‘alveolar’ and ‘palatal’ ‘occlusives’ or ‘nasals’.

Although we have abandoned the idea of the opposition ‘alveolar’ ~ ‘palatal’ being neutralized, it does not mean there is no neutralization involving the dimension ‘labial’ ~ ‘palatal’ ~ ‘alveolar’ ~ ‘velar’. There is one phenomenon that we think should be interpreted as neutralization of place (of articulation). It is the non-occurrence of any nasal but [m] before another contoid or contoids in pre-nuclear contexts. In other words: it is only the nasal [m] that can be followed by one or more contoids word-initially or word-finally. As we have already seen, [ɲ] is not occurrent before a contoid except for the situations already mentioned. The contoid [n] is, however, also not occurrent before any contoid in pre-nuclear contexts. The examples of [m] occurring before a contoid can be sorted into two groups:

1. Followed by either of [l], [r], [n], [ɲ] or [r]: [mlɛ:ko] *mléko* “milk”, [mrak] *mrak* “cloud”, [mnofio] *mnoho* “a lot of”, [mɲesto] *město* “town”, [mɾɛŋka] *mřenka* “groundling”.
2. Followed by any other contoid: [mʃɛ] *mše* “mass”, [mʒik] *mžik* “twinkle”, [msta] *msta* “vengeance”, [mzda] *mzda* “pay”, [msci:t] *mstít (se)* “to take revenge”, [mstni:] *mstný* “vengeful”, [mdlo] *mdlo* “qualm”.

All occurrences of the second group are instances of so-called side-syllables ([m] is extrasyllabic here, so to speak). The [m] is here exclusively word-initial, because it is not possible to add a consonantal prefix to a word beginning with an extrasyllabic [m] unless the word sounded unnatural or archaic (e.g. *zmdlelý* used by some Czech poets (see SSJČ) instead of *zemdlelý* “suffering from inanition” sounds rather unnatural, not to mention it is hard to pronounce anyway). The occurrences of the first group are not recognized as instances of side-syllables, because the scale of sonority is not violated, as it were. The [m] can here be preceded by another contoid: [smlouva] *smlouva* “agreement”, [zmrazit] *zmrazit* “to freeze something”, [vmɲestnat] *vměstnat* “to fit something into”, [ɦɾmɲɛt] *hřmět* “to roar”. This has, however, to do with the distribution of phonemes, not with their paradigmatic identity. What is important for us at this moment is the non-opposability of [m] to any other nasal in the context before any contoid. The opposition between ‘labial’ /m/, ‘palatal’ /ň/ and ‘alveolar∪velar’ /n/ (it is a hyper-phoneme) is not valid in the context

before a consonant or a consonant group and is therefore neutralized. The resulting archiphoneme is /M/ defined as the intersection of /m/, /ň/, /n/, thus as ‘nasal’. In other words, the archiphoneme /M/ is indifferent to the distinction between ‘labial’, ‘palatal’, ‘alveolar’ and ‘velar’. All of the instances of [m] mentioned under the aforementioned groups are realizations of the archiphoneme /M/. The difference between the first and the second group is, in phonotactics, explained as /M/ occupying either the position ‘e5’ or ‘e1/p’ (see Figure 1.6b). The sub-system of consonants in the context of the discussed neutralization is expressed in Figure 5.5b.

a sub-system of consonants	occlusive		constrictive		nasal
	voiceless	voiced	voiceless	voiced	
<i>labial</i>	p	b	f	v	M
<i>palatal</i>	tʃ	dʃ	š	ž	
<i>alveolar</i>	t	d	s	z	
<i>velar</i>	k	g	x	h	

Phonemes outside the system of proportions: /j/ ‘approximant’, /ř/ ‘spirant’.

Figure 5.5b

At the beginning of this section we have written there are three logically possible types of neutralization for Czech consonants. Having dwelt so long on a possible neutralization involving the dimension ‘labial’ ~ ‘palatal’ ~ ‘alveolar’ ~ ‘velar’, we can cut short the discussion on possible neutralizations involving the dimension ‘occlusive’ ~ ‘constrictive’ ~ ‘nasal’. We have not found any reasons for postulating any neutralization involving this dimension. Admittedly, not all contexts exhibit occurrences of all ‘occlusives’, all ‘constrictives’ and all ‘nasals’ but we ascribe this to defective distribution. For instance, ‘nasal’ phonemes (not even /M/) do not occur before /m/ within a single phonotagm; across phonotagms /n/ occurs before /m/ only in *bonmot* “bon mot” (which is not only a foreign word but also most likely two words), /ň/ and /m/ before /m/ in imperatives (e.g. *zvoňme!* “let us ring!”, *zlomme* “let us break!”), and /ň/ before /m/ in *koňmi* “horse (instr. pl.)” or *koňmo* “on-horseback”). This non-occurrence of ‘nasals’ before /m/ is simplest to account as defective distribution of ‘nasal’ consonants. The bottom-line is: there is no neutralization involving the dimension ‘occlusive’ ~ ‘constrictive’ ~ ‘nasal’.

5.6 Neutralization of length

The vocalic subsystem of Czech is usually regarded as stable (see Krčmová 2006: 95), though there are some hints it need not be so (Trnka 1966, Palková 1997: 264). A difference mentioned as liable to be canceled is that between ‘short’ and ‘long’ vowels. For the ease of reference we will call this type of neutralization as *neutralization of length*. In the mentioned article Trnka says the following:

First of all, long vowels do not occur before homomorphic consonant clusters other than *st, st', sk, zd, zd', št', žd', tr, tr', dr, dř, rt, rt', mň*, and are also non-occurrent in the first syllable of disyllabic morphemes, cf. *haluz, holub, topol, tuleň, biskup, cypřiš, jestřáb, papír, beseda, železo*, etc. In addition to these distributional restrictions of vowel quantity, the neutralization of the opposition *i|i* and *u|ú* before *j* and before the tautosyllabic *m* is to be mentioned. Both *i(y)* and *ú(ů)* lose their length in these environments in spite of the retention of their ‘accents’ in spelling, with the result that only short *i* and *u* appear in the pronunciation uninfluenced by the spelling. Cf. *šije, zabíjí, navíjí, říjen; můj, tvůj, lůj, stůj, stůjíte, újma; prosím, umím, svěžím, novým, znamením; dům, synům, hochům*. As to the non-occurrence of long vowels before the consonant clusters of the same morpheme, e.g. in *kult, rumpál, mince, verš, manžel*, it is doubtless due to the foreign origin of such words [...] (*op. cit.*: 12)

It should be noted at once that the shortening of long *i* and *ú* before *j* and *m* does indeed occur but it is a feature of colloquial Czech; standard Czech codification still requires the retention of length (see Palková 1997: 323). This shortening will therefore not be discussed here, although it is a cue to neutralization processes in the vocalic system. As to the other points in Trnka’s quotation, it is a matter yet to be examined in detail. He operates with a notion “homomorphic consonant clusters” which is a somewhat dubious issue in phonology where we should not operate with morphemes but with phonological forms. Moreover, his claim that ‘long’ vowels cannot occur in the first syllable of disyllabic morphemes may be invalidated by [ka:men] *kámen* “stone”: from the synchronic point of view it is certainly what Trnka calls a disyllabic morpheme. Another example may be [du:vot] *důvod* “reason, ground”; only a diachronist will know it is in origin a two-morpheme word.

We can, however, examine a different point: occurrences of ‘long’ vowels before word-final (i.e. phonotagm-final) consonantal clusters. We have not been able to find ‘long’ vowels before consonant clusters other than these: /ST/, /ŠŤ/, /mŠ/, /rT/, /SK/, /nS/, /mS/, /XŠ/, /TS/, /TŠ/, /jTŠ/, /TST/, /PST/. Examples are: [kra:st] *krást* “to steal”, [zvla:ʃc] *zvlášt* “in particular”, [ji:mʃ] *jímž* “by which”, [nart] *nárt* “instep”, [pra:sk] *prásk* “bang (onomatopoeic)”, [faja:ns] *fajáns* “faince”, [ri:ms] *říms* “molding (gen. pl.)”, [ji:xʃ] *jíchž* “of whom”, [pala:ts] *palác* “palace”, [fira:tʃ] *hráč* “player”, [pu:jtʃ] *půjč!* “borrow!”, [rit:st] *říct* “to say”, [za:pst] *zábst* “to freeze”. Out of the diphthongs only /ö/ [ou] has been found before /ST/, /ŠŤ/ and /TST/: [soust] *soust* “gulp (gen. pl.)”, [pouʃc] *poušt* “desert” and [tloutst] *tlouct* “to hit”.

The question remains whether the non-occurrence of ‘long’ vowels before the rest of the final clusters is due to neutralization or whether it is due to defective distribution of ‘long’ vowels or whether it is merely accidental. If it were a result of neutralization or of defective distribution, we should be able to find a regular pattern in the non-occurrence. Failing to find a regular pattern, we should assume the non-occurrence is just accidental. That which cannot be made part of our theory must be regarded as accidental (cf. Mulder 1968: 198, Hervey 1978: 56)

So, for instance, we could not regard the non-occurrence of voiced contoids word-finally before a pause as merely accidental because we can show the non-occurrence to be regular. The situation is not so straightforward in the case of ‘long’ vowels, though. Is there any regularity? We can see that the clusters before which ‘long’ vowels occur all contain either /S/ or /Š/; the exception is /rT/ (*nárt*). Does it mean that ‘long’ vowels cannot stand before a combination of consonants one of which is not /S/ or /Š/? In other words: is there any structural restraint preventing ‘long’ vowels from appearing before final clusters such as /FT/, /mP/, /nT/ or /PT/, neither of which contains /S/ nor /Š/? We have not been able to formulate any such restraint. Moreover, we have not been able to find in our data that the ‘long’ vowels were occurrent before all clusters containing /S/ or /Š/: they are not found before /PS/, /SŤ/, /ŠT/, /KS/, /KŠ/. Do the latter clusters have a common feature preventing ‘long’ vowels from appearing before them? Or is the non-occurrence merely accidental? Trnka suggests that the non-occurrence might be because these clusters are found only in phonological forms of words of foreign origin. However, it is hardly true,

because e.g. /ŠŤ/ occurs in a phonological form of a word of domestic origin (*pust!* “let go!”) and yet no ‘long’ vowel has been found to occur before it.

Naturally, the very reason we do not find ‘long’ vowels before these clusters is because our data are incomplete. ‘Long’ vowels may occur before consonantal clusters other than the mentioned ones and we are only not aware of these examples. This possibility and the fact that we cannot, for the time being, show convincingly there is a regular pattern in the non-occurrence of ‘long’ vowels before certain clusters lead us to a conclusion that the non-occurrence in question is merely accidental and not a product of neutralization of the opposition between ‘short’ and ‘long’ vowels or due to defective distribution of ‘long’ vowels. We acknowledge the distribution of ‘long’ vowels is restricted, as least in comparison with ‘short’ vowels, but as of now we are not able to formulate a *phonological* condition according which the distribution was limited. It may be that the future research will enable us to formulate it but until then we will not speculate and regard the non-occurrence of ‘long’ vowels before certain word-final clusters as accidental. By *accidental* we mean that there appear to be no structural restriction on the occurrence of ‘long’ vowels, the possibility is only not exercised in the known phonological forms of Czech words. This conclusion may sound controversial to some linguists, especially those who incline to corpus-based analyses or those in search of universals in languages. If we find *no* occurrence of ‘long’ vowels before clusters other than /ST/, /ŠŤ/, /mŠ/, /rT/, /SK/, /nS/, /mS/, /XŠ/, /TS/, /TŠ/, /jTŠ/, /TST/, /PST/, how can it be that the non-occurrence is only accidental? However, we should remember that, first of all, finding no example does not mean it is not possible; a language is an open system and thus no corpus (e.g. Czech National Corpus for Czech) can encompass the whole language. Secondly, can we, for instance, explain *phonologically* why ‘long’ vowels are not occurrent before word-final /ŠŤ/, though they occur before /ST/ or /ŠŤ/? It is our opinion that we cannot, and hence the non-occurrence is only a product of chance. Finally, let us look at [nart] *nárt* “instep”: we have not been able to find any other word where a ‘long’ vowel would stand before the cluster /rT/. But what if the word did not exist—would it mean that ‘long’ vowels could not occur before /rT/? This is a problem of many approaches, especially generativist ones: when they do not happen to find a category or feature X in the world’s languages, they conclude the category/feature X is universally impossible for human languages. However, how can we, for

example, know the category/feature did not exist in an American-Indian language before the European settlers managed to exterminate all of its users? On the rejection of universalism (and psychologism) by AF see Dickins 1999: 18-34, Mulder 1989: 7-36.

But let us return to the analysis of Czech. Bearing in mind what has been written in the last paragraph, we conclude that the non-occurrence of the diphthongs /ã/ and /ě/ before final clusters is also accidental. We have found /ö/ to occur before some word-final clusters and we cannot show convincingly the other diphthongs could not occur before a consonantal cluster, too. This conclusion will be held until shown to be inadequate by our being able to impose a regular pattern on the non-occurrence of ‘long’ vowels before a certain class of items. However, unless we can show with certainty the regularity, we cannot speculate that the non-occurrence is systematic. AF rejects any form of speculation as scientifically invalid procedures.

Although we have, for the time being, not found enough evidence for postulating neutralization before consonantal clusters, it may still be that the opposition between ‘short’ and ‘long’ vowels is neutralized after all. Let us examine the situation in Figure 5.6a. It exemplifies the occurrence of vocoids and diphthongoids before [j] demonstrating that, out of all the vocoids, the only non-occurrent one is [ɛ:] (exceptions are apparently onomatopoeic forms like [fi:ɛj]). All the other vocoids can follow [j] (see examples in Section 2.3).

[pj] <i>pyj</i> “phallus”	[dej] <i>dej!</i> “give!”	[vlaj] <i>vlaj!</i> “flap!”	[sluj] <i>sluj</i> “cavern”	[spoj] <i>spoj</i> “junction”
[ri:jna] <i>řijna</i> “October (gen. sg.)”	[ɛ:] not found	[maj] <i>máj</i> “May”	[stu:j] <i>stůj!</i> “stop!”	[bo:jka] <i>bójka</i> “makefast”
[euj] not found		[auj] not found	[dvoujazitʃni:] <i>dvoujazyčný</i> “bilingual”	

Figure 5.6a

As regards the diphthongoids, they do not appear to occur before [j], either. One of the only attested examples is [dvoujazitʃni:], *dvoujazyčný* “bilingual”. Here [dvou] is a form of the prefix *dvou-* “bi-“, and so one can say that the combination [ouj] occurs only across a morpheme boundary. However, as has been repeatedly pointed out, this is a fact irrelevant for a phonological analysis. The fact, on the other hand, relevant for a phonological analy-

sis is that [ouj] occurs across two syllables. We do not find any example of a combination of [ou] with [j] within one syllable, e.g. at the end of a word. Admittedly, this is also true for the sequences [i:j] and [o:j] in the examples [ri:jna] and [bo:jka] but these forms would be syllabified as [ri:j]-[na] and [bo:j]-[ka]. It is reasonable because the combinations [jn] and [jk] do not occur word-initially and thus the syllabification [ri:]-[jna] and [bo:]-[jka] is ruled out by the principle of simplicity (sc. we should not introduce new things unless necessary). So the sequences [i:j] and [o:j] do occur syllable-finally, though not word-finally. However, the form [dvoujazitʃni:] should be syllabified as [dvou]-[jazitʃni:], because we do not have any evidence that [ouj] can occur word-finally. This suggests that the non-occurrence of the diphthongoids is regular before [j]; it might therefore be a product of neutralization.

If neutralization were to be postulated, we should first of all state of what opposition or oppositions it is an instance of neutralization. As all short and long vocoids (the exception of [ɛ:] will be discussed momentarily) occur before [j], the neutralization should only affect the ‘long’ ~ ‘short’ ~ ‘diphthongal’ dimension. It includes the following oppositions: three-term oppositions /ī/ ~ /i/ ~ /ē/, /ē/ ~ /e/ ~ /ë/, /ā/ ~ /a/ ~ /ä/, /ū/ ~ /u/ ~ /ö/, /ō/ ~ /o/ ~ /ö/, i.e. those between ‘long’, ‘short’ and ‘diphthongal’ vowels; two-term oppositions /i/ ~ /ë/, /e/ ~ /ë/, /a/ ~ /ä/, /u/ ~ /ö/, /o/ ~ /ö/, i.e. those between ‘short’ and ‘diphthongal’ vowels; two-term oppositions /ī/ ~ /ë/, /ē/ ~ /ë/, /ā/ ~ /ä/, /ū/ ~ /ö/, /ō/ ~ /ö/, i.e. those between ‘long’ and ‘diphthongal’ vowels; and two-term oppositions /ī/ ~ /i/, /ē/ ~ /e/, /ā/ ~ /a/, /ū/ ~ /u/, /ō/ ~ /o/, i.e. those between ‘long’ and ‘short’ vowels. If we leave out the oppositions between ‘central’ vowels (i.e. those having /a/, /ā/ and /ä/ as their terms), we can say that only the oppositions between ‘short’ and ‘long’ vowels can be neutralized from the logical point of view. The reason lies in the fact that the relations between the phonemes *qua* terms of these oppositions are not exclusive relations.

We hold that only the oppositions between phonemes in an exclusive relation are neutralizable oppositions. In this we follow André Martinet and Tsutomu Akamatsu (see Martinet 1956: 41-2, Akamatsu 1988: 52-63). The concept of exclusive relation has not been particularly operated with in AF, though the notion is not in principle incompatible with the axiomatic-functionalist view of neutralization (cf. Mulder 1968: 112-3). We take for granted that only the oppositions between phonemes in an exclusive relation are those that

can be neutralized. There are logical reasons for this we are not going to discuss here in detail. We follow Akamatsu who writes:

[T]wo or more phonemes are in an exclusive relation if they are alone in a given phonological system in possessing the sum of the relevant [i.e. distinctive] features common to them. (1988: 56)

Let us demonstrate this on the opposition $/\bar{u}/ \sim /u/ \sim /ö/$. The same can be *mutatis mutandis* applied to the other oppositions expect for those between $/\bar{a}/$, $/a/$ or $/\bar{ä}/$. The sum of the distinctive features common to $/\bar{u}/$ ‘back high long’, to $/u/$ ‘back high short’ and to $/ö/$ ‘back diphthongal’ equals ‘back’. Nevertheless, the phonemes are not the only ones in possessing this distinctive feature, because the phonemes $/o/$ ‘back mid short’ and $/\bar{o}/$ ‘back mid long’ also share it. The opposition $/u/ \sim /u/ \sim /ö/$ cannot therefore be neutralized. If it were, the tentative archiphoneme $/X/$ would be defined as ‘back’. Because the opposition between the phonemes $/o/$, $/\bar{o}/$, and $/ö/$ can also be neutralized and the resulting archiphoneme $/Y/$ as the intersection of the sets ‘back mid short’ (for $/o/$), ‘back mid long’ (for $/\bar{o}/$), and ‘back diphthongal’ (for $/ö/$) would also defined as ‘back’, we would have two different archiphonemes $/X/$ ‘back’ and $/Y/$ ‘back’, which is absurd. The same applies for the opposition $/u/$ ‘back high short’ $\sim /ö/$ ‘back diphthongal’: the sum of the distinctive features common to them is ‘back non-long’. However, the same set of distinctive features is included in the phoneme $/o/$ ‘back mid short’, because every ‘short’ vowel is by implication ‘non-long’.

This shows briefly why oppositions between phonemes in a non-exclusive relation cannot be neutralized. The oppositions $/\bar{i}/ \sim /i/ \sim /ë/$, $/\bar{e}/ \sim /e/ \sim /ë/$, $/\bar{u}/ \sim /u/ \sim /ö/$, $/\bar{o}/ \sim /o/ \sim /ö/$, $/\bar{i}/ \sim /ë/$, $/e/ \sim /ë/$, $/u/ \sim /ö/$, $/o/ \sim /ö/$, and $/\bar{i}/ \sim /ë/$, $/\bar{e}/ \sim /ë/$, $/\bar{u}/ \sim /ö/$, $/\bar{o}/ \sim /ö/$ are not exclusive oppositions and cannot be neutralized. Only the oppositions $/\bar{i}/ \sim /i/$, $/\bar{e}/ \sim /e/$, $/\bar{u}/ \sim /u/$, $/\bar{o}/ \sim /o/$, i.e. oppositions between ‘long’ and ‘short’ are neutralizable. The reason is that, for instance, the sum of the features common to $/\bar{i}/$ ‘front high long’ and $/i/$ ‘front high short’ is ‘front high’ which is *qua* set not included in any other phoneme.

If we return to the very problem we are trying to solve here, which is the non-occurrence of diphthongoids $[\epsilon u]$ and $[ou]$ before $[j]$, we see that the only logical possibility for interpreting it as an instance of neutralization is to postulate neutralization between ‘short’ and ‘long’ vowels. This is, however, a highly unsatisfactory solution because we

would be interpreting the non-occurrence of diphthongoids by cancellation of the difference between ‘short’ and ‘long’ vowels. The only reasonable solution is to ascribe the non-occurrence of the diphthongoids to limited distribution of /ě/ and /ō/ and say that these diphthongs do not occur before /j/ within the same phonotagm. The non-occurrence may still be accidental as was the non-occurrence of ‘long’ vowels before certain consonantal clusters. However, in this case there are reasons for launching a hypothesis “no diphthong can occur before /j/ within the same phonotagm” because we are able to specify the structural constraint on the non-occurrence of the diphthongs. First of all, *none* of the diphthongs has been found to occur before post-nuclear /j/ but this could not be said about the non-occurrences of ‘long’ vowels or diphthongs before consonantal clusters. Second, the combination [ouj] or better [ou̯j] is even from the phonetic point of view somewhat unusual and thus it should not be surprising that Czech may try to avoid it.

As regards the notion “exclusive relation”, the situation with oppositions between /a/ ‘central short’, /ā/ ‘central long’ and /ǎ/ ‘central diphthongal’ is different. All of the oppositions /a/ ~ /ā/ ~ /ǎ/, /a/ ~ /ǎ/, /ā/ ~ /ǎ/ and /a/ ~ /ā/ are neutralizable, because the terms of these oppositions are in an exclusive relation. The feature common to /a/ ~ /ā/ ~ /ǎ/ is ‘central’, those to /a/ ~ /ǎ/ are ‘non-long central’, those to /ā/ ~ /ǎ/ are ‘non-short central’ and those to /a/ ~ /ā/ ‘non-diphthongal central’. It is due to the simple fact that ‘central’ vowels are not split to ‘high’ and ‘mid’ categories like ‘front’ and ‘back’ vowels. From the theoretical perspective there is thus no logical obstacle why we could not interpret the non-occurrence of [au] before [j] as a consequence of neutralization. However, since we have ruled out the possibility of neutralization for the ‘front’ and ‘back’ vowels in this context, the principle of simplicity commands us not to postulate neutralization for ‘central’ vowels, either. It would produce no benefit if we interpreted the non-occurrence of [eu] and [ou] as a result of defective distribution of /ě/ and /ō/ but as an instance of neutralization in the case of [au]. Not to mention we would have had to face a problem of deciding which of the oppositions would have been neutralized, whether /a/ ~ /ǎ/, /ā/ ~ /ǎ/ or /a/ ~ /ā/.

Let us now turn the attention to the non-occurrence of [ɛ:] before [j]. The non-occurrence is apparently regular as we can thus regard it either as a result of neutralization or a consequence of defective distribution of /ě/. We take the non-occurrence as regular because we have not found the combination [ɛ:j] in our data. As the Czech orthography

closely reflects the sound structure, one can easily confirm this by looking for the combination *ěj* in the Czech National Corpus (ČNK). The search will turn out either misspelled words or onomatopoeic ones. This is strong evidence that the non-occurrence is regular.

A natural question to ask is why only [ɛ:] is non-occurrent after [j]. We are not able to give here a definitive answer, but it is perhaps because [ej] functions as a diphthongoid or at least has a status different to the other combinations of vocoids with [j]. In colloquial Czech (which is in origin a Bohemian dialect around the capital city Prague) some [i:]'s of the standard form of Czech are replaced by [ej]'s: e.g. [mlɛjn] instead of [mli:n], *mlyn* “mill” or [dobrej] instead of [dobri:], *dobrý* “good”. In a Moravian dialect (e.g. that of the present writer) the words have, however, these forms: [mlɛ:n] and [dobrɛ:] with a change [ej] > [ɛ:]. Another, similar change, which might be termed *monophthongization*, also takes place in the Moravian dialect of the present writer (Moravia being the eastern part of the Czech Republic): a change of [ou] to [o:], so e.g. standard [mouka] > [mo:ka], *mouka* “flour”, [boudou] > [bo:do:], *boudou* “hut (instr. sg.)”. The other diphthongs /ä/ [au], /ě/ [ɛu] and other combinations /aj/, /oj/, /uj/ are not affected and remain unchanged.

However, these facts do not belong to our analysis proper, as they concern different variants of Czech other than the one analyzed here. Yet colloquial Czech affects standard Czech, because colloquial Czech is the variant that the majority of Czechs use in everyday speech. The standard and colloquial variants are so interlaced that it is difficult to make a sharp distinction between them.

Let us return of the possibility of neutralization. As already mentioned, out of the oppositions between /ē/, /e/ and /ě/ it is only the opposition /e/ ~ /ē/ that is neutralizable. The relation between /ē/ ‘front mid long’ and /e/ ‘front mid short’ is exclusive because the sum of the distinctive features common to them, sc. ‘front mid’, is not shared by any other phoneme in the system. It may therefore be the case that the non-occurrence of [ɛ:] before [j] is to be interpreted as neutralization of the opposition between /ē/ and /e/. If so, the resulting archiphoneme /E/ would be defined as ‘front mid’. It means that the difference between the distinctive features ‘long’ and ‘short’ is canceled for ‘front mid’ vowels before and/or after /j/. However, this archiphoneme is, at least potentially, opposed to /ě/ ‘front diphthongal’ and so it must be defined as ‘front mid non-diphthongal’. The distinctive feature ‘non-diphthongal’ may be a little controversial, because ‘diphthongal’ /ě/ (i.e. diphthongoid

[ɛu]) has not been found to occur before /j/ [j]. As mentioned above, we regard this to be due to defective distribution of /ě/, not a result of the inoperability of the distinction between ‘short’, ‘long’ and ‘diphthongal’ vowels. The distinction is still valid and hence /E/ must be defined as ‘front non-diphthongal’.

The postulation of neutralization of /e/ ~ /ě/ before /j/ touches upon a theoretical problem discussed above in Section 5.5. The opposition between ‘short’ and ‘long’ vowels is neutralized only for ‘front mid’ vowels, not for any other vowels in the system. Can we postulate cancellation of some distinction if it does not affect all phonemes for which the distinction is valid? In Section 5.5 we, following Mulder, concluded there was no logical reason not to assume so. We must therefore decide on the grounds of adequacy of this and the alternative solution, though we wobble at the edge of arbitrary and non-arbitrary decisions here. The alternative solution is to regard the non-occurrence of [ɛ:] before [j] as a result of defective distribution of /ě/. We regard this solution as less adequate, though.

The reasons we opt for attributing the non-occurrence of [ɛ:] before [j] to neutralization of the opposition /e/ ~ /ě/ are several. First of all, as mentioned a few paragraphs above, the behavior of [ɛj] is conspicuously peculiar; it acts as if it were a diphthongoid. This peculiarity might be underlined by interpreting [ɛj] as /Ej/. Secondly, operating with neutralization instead of defective distribution may be preferable simply because the opposition between ‘short’ and ‘long’ vowels exhibits tendencies to be neutralized. There are not only tendencies suggested by Trnka in the quotation at the beginning of this section; other, similar tendencies are known to exist in dialects of Czech (shortenings of long vocoids). However, these processes are, as of now, not regarded to be correct in standard Czech, sc. in the variety of Czech we have been analyzing here.

To cut the discussion short let us say that we interpret the non-occurrence of [ɛ:] before [j] as a consequence of neutralization of the opposition /e/ ~ /ě/, though the alternative solution of ascribing it to defective distribution of /ě/ before /j/ is also possible. We do not regard it as accidental because we can formulate a restriction on the non-occurrence: it is the presence of post-nuclear /j/. The consonantal sub-system for the context of this neutralization is reproduced in Figure 5.6b.

a sub-system of vowels	<i>front</i>		<i>central</i>	<i>back</i>	
	<i>high</i>	<i>mid</i>		<i>high</i>	<i>mid</i>
<i>short</i>	i	E	a	u	o
<i>long</i>	ī		ā	ū	ō
<i>diphthongal</i>	ě		ä	ö	

Figure 5.6b

5.7 Other possible neutralizations of vowels

We have spent a considerable length on the discussion of possible neutralizations of vowels involving the dimension ‘short’ ~ ‘long’ ~ ‘diphthongal’. Like with consonants, there are several possible types of neutralization of vowels in Czech. They may involve vowels of three vocalic dimensions. Thus:

1. Neutralization involving the dimension ‘front’ ~ ‘central’ ~ ‘back’.
2. Neutralization involving the dimension ‘short’ ~ ‘long’ ~ ‘diphthongal’.
3. Neutralization involving the dimension ‘high’ ~ ‘mid’.

We have already discussed a neutralization of the second type, namely neutralization of length. The point to discuss now is whether the other two dimensions are liable to neutralization, too. Namely, whether there are neutralization affecting the vowels participating in the distinction ‘front’ ~ ‘central’ ~ ‘back’ on the one hand and neutralizations affecting the vowels participating in the distinction ‘high’ ~ ‘mid’. Though more research is still necessary, we have not found any significant non-occurrences of vocoids ascribable to the mentioned possible neutralizations.

The oppositions between ‘high’ and ‘mid’ vowels, that is between /i/ and /e/, /ī/ and /ē/, /u/ and /o/, /ū/ and /ō/ are stable, as we have not been able to find a context where this difference would not operative. The difference between ‘front’, ‘central’ and ‘back’ was, however, suggested to be affected (cf. Mathesius 1931, Vachek 1968: 89). What was pointed out is the occurrence of ‘back’ vowels /o/, /u/ (+ /ö/) after ‘palatal’ consonants /tʲ/, /dʲ/, /š/, /ž/, /ň/. To the ‘palatal’ consonants the consonants /ɣ/ and /j/ are added as well as /Ts/ [ts] and /Tš/ [tʃ], which are traditionally interpreted as single phonemes. According to

Vachek (*ibid.*) the occurrences can be grouped to three situations. The ‘back’ vowels occur after the mentioned consonants:

1. In forms of words of foreign origin: *jolka* “little jolly”, *čutora* “canteen”.
2. In forms of words synchronically foreign or emotively colored or of onomatopoeic origin: e.g. *čuchat* “to smell” instead of non-emotive *čichat* of the same meaning, *čumět* “to stare at”, *šoupat* “to push”, *d’obat* “to pick”, *fňukat* “to cry”, *křoupat* “to crack”.
3. Across morpheme boundaries: *hráčům* “player (dat. pl.)”, *mužové* “men”, *pekařů* “baker (gen. pl.)”.

Though we do not deny the pertinence of these facts to the analysis of the phonological constitution of Czech words, we hope to have made repeatedly clear throughout our analysis that such facts have no validity for the postulation of the phonematic identity of particular items. We acknowledge that the so-called functional loads of particular phonemes of Czech vary and that the degree the phonemes are utilized in phonological forms is different, but there is no justification for saying /o/, /u/, /ö/ are prevented from occurring after ‘palatals’ and /j/, /ř/. There is even less justification for introducing neutralization here.

6. Statement of realization

In this final part we will discuss briefly realizations of all the phonemes, the hyperphoneme and the archiphonemes we have set for the phonematic system of Czech. In addition, several combinations of phonemes and their realizations will be mentioned.

6.1 Canonical allophones

Having set the phonemes of Czech, we will now turn to ways the phonemes are realized. We will list all of the phonemes and describe their basic allophones in standard Czech. These allophones may be informally termed *canonical allophones* (cf. Dickins 1998: 253ff.) by which are meant those allophones whose phonetic forms are regarded as canonical or “correct” realizations in the variety of Czech we are examining here. The variety is of course the orthoepic (standard) Czech. Within orthoepy, which studies the correct pronunciation of words, a distinction is sometimes made between orthoepy and orthophony, the latter focusing on the correct articulation of sounds in the given language. We will therefore be interested in orthophonetic allophones of Czech phonemes by which we mean phonemes realized by allophones correctly articulated. This rules out, for instance, [ʀ] (i.e. a uvular trill) as a realization of the phoneme /r/. It is not uncommon that many people pronounce /r/ as a uvular trill instead of an alveolar trill [r] but this pronunciation is not regarded as orthophonetic.

If we say “phonemes being realized as” or “phonemes pronounced as”, it is only a manner of speaking. Phonemes are not realized and do not have allophones, because they are not defined as classes of allophones but as simultaneous bundles of distinctive features. It is the phonological form to which a phoneme corresponds that is defined as a bundle of allophones. An allophone has a phonetic form, which is usually a speech-sound. Hence if we say that a phoneme X is realized by a sound Y, we mean that the phoneme X corresponds to a certain phonological form which is a class of allophones one of which has a

phonetic form Y. However, as long as we remember this, we can still say that a phoneme X is realized or pronounced by a sound Y (cf. Figure 1.5a)

We will not attempt to give any detailed description of the realizations of Czech phonemes, because such descriptions can be found elsewhere. We will refer in particular to Hála 1962, Palková 1997 and Krčmová 2006. Palková 1997 is perhaps the most detailed description and up-to-date description; it contains orograms, labiograms, linguograms and palatograms of Czech sounds (reproduced from Hála 1960) and spectrograms for vocoids. Admittedly, all descriptions base themselves on now the already classical work by Bohuslav Hála (1962) where the description of the phonic aspect of Czech is discussed in the greatest detail and which is itself a product of the author's lifelong research. This work is, however, now a little bit outdated and thus Palková 1997 is preferred. A detailed roentgenological description of Czech vocoids can be found in Ondráčková 1964. There are of course more major and minor descriptions of Czech sounds, though mostly written in Czech. For a detailed English description of Czech sounds see Borovičková & Maláč 1967. A very brief English description of Czech sounds can be found in Dankovičová 1999. The recordings of the illustrative words mentioned in that article (which is from *Handbook of the International Phonetic Association*) can be found at the following web address:

<http://web.uvic.ca/ling/resources/ipa/handbook/IPAhandbook.zip>

6.2 Consonants

The following are consonants of Czech, i.e. those phonemes that can stand only in peripheral positions within phonotagms. The set of distinctive features is given for each phoneme. Note that /n/ is in fact a hyperphoneme.

/p/ = 'labial occlusive voiceless'. Realized as a voiceless bilabial plosive, IPA [p] (Hála 1962: 220-1, Palková 1997: 223, Krčmová 2006: 129-20).

/b/ = 'labial occlusive voiced'. Realized as a voiced bilabial plosive, IPA [b] (Hála 1962: 220-1, Palková 1997: 223, Krčmová 2006: 129-30).

/f/ = 'labial constrictive voiceless'. Realized as a voiceless labio-dental fricative, IPA [f] (Hála 1962: 236-9, Palková 1997: 227, Krčmová 2006: 138).

/v/ = ‘labial constrictive voiceless’. Realized as a voiced labio-dental fricative, IPA [v] (Hála 1962: 236-9, Palková 1997: 227, Krčmová 2006: 138). Some phoneticians have suggested that Czech has two v-sounds, one being a labio-dental constrictive, and the other an occlusive one (see Frinta 1909: 117-9, Trávníček 1951: 18-9, 57). The occlusive v-sound is said to occur in these contexts:

1. Before all vocoids, examples: [vada] *vada* ‘defect’, [veʃeʒe] *večeře* ‘dinner’, [viʒet] *vidět* ‘to see’, [voda] *voda* ‘water’, [vu:ttse] *vůdce* ‘leader’.
2. Before sonants and nasals, examples: [v_mɲesce] *v městě* ‘in the town’, [vra:na] *vrána* ‘crow’, [v_lesɛ] *v lese* ‘in the forest’, [vjenets] *věnc* ‘collar’.
3. After all voiced and voiceless contoids, examples: [fivjezda] *hvězda* ‘star’, [zva:t] *zvat* ‘to invite’, [rva:t] *řvat* ‘to shout’, [dva] *dva* ‘two’, [kve:st] *kvést* ‘to bloom’.

The constrictive variant is said to occur in the other contexts: before voiced contoids, sometimes even before nasals, examples [plavba] *plavba* ‘cruise’, [pravda] *pravda* ‘truth’, [pravʒivi:] *pravdivý* ‘true’. The occurrence of the occlusive v-sound has been disputed by some phoneticians (Hála 1962: 239, Romportl 1958: 267, fn.) on the grounds that it is impossible to produce a labio-dental occlusion, which is obviously not true, because labio-dental occlusives do occur in world’s languages, though very rare.

Frinta’s conclusion was based on his auditory observation and apparently not supported by an experimental research. To the best of our knowledge no detailed investigation of the problem of Czech [v] has been published. Most phonetic descriptions classify it as a labio-dental constrictive. Palková (1997: 211) writes that this classification is traditional and that there are indeed phonic differences between the Czech [v] and, for instance, English [v].

/m/ = ‘labial nasal’. Realized as a voiced bilabial nasal, IPA [m]. Before /v/ and /f/ it may be realized, due to assimilation, as a voiced labio-dental nasal, IPA [m̠] (Hála 1962: 222-4, Palková 1997: 223, Krčmová 2006: 129-30); the allophones [m] and [m̠] are free variants here. The occurrence of the labio-dental variant is restricted to words where the letter *m* stands before the letters *f* and *v* in spelling, e.g. *nymfa*, *tramvaj*. The words with the letter *n* before *f* and *v* may also be pronounced with a labio-dental nasal but this pronunciation is not regarded as standard, e.g. *konference*, *konvalinka*, pronounced [konferentse], [konvalɪŋka].

/t/ = ‘alveolar occlusive voiceless’. Realized as a voiceless alveolar plosive, IPA [t] (Hála 1962: 224-6, Palková 1997: 224, Krčmová 2006: 130-1). The sound is traditionally classified as an alveolar plosive, but the tongue touches the back of the upper teeth during articulation, so *dento-alveolar* might be a better term. Its voiced counterpart [d] is, however, an alveolar plosive. On the allophone [c] see Section 6.3.

/d/ = ‘alveolar occlusive voiced’. Realized as a voiced alveolar plosive, IPA [d] (Hála 1962: 224-6, Palková 1997: 224, Krčmová 2006: 130-1). On the allophone [j] see Section 6.3.

/s/ = ‘alveolar constrictive voiceless’. Realized as a voiceless alveolar sibilant fricative, IPA [s] (Hála 1962: 239-44, Palková 1997: 228, Krčmová 2006: 139).

/z/ = ‘alveolar constrictive voiced’. Realized as a voiced alveolar sibilant fricative, IPA [z] (Hála 1962: 239-44, Palková 1997: 228, Krčmová 2006: 139).

/n/ = ‘alveolar∪velar nasal’. Realized as a voiced alveolar nasal, IPA [n] (Hála 1962: 225-6, Palková 1997: 224, Krčmová 2006: 130-1). Before /k/, /g/, /x/ it is realized, due to assimilation, as a voiced velar nasal, IPA [ŋ] (Hála 1962: 232-5). On the allophone [ɲ] see Section 6.3.

/tʃ/ = ‘palatal occlusive voiceless’. Realized as a voiceless palatal plosive, IPA [c] (Hála 1962: 227-31, Palková 1997: 225, Krčmová 2006: 132-3).

/dʃ/ = ‘palatal occlusive voiced’. Realized as a voiced palatal plosive, IPA [j] (Hála 1962: 227-31, Palková 1997: 224, Krčmová 2006: 130-1).

/š/ = ‘palatal constrictive voiceless’. Realized as a voiceless post-alveolar sibilant fricative, IPA [ʃ] (Hála 1962: 239-44, Palková 1997: 229, Krčmová 2006: 140-1).

/ž/ = ‘palatal constrictive voiced’. Realized as a voiced post-alveolar sibilant fricative, IPA [ʒ] (Hála 1962: 239-44, Palková 1997: 229, Krčmová 2006: 140-1).

/ň/ = ‘palatal nasal’. Realized as a voiced palatal nasal, IPA [ɲ] (Hála 1962: 227-31, Palková 1997: 225, Krčmová 2006: 132-3).

/k/ = ‘velar occlusive voiceless’. Realized as a voiceless velar plosive, IPA [k] (Hála 1962: 231-5, Palková 1997: 226, Krčmová 2006: 133-4).

/g/ = ‘velar occlusive voiced’. Realized as a voiced velar plosive, IPA [g] (Hála 1962: 231-5, Palková 1997: 226, Krčmová 2006: 133-4).

/x/ = ‘velar constrictive voiceless’. Realized as a voiceless velar fricative, IPA [x] (Hála 1962: 248-9, Palková 1997: 230, Krčmová 2006: 142).

/h/ = ‘velar constrictive voiced’. Realized as a voiced laryngeal fricative, IPA [ɦ] (Hála 1962: 248-9, Palková 1997: 230-1, Krčmová 2006: 142-3). On [ɣ] see Section 6.2.

/j/ = ‘approximant’. Realized as a voiced palatal approximant, IPA [j]. The sound [j] is traditionally classified as a palatal fricative (Hála 1962: 244-8) but it is more appropriate to regard it as an approximant (cf. Palková 1997: 211-2, 233-4, Krčmová 2006: 141-2), because, first, there is a phonic difference between palatal fricatives and palatal approximants, though the difference seems to be little utilized in the world’s languages (see Ladefoged & Maddieson 1996: 165). Second, the Czech is obviously an approximant; its phonic characteristics are very similar to the vocoids [ɪ], [i:].

/ř/ = ‘spirant’. Realized as a voiced fricative trill, IPA [r̝], or as a voiceless fricative trill, IPA [r̥] (Hála 1962: 264-8, Palková 1997: 231, Krčmová 2006: 146, Romportl 1973a). The voiceless allophones is realized at the end of a word (i.e. when /ř/ occur in a post-nuclear position) and in the vicinity of a ‘voiceless’ consonant, no matter if it precedes or follows it. The phoneme /ř/ is realized by the voiced allophone in all the other contexts.

6.3 Consonantal archiphonemes

What we have described so far is the overall system of consonantal phonemes of Czech but there are sub-systems of consonants that have to be described, too. They are the systems of consonantal archiphonemes. As regard neutralization of voice, we are going to list all the archiphonemes and describe their realizations as a bundle, because the manner of realization applies for each archiphoneme. The archiphonemes have resulted from the neutralization between ‘voiceless’ and ‘voiced’ consonants and are thus indifferent to the distinction between ‘voiceless’-ness and ‘voiced’-ness. In realization the archiphonemes have the same manner of articulation and the same place of articulation like the phonemes from which they have resulted. Hence e.g. /P/ ‘labial occlusive’ is realized as a bilabial plosive. Whether an archiphoneme is realized by voiceless or by voiced sound depends on the context where it occurs. The archiphonemes are the following ones:

/P/ = ‘labial occlusive’, realized as [p] or [b].

/F/ = ‘labial constrictive’, realized as [f] or [v].

/T/ = ‘alveolar occlusive’, realized as [t] or [d].

/S/ = ‘alveolar constrictive’, realized as [s] or [z].

/Ť/ = ‘palatal occlusive’, realized as [c] or [j].

/Š/ = ‘palatal constrictive’, realized as [ʃ] or [ʒ].

/K/ = ‘velar occlusive’, realized as [k] or [g].

/X/ = ‘velar constrictive’, realized as [x] or [ħ] or [ɣ] (see below).

The distribution of voiceless and voiced allophones of the archiphonemes can be described by the following rules. We speak here about phonological forms and we mean phonological forms of signs, i.e. of words and momemes (i.e. morphemes). We use the notion “diaereme”, which is a para-phonotactic feature whose function is to mark boundaries between phonological forms (see Bičan forthcoming). It most often corresponds to a boundary between words but in some cases also to boundaries between momemes (i.e. morphemes). It will be transcribed as ‘#’. In the symbolic notation of the relevant contexts ‘T’ stands for any ‘voiceless’ consonant (i.e. either of /p/, /t/, /tʰ/, /k/, /f/, /s/, /š/, /x/), ‘D’ for any ‘voiced’ consonant (i.e. either of /b/, /d/, /dʰ/, /g/, /z/, /ž/, /h/); note that /v/ is excluded from this set; it is a special case—neutralization does not take place before this phoneme. Neither does it before any of the consonants /j/, /m/, /n/, /ň/ (i.e. all consonants indifferent to the distinction ‘voiceless’ ~ ‘voiced’ except for /ř/) and semiconsonants /r/, /l/. The set of these phonemes may be called *sonants* and symbolized by ‘R’. ‘V’ stands for any vowel. ‘A’ represents any archiphoneme resulted from the neutralization of the ‘voiceless’ ~ ‘voiced’ opposition. ‘_’ stands for the particular context.

The archiphonemes are realized as voiceless in the following contexts:

1. Before a ‘voiceless’ consonant. It includes these contexts:

_T. Example: /Stan/, realized [stan] *stan* “tent”.

_AT. Example: /PStruX/, realized [pstrux] *pstruh* “trout”.

_AAT. Example: /udavaTŠStvī/, realized [ʔudavatʃstvi:] *udavačství* “sneaking”.

_řT. Example: /Křř'ini/, realized [křř'ini] *křřtiny* “christening party”.

2. At the end of a phonological form. It includes these contexts:

_#/. Example: /leT/, realized [lɛt] *led* “ice”.

_A#. Example: /šeST/, realized [ʃɛst] *šest* “six”.

_AA#. Example: /zāPST/, realized [za:pst] *zábst* “to freeze”.

_ř#. Example: /pePř/, realized [pɛpř] *pepř* “pepper”.

3. At the end of a phonological form if the form is followed by a form beginning with a ‘voiceless’ consonant. The boundary between phonological forms is signaled by the onset of stress. It includes these contexts:

_#T. Example: /potoK#teTše/, realized [ˈpɔtɔk_ˈtɛʃɛ] *potok teče* “the rivulet flows”.

_#AT. Example: /loF#Ptākū/, realized as [lof_ˈpta:ku:] *lov ptáků* “hunt of birds”.

_#AAT. Example: /loF#PŠtrosū/, realized [lof_ˈpʃtrosu:] *lov pštrosů* “hunt of ostriches”.

_#AřT. Example: /mīT#Křřini/, realized [mi:t_ˈkřřini] *mít křřtiny* “to have a christening party”.

_A#T. Example: /šeST#koTšeK/, realized [ʃɛst_ˈkɔʃɛk] *šest koček* “six cats”.

_AA#T. Example: /pēTST#xleba/, realized [pɛ:ts_ˈtxlɛba] *péct chleba* “to bake bread”.

_A#AT. Example: /šeST#Ptākū/, realized [ʃɛst_ˈpta:ku:] *šest ptáků* “six birds”.

_AA#AT. Example: /teKST#Psala/, realized [tekst_ˈpsala] *text psala* “the text was written”.

_A#AAT. Example: /šeST#PŠtrosū/, realized [ʃɛst_ˈpʃtrosu:] *šest pštrosů* “six ostriches”.

_AA#AAT. Example: /pēTST#PStruha/, realized [pɛ:ts_ˈpstruha] *péct pstruha* “to bake a trout”.

_ř#T. Example: /uvñiTř#kruhu/, realized [ʔuvɲitř_ˈkruhu] *uvnitř kruhu* “inside of the circle”.

_ř#AT. Example: /uvñiTř#Stātu/, realized [ʔuvɲitř_ˈstatu] *uvnitř státu* “inside of the country”.

_ř#AAT. Example: /uvñiTř#PŠtrosī/, realized [ʔuvɲitř_ˈpʃtrosi:] *uvnitř pštrosí* (*farmy*) “inside of the ostrich (farm)”.

4. At the end of a phonological form if the form is followed by a form beginning with a vowel and the boundary is realized with a glottal stop and/or the onset of stress. The boundary may be either across phonological forms of words or across phonological forms of monemes (morphemes), though the latter is rarer. It includes these contexts:

_#V. Examples: /pjeT#ät/, realized [pjɛt_ʔaut] *pět aut* “five cars”;
/beS#oTkladně/, realized [bɛs_ʔotkladɲɛ] *bezodkladně* “immediately, without delay”.

_A#V. Example: /šeST#ät/, realized [ʃɛst_ʔaut] *šest aut* “six cars”.

_AA#V. Example: /teKST#ätorä/, realized [tɛkst_ʔautora] *text autora* “text of the author”.

_ř#V. Example: /vePř#utekl/, realized [vɛpř_ʔutekl] *vepř utekl* “the pig run away”.

5. At the end of a phonological form if the form is followed by a form beginning with a consonants indifferent to the distinction between ‘voiceless’ and ‘voiced’ phonemes. It includes /r/, /l/, /j/, /m/, /n/, /ň/. The orthoepy requires the consonants preceding sonants to be realized with voiceless contoids but it is very common that the consonants are realized rather with voiced contoids instead; this is at least the case for Moravian dialects (including the present writer’s one). It may be a matter of time when these realizations become accepted. The boundary between forms is again signaled by the onset of stress. It includes these contexts:

_#R. Example: /mäŠ#rīmu/, realized [ma:ʃ_ʔri:mu], dialectal [ma:ʒ_ʔri:mu] *máš rýmu* “you have cold”.

_A#R. Example: /doST#rīže/, realized [dost_ʔri:ʒɛ], dialectal [dozd_ʔri:ʒɛ] *dost rýže* “enough of rice”.

_AA#R. Example: /teKST#jeŠťe/, realized [tɛkst_ʔjɛʃcɛ], dialectal [tɛgzd_ʔjɛʃcɛ] *text ještě* “the text (has not) yet (been)”.

_ř#R. Example: /pePř#může/, realized [pɛpř_ʔmu:ʒɛ], dialectal [pɛbr_mu:ʒɛ] *pepř může* “pepper can”.

6. At the end of a phonological form if the form is followed by a form beginning with /v/. The phoneme is a peculiar one within the system of Czech phonemes; it be-

haves as if it belonged to the group of the phonemes /j/, /m/, /n/, /ň/, /r/, /l/, i.e. those consonants indifferent to the distinction ‘voiceless’ ~ ‘voiced’. Once again the realizations are voiced in some dialects. The boundary is signaled by the onset of stress. It includes the following contexts:

_#v. Example: /hneT#vedle/, realized [ɦnɛt_ˈvɛdlɛ], dialectal [ɦnɛd_ˈvɛdlɛ] *hned vedle* “just next to”.

_A#v. Example: /nēST#vejTse/, realized [nɛ:st_ˈvejtɕɛ], dialectal [nɛ:zd_ˈvejtɕɛ] *nést vejce* “to carry eggs”.

_AA#v. Example: /teKST#višel/, realized [tɛkst_ˈviʃɛl], dialectal [tɛgzd_ˈviʃɛl] *text vyšel* “the text was released”.

_ř#v. Example: /pePř#voňi/, realized [pɛpř_ˈvoɲi:], dialectal [pɛbr_ˈvoɲi:] *pepř voní* “pepper smells”.

The archiphonemes are realized voiced in the following contexts:

1. Before a ‘voiced’ consonant. It includes the following contexts:

_D. Example: /PdītT/, realized [bɟi:t] *bdít* “to be awake”.

_AD. Example: /FShleT/, realized [vzɦlɛt] *vzhled* “look”.

_AAD. A possible context but any example has not been found, because such combinations are very rare if existing at all.

2. At the end of a phonological form if the immediately following form begins with a ‘voiced’ consonant. The boundary is signaled by the onset of stress.

_#D. Example: /pūjTšiT#hraTšku/, realized [ˈpu:jtʃiːd_ˈɦratʃku] *půjčit hračku* “to borrow a toy”.

_#AD. Example: /kōpiT#Kbelīkem/, realized [ˈkoupɪd_ˈɡbeli:k] *koupit kbelík* “to buy a bucket”.

_#AAD. Example: /posōd’iT#FShleT/, realized [ˈposouɦɪd_ˈvzɦlɛt] *posoudit vzhled* “to judge the look (of)”.

_A#D. Example: /šeST#hod’in/, realized [ʃɛzd_ˈɦoɦɪn] *šest hodin* “six hours”.

_AA#D. Example: /pētST#dlōho/, realized [pɛ:ɕ_ˈdlouɦo] *péct dlouho* “to bake long”.

_A#AD. Example: /šeST#Kbelīkū/, realized [ʃɛzd_ˈɡbeli:ku:] *šest kbelíkū* “six buckets”.

_AA#AD. Example: /teKST#Sdarma/, realized [tegzd₁'zdarma] *text zdarma* “the text for free” (e.g. was translated for free).

_A#AAD. Example: /jejiXŠ#FShleT/, realized [jejifš₃'vzfilet] *jejichž vzhled* “whose look”.

_AA#AAD. Example: /teKST#FShledem/, realized [te:gzd₁'vzfīledem] *text vzhledem* “the text with regard to”.

3. At the end of a phonological form if the immediately following form begins with /ř/. The boundary is signaled by the onset of stress. It includes the following contexts:

_#ř. Example: /tak#řeTšenī/, realized [tag₁'reʃeni:] *tak řečený* “so called”.

_A#ř. Example: /doST#řepi/, realized [dozd₁'repi] *dost řepy* “enough of beet-root”.

_AA#ř. Example: /teKST#řed'itele/, realized [tegzd₁'rejitele] *text ředitele* “text of the director”.

A separate note should be devoted to the archiphoneme /X/. It is realized by [x], i.e. a voiceless velar fricative, in the contexts where the archiphonemes are realized by voiceless allophones. In the contexts where they are realized by voiced allophones, the archiphoneme /X/ may be realized by [ɦ], i.e. a voiced laryngeal fricative, or by [ɣ], i.e. a voiced velar fricative. The sound [ɣ] is the real voiced counterpart of [x] from the phonetic perspective but it is the peculiarity of Czech that the actual voiced counterpart of [x] is the sound [ɦ], i.e. a sound with a different place of articulation.

The allophones [ɣ] and [ɦ] seem to be free variants, though [ɣ] may be more likely in situations where the archiphoneme /X/ corresponds to *ch* in spelling. The examples are: [smi:ɣ₁'bla:znu:] or [smi:ɦ₁'bla:znu:] *smích bláznů* “laughter of madmen”, [ceɣ₁'ʒen] or [ceɦ₁'ʒen] *těch žen* “those women (gen.)”. However, the variant [ɣ] may also occur in situations when the archiphoneme /X/ corresponds to *h* in spelling (cf. Palková 1997: 241): [zdviɣ₁'bude] or [zdviɦ₁'bude] *zdvih bude* “the lift will be”. It has also been reported to occur in the following words (see Vachek 1968: 69): *hřeb* “nail”, *pohřeb* “funeral”, *ohbí* “bend”, *hbitý* “swift”, *ohnout* “to bend”, sc. pronounced, respectively, as [ɣreɸ], [ʔoɣbi:], [ɣbiti:], [ʔoɣnout]. Whether some people really pronounce these words with [ɣ] rather than with [ɦ] may be a matter of dispute. At any rate, however, [ɣ] may occur as a realization of

/X/ in e.g. *Suchdol* (a place-name), phonologically /suXdol/, because the spelling may induce speakers to pronounce [ɣ] rather than [ɦ].

The last archiphoneme to be discussed is /M/ as a result of neutralization between /m/, /ň/ and /n/. It belongs to a different sub-system than the archiphonemes of the neutralization of voice. It occurs before a consonant in the pre-nuclear context. It is always realized as [m], i.e. a voiced bilabial nasal.

6.4 Combinations of consonants

It is true that when in combination phonemes may be realized in numerous ways, because adjacent segments tend to influence each other and speech is in fact not even discrete but a continuous flow. For instance, the phoneme /x/ in a combination /xi/ is as a rule realized in a slightly different manner than in a combination /xu/. In the former case the tongue is shifted more to the front due to the presence of adjacent /i/. However, we are not going to discuss here such variations. The consonantal combinations whose realizations should be especially highlighted are /Ts/, /TS/, /Tš/, /TŠ/, /Tz/ and /Tž/. These are realized by affricates, which have been evaluated here as corresponding to combinations of two phonemes. On combinations of phonemes and their realizations see also Borovičková & Maláč 1967.

/Ts/, realized as a voiceless (pre-)alveolar affricate, IPA [ts] (Hála 1962: 254-5, Palková 1997: , Krčmová 2006: 135-6). Example: /Tsenə/, [tsenə] *cena* “prize”.

/Tš/, realized as a voiceless post-alveolar affricate, IPA [tʃ] (Hála 1962: 254-5, Palková 1997: 235, Krčmová 2006: 136-7). Example: /TšeX/, [tʃɛx] *Čech* “Czech”.

/Tz/, realized as a voiced (pre-)alveolar affricate, IPA [dʒ] (Hála 1962: 254-5, Palková 1997: 234-5, Krčmová 2006: 135-6). The only example of pre-nuclear occurrence of /Tz/ seems to be /TzinkaT/, [dʒɪŋkat] *dzinkat* “to make a sound similar to [dʒ]”. It may also occur in words like *podzim* “autumn”, *podzemní* “subterranean”, though here it may be realized as a two-sound sequence [d.z] if the boundary between phonotagms is highlighted.

/Tž/, realized as a voiced post-alveolar affricate, IPA [dʒ] (Hála 1962: 254-5, Palková 1997: 235, Krčmová 2006: 136-7). Examples (words of foreign origin): /TžuS/, [dʒus] *džus* “juice”, /Tžem/, [dʒɛm] *džem* “jam”.

/TS/, realized as [ts] or [ɟ]. The voiceless allophone occurs in contexts where the archiphonemes of the neutralization of voice are realized as voiceless; the voiced allophone occurs in contexts of the voiced realizations. Examples: /d'eTSko/, realized [ɟɛtsko] *děcko* “kid”, /leTSKgo/, realized [lɛɟgdo] *leckdo* “whoever”, /moTS#kolāTšū/, realized [mots_ˈkola:tʃu:] *moc koláčů* “a lot of pies”, /moTS#dortū/, realized [moɟ_ˈdortu:] *moc dortů* “a lot of cakes”.

/TŠ/, realized as [tʃ] or [ɟʃ]. The distribution of the allophones is identical to that of /TS/. Examples: /ruTŠka/, realized [rutʃka] *ručka* “little hand”, /lɛTŠba/, realized [lɛ:ɟba] *léčba* “(medical) treatment”, /upeTŠ#kolāTŠ/, realized [ˈʔupɛtʃ_ˈkola:tʃ] *upeč koláč* “bake a pie!”, /upeTŠ#dorT/, realized [ˈʔupɛɟ_ˈdort] *upeč dort* “bake a cake!”.

In addition to these we should also mention combinations /ntʃ/, /ndʃ/, /tň/, /dň/. They may be realized as [nc], [nɟ], [tɲ], [dɲ] or as [ɲc], [ɲɟ], [cɲ] and [ɲɲ]. This means that the phonemes /t/, /d/ and /n/ have two orthophonic allophones, [t] and [c], [d] and [ɟ], [n] and [ɲ]. The palatal allophones may occur before /tʃ/, /dʃ/ and /ň/ as free variants of the alveolar allophones. The alveolar allophones seem to be more likely to occur in careful speech.

6.4 Semiconsonants

Semiconsonants are those phonemes that can stand both in the nuclear position and in a peripheral position. In the nuclear position they are realized with syllabic [l], [r], in peripheral position the realizations are non-syllabic. It has been argued (Palková 1997: 232-3) that there is in fact no articulatory or acoustic difference between the syllabic and non-syllabic variants, the difference being only in the sequence of sounds (syllabic variants can occur only between two contoids or after a contoid at the end of a word). This does not seem to be in agreement with measurements of Ilse Lehiste (1965: 181-6) who examined differences between *Petr apoštol* (with syllabic /r/), *Petra pošvali* (non-syllabic /r/), *pět raportů* (non-syllabic), *Petr raportuje* (syllabic /r/ followed by a non-syllabic /r/) and similar phrases (cf. also Bičan forthcoming). The findings are summarized in the following quotation (*op. cit.*: 185):

In general, syllabic /l/ and /r/ were found to be longer than their non-syllabic counterparts: the average duration of syllabic /l/ and /r/ was approximately 10.7 csec (in-

cluding the release of the preceding consonant), that of nonsyllabic /l/ and /r/ – 7.5 csec. The intensity of syllabic /l/ and /r/ was also somewhat higher than the intensity of nonsyllabic /l/ and /r/ [...]. The average F₂ positions for both syllabic /l/ and syllabic /r/ were approximately 150 cps higher than for nonsyllabic /l/ and /r/ [...].

Be it as it may, we will leave the definitive answer to phoneticians. For our purposes it suffices to say that /r/, /l/ are realized as syllabic in the contexts C_C, C_# where ‘C’ stands for any consonant and ‘#’ for a boundary between phonological forms. In any other contexts the phonemes are realized as non-syllabic. This includes the context #_C, i.e. at beginning of a phonological form where so-called side-syllables occur (cf. Section 1.4 and Duběda 2005: 132).

/r/ = ‘vibrant’. Realized as a voiced alveolar trill, IPA [r] (Hála 1962: 260-4, Palková 1997: 231-2, Krčmová 2006: 145).

/l/ = ‘lateral’. Realized as a voiced alveolar lateral approximant, IPA [l] (Hála 1962: 257-60, Palková 1997: 232-3, Krčmová 2006: 143-4).

6.6 Vowels

Vowels are those phonemes that can stand only in the nucleus of a phonotagm. The range of their realizations was suggested in Figure 1.4b. When transcribing Czech vocoids to the IPA, one faces up a problem. The IPA transcription makes automatically a difference between open and close variants of vocoids but this difference is largely irrelevant for standard Czech. The transcriber has to choose one variant, which may give, in comparison with other languages, a wrong picture about Czech vocoids. One of the consequences of this fact is the existence of several transcriptions of Czech vocoids, one represented by Dankovičová (1999), another by Palková (1997: 37-40), a little bit different in Duběda 2005: 106. We do not want to discuss here which one is more accurate. There are two reasons we have chosen the way of Dankovičová. First, the transcription appears in *Handbook of the International Phonetic Association* which is an official guide to the use of the IPA. This does not of course add accuracy to the transcription but it does add it some weight. Secondly, even in the era of computers it is technically easier to write [o] and [u] instead of [ɔ] and [ʊ].

The Czech vocoids are differentiated as to horizontal movement of the tongue body, as to vertical movement of the tongue body, as to the shape of lips and as to the duration. None of the Czech vocoids is nasalized, though they may be slightly nasalized before nasals but these realizations are not regarded as orthophonic. From the perspective of horizontal movement of the tongue there is a difference between front, central and back vocoids; the basis is regarded to be the position of central [a]. From the perspective of vertical movement of the tongue a difference is made between low, mid and high vocoids; the basis is again the position of [a] (the lowest). As mentioned, the difference between open and close variants of vocoids is not relevant for Czech; when compared with languages where it is relevant, the quality of Czech vocoids lies in the area between typically open and typically closed vocoids (Palková 1997: 170-1). From the perspective of the use of lips there are two fundamental shapes: lips are either unrounded or rounded. All back vocoids are rounded. Finally, from the perspective of duration Czech vocoids are either short or long, the duration of the long vocoids being approximately twice as long as the short ones. In many languages a difference in quantity is accompanied with a difference in quality; this does not quite hold true for Czech vocoids. The only notable exception is the difference between short [ɪ] and long [i:], the former being slightly more open than the latter. All vocoids are voiced.

/i/ = ‘front high short’. Realized as a voiced short front high unrounded vocoid, IPA [ɪ] (Hála 1962: 164-72, Palková 1997: 181, Krčmová 2006: 120).

/ī/ = ‘front high long’. Realized as a voiced long front high unrounded vocoid, IPA [i:] (Hála 1962: 164-72, Palková 1997: 181, Krčmová 2006: 120). On the difference between short [ɪ] and long [i:] see above.

/e/ = ‘front mid short’. Realized as a voiced short front mid unrounded vocoid, IPA [ɛ] (Hála 1962: 159-64, Palková 1997: 182, Krčmová 2006: 119-20).

/ē/ = ‘front mid long’. Realized as a voiced long front mid unrounded vocoid, IPA [ɛ:] (Hála 1962: 159-64, Palková 1997: 182, Krčmová 2006: 119-20).

/a/ = ‘central short’. Realized as a voiced short central low unrounded vocoid, IPA [a] (Hála 1962: 152-8, Palková 1997: 183, Krčmová 2006: 119).

/ā/ = ‘central long’. Realized as a voiced long central low unrounded vocoid, IPA [a:] (Hála 1962: 152-8, Palková 1997: 183, Krčmová 2006: 119).

/u/ = ‘back high short’. Realized as a voiced short back high rounded vocoid, IPA [u], Palková and Duběda as [ɯ] (Hála 1962: 173-82, Palková 1997: 185, Krčmová 2006: 121).

/ū/ = ‘back high long’. Realized as a voiced long back high rounded vocoid, IPA [u:], Duběda as [ɯ:] but Palková as [u:] (Hála 1962: 173-82, Palková 1997: 185, Krčmová 2006: 121).

/o/ = ‘back mid long’. Realized as a voiced short back mid rounded vocoid, IPA [o], Palková and Duběda as [ɔ] (Hála 1962: 173-8, Palková 1997: 184, Krčmová 2006: 120-1).

/ō/ = ‘back mid long’. Realized as a voiced long back high rounded vocoid, IPA [o:], Duběda as [ɔ:] but Palková as [o:] (Hála 1962: 173-8, Palková 1997: 184, Krčmová 2006: 120-1).

/ě/ = ‘front diphthongal’. Realized as a voiced diphthongoid with the first phase (the first gesture) similar to the sound [ɛ] and the second phase (gesture) similar to [u] (or [ɯ]), IPA [ɛu], Duběda as [ɛɯ]. There does not appear to be any detailed description of the articulation of [ɛu], because it is generally not regarded as a Czech sound (a brief description in Palková 1997: 172).

/ä/ = ‘central diphthongal’. Realized as a voiced diphthongoid with the first phase (the first gesture) similar to the sound [a] and the second phase (gesture) similar to [u] (or [ɯ]), IPA [au], Duběda as [aɯ]. Again, there does not seem to be any detailed description of [au] for the same reasons as in the case of [ɛu] (a brief description in Palková 1997: 172).

/ö/ = ‘back diphthongal’. Realized as a voiced diphthongoid with the first phase (the first gesture) similar to the sound [o] (or [ɔ]) and the second phase (gesture) similar to [u] (or [ɯ]), IPA [ou], Duběda as [ɔɯ] (Palková 1997: 186, see also Studenovský & Trpák 2004).

6.6 Vocalic archiphoneme

As a result of the discussion of possible neutralization processes for Czech vowels, we postulated one vocalic archiphoneme. It occurs before /j/, which is a context where the difference between /ě/ and /e/ is not operative. The archiphoneme /E/ ‘front mid non-diphthongal’ is realized as [ɛ] here.

7. Summary and Conclusion

Our work tried to present an alternative view of the phonematics of Czech, a view based on the theory and methodology of Axiomatic Functionalism. The theory has been developed by Jan W. F. Mulder in association with Sándor G. J. Hervej, and its origin can be traced back to 1960s. Since then it has been used as an effective tool for descriptions of natural languages and we attempted to apply it on the phonic aspect of Present Standard Czech. However, the discussion of theoretical and methodological background of the theory was kept to a minimum because it can be found elsewhere, expressed in a more eloquent way. The axiomatic-functionalist theory of phonology should not be in principle unfamiliar to linguists, because it has many similarities with phonology of André Martinet and Nikolai S. Trubetzkoy. It employs the commutation as the most important analytical procedure, sets the opposition as the basic relation between phonemes and operates with notions “neutralization” and “archiphoneme”. All of this is embraced by the recognition of the distinctive function as the most important function of language.

A description of the phonematics of a language should, in our functionalist view, encompass a description of the inventory of phonemes of the analyzed language and a description of mutual oppositional relations between the phonemes. We tried to include both of the aspects. On the other hand, a description of the phonotactics should include a statement about the distribution and combinatory possibilities of phonemes. We hope to provide such a description for Czech in our future work but we cannot do this without setting the phonemes of Czech in the first place.

In a functionalist view a phoneme is defined as a simultaneous (unordered) bundle of distinctive features. The features are not universal like in some other approaches but are arrived at on the basis of commutation test. To reuse de Saussure’s famous words, distinctive features (and hence even phonemes as their bundles) are “des entités oppositives, relatives et négatives” (de Saussure 1931: 164). A distinctive feature of a phoneme expresses the phoneme’s oppositional value, its paradigmatic identity and its relation to other phonemes. Every distinctive feature moreover expresses that which it is not: if, on the basis of

commutation test, we define a phoneme as ‘voiced’ it is first of all because it is not ‘voiceless’, not because it is always voiced in realization.

The inventory of the Czech phonemes was divided to three major groups according to their mutual opposability and according to their capacity to stand in nuclear or peripheral (non-nuclear) positions in a syllable, a phonologically defined notion we adopted as the basic unit of distribution of phonemes. The groups are consonants, vowels and semiconsonants.

Consonants were defined as phonemes with the capacity of occupying only the peripheral positions in a syllable. The Czech phonematic inventory includes 21 consonants, whose mutual relations are expressed in a phoneme table in the following figure. To these we add the phonemes /j/ ‘approximant’ and /ř/ ‘spirant’ which are outside the main system of proportions and which are characterized by one distinctive feature each. The names of distinctive features are completely arbitrary, though motivated. In our paper we explain why these phonemes are outside the system, why /j/ is not regarded as a positional variant of /i/ and why no closer relationship between /r/ and /ř/ is postulated. The phoneme /n/ stretches over two slots because it is a so-called hyperphoneme with distinctive features ‘alveolar∪velar nasal’. The feature ‘alveolar∪velar’ is a so-called hyper-feature which represents the distinctive features ‘alveolar’ and ‘velar’ and whose oppositional value is equivalent to the sum of the oppositional values of these features in other phonematic contexts. The notions “hyperphoneme” and “hyper-feature” were introduced to do away with a logical inconsistency of traditional phoneme tables.

	<i>occlusive</i>		<i>constrictive</i>		<i>nasal</i>
	<i>voiceless</i>	<i>voiced</i>	<i>voiceless</i>	<i>voiced</i>	
<i>labial</i>	p	b	F	v	m
<i>palatal</i>	tʃ	dʃ	š	ž	ň
<i>alveolar</i>	t	d	s	z	n
<i>velar</i>	k	g	x	h	

The inventory of Czech consonants does not include so-called affricates [ts], [tʃ] and/or their voiced counterparts. Though we acknowledge that alternative analyses are possible, we chose not to regard them as single phonemes but as realizations of two-phoneme com-

binations /Ts/, /Tš/, /Tz/ and /Tž/. This analysis may be counter-intuitive but we argue it is simpler than the analysis where they would be interpreted as single phonemes. First, we have a smaller—and therefore simpler—inventories of phonemes. Second, the prospective phonotactic analysis of Czech will be simpler, because /Ts/, /Tš/, /Tz/ and /Tž/ follow the general pattern of combinations of ‘occlusive’ with ‘constrictives’ (cf. /Ps/, /Pz/, /Ks/, /Sp/, /Sb/, /St/, /Št/, /Sk/ etc.). On the other hand, the phonic segments we analyze as single phonemes are diphthongs [ɛu], [au] and [ou]. These cannot be, as is done by some linguists, analyzed as /eu/, /au/, /ou/ because every phoneme, in addition to being a bundle of distinctive features, has the potential to enter into different syntagmatic relations with other phonemes. The alleged phoneme /u/ in /eu/, /au/, /ou/ lacks this potential and cannot, by definition of phoneme, be regarded to be one.

The diphthongs, here transcribed as /ě/, /ǎ/, /ö/ because they are single phonemes, belong to a class of vowels. Vowels are those phonemes occupying only the nuclear position of a syllable. Czech has 13 vowels which enter into mutual relations as expressed in the following table. The presentation differs from the traditional triangular scheme but it is because the diphthongs as single vowels were included. Otherwise the table is not different to the traditional accounts: we distinguish between ‘front’, ‘central’ and ‘back’ vowels; except for ‘diphthongal’, ‘front’ and ‘back’ vowels are either ‘high’ or ‘mid’. There are three types of “quantity”, so to speak: ‘short’, ‘long’ or ‘diphthongal’.

	<i>front</i>		<i>central</i>	<i>back</i>	
	<i>high</i>	<i>mid</i>		<i>high</i>	<i>mid</i>
<i>short</i>	i	e	a	u	o
<i>long</i>	ī	ē	ā	ū	ō
<i>diphthongal</i>	ě		ǎ	ö	

In addition to consonants and vowels Czech also have two so-called semiconsonants /r/ ‘vibrant’ and /l/ ‘lateral’. These are phonemes that can occupy both the nuclear as well as peripheral positions in a syllable. The syllabic [ɹ̥] has not been considered because it occurs in a very limited set of words in all of which it can be replaced by [um].

Having set the inventory of Czech phonemes, we tried to counter various arguments against the nativity and genuineness of phonemes such as /f/, /g/, /ō/, /ǎ/ and /ě/. Because

these phonemes occur in a considerable number of Czech words and because our analysis is purely synchronic, we regard these phonemes as firm parts of the phonematics of Czech. Whether the words they occur in are of foreign origin is irrelevant as long as they are distinctive entities in Czech. Very few phonological analyses of Czech recognize the diphthong /ě/ [eu] as a phoneme but we show it has the phonematic status in Czech, even though its functional load may be the least. It is true that in some words the diphthong may be replaced by a two-phoneme sequence /eu/ (e.g. *pneumatika*) but there are, on the other hand, words where this is never the case (e.g. *euro*, a word which is used more and more in Czech).

The major portion of this work is Part 5 “Neutralization and archiphoneme”. It discusses a functionalist view of these two notions and applies them on the phonematics of Czech. We deem these two notions are logically derivable from the notion “opposition” and from the definition of phoneme as a simultaneous bundle of distinctive features. No other description of Czech had, however, applied these notions to such an extent we did. This part of our work is therefore unique and allows seeing the widely known phenomena from a different and a properly functionalist angle.

In the axiomatic-functionalist framework “neutralization” is viewed as non-operability of an opposition in a certain context. The phonematic entity occurring in the context of neutralization is archiphoneme defined as the intersection of the sets of distinctive features of two or more phonemes. Though not functionally identical with the neutralized phonemes, an archiphoneme is functionally equivalent to them and represents these phonemes in certain sub-systems.

The most important neutralization process in Czech was conveniently called neutralization of voice. It takes place at the end of words and in the context before either a ‘voiceless’ or ‘voiced’ consonant where the distinction between ‘voiceless’ and ‘voiced’ consonants (including consonantal clusters) is suspended. The archiphonemes occurring in these contexts are indifferent to the distinction, even though they may be realized as phonetically voiceless or voiced. The absolute phonic characteristics are irrelevant for a functionalist phonological analysis as long as they do not have a function, namely the distinctive function. The inventory of consonants, i.e. of archiphonemes occurring in the contexts of neutralization of voice is presented in the following table. To these we should add /ř/ and /j/

which do not undergo the neutralization by not participating in the opposition between ‘voiceless’ and ‘voiced’ phonemes.

	<i>occlusive</i>	<i>constrictive</i>	<i>nasal</i>
<i>labial</i>	P	F	m
<i>palatal</i>	Ĭ	Š	ň
<i>alveolar</i>	T	S	n
<i>velar</i>	K	X	

In addition to neutralization of voice we postulated another instance of neutralization for consonants which involved the ‘nasal’ phonemes /m/, /ň/ and /n/. In the context before any consonant in the frame of one syllable there can stand only the segment [m]. From this we conclude that the opposition between ‘labial nasal’, ‘palatal nasal’ and ‘alveolar∪velar nasal’ is irrelevant here, and the segment [m] realizes, in these contexts, an archiphoneme defined simply as ‘nasal’.

A considerable amount of space was dedicated to neutralization processes in the vocalic system, in particular to neutralization of the opposition between ‘short’ and ‘long’ vowels (we called it neutralization of length). That such tendencies occur in Czech had been suggested by several linguists but we had to conclude that these tendencies could not be ascribed to neutralization of length in Present Standard Czech. First, there are so-called shortenings of ‘long’ vowels but these are features of non-standard Czech and thus out of the scope of this paper. Second, the limited occurrence of ‘long’ vowels before certain consonantal clusters is best to be regarded as accidental rather than an outcome of neutralization. It may, however, be that the future research will show that the distribution is indeed systematic. In this respect our analysis is open and subject to further specifications.

Yet we were able to point to one peculiarity in the distribution of length: if we exclude apparently onomatopoeic words we find out that long [ɛ:] does not occur before [j] in any word known to us. This restriction may be due to the fact that [ɛj] behaves as if it were a diphthong but such a status cannot be ascribed to this segment under the theory adopted here. However, we could account for this peculiarity by postulating neutralization between /e/ and /ē/ before /j/ and positing an archiphoneme /E/ ‘front mid non-diphthongal’. As al-

ready hinted, we did not find any justification for postulating any other neutralization processes for Czech vowels, though we notice the opposition between ‘short’ and ‘long’ is liable to neutralization. The system of semiconsonants is immune to neutralization because /l/ and /r/ are isolated phonemes.

The whole analysis is accompanied by a brief statement of the range of realization of Czech phonemes. We included only so-called canonical allophones by which we meant only those realizations regarded as orthophonic or correct according to the norm of standard pronunciation of Czech. A comprehensive description of realizations of the archiphonemes in different context was included, too. Our aim was, however, not to provide an exhaustive phonetic description of Czech sounds, because this had been done more adequately in other works to which we referred.

In our work we offered a detailed account on the phonematics of Czech in an axiomatic-functionalism perspective. Although the inventory of the Czech phonemes was already described by other linguists, we believe it is necessary to have alternative views. Only then can one see aspects the others did not, compare them and try to deal with them in a more effective way. We hope this work will help other linguists see some things in a different light and deal with them perhaps more effectively than we did.

References

Dictionaries and sources:

- ČNK *Český národní korpus* [Czech National Corpus] (<http://ucnk.ff.cuni.cz/>)
- FSL *Frekvenční slovník češtiny* [Word-frequency dictionary of Czech] (Praha, 2004)
- SSČ *Slovník spisovné češtiny* [Dictionary of literary Czech] (Praha, 3rd edition, 2003)
- SSJČ *Slovník spisovného jazyka českého I-IV* [Dictionary of the literary Czech language] (Praha, 1960-1971)
- PSJČ *Příruční slovník jazyka českého I-VIII* [Concise dictionary of the Czech language] (Praha, 1935-1957)

Akamatsu, Tsutomu. 1992. *Essentials of Functional Phonology*. Louvain-La-Neuve: Peeters.

----. 2000. *Japanese Phonology. A Functional View*. München: LINCOM.

Bičan, Aleš. 2006. "Phoneme and alternations: different views". *Teorie a empirie: Bichla pro Krčmovó* (eds. Tomáš Hoskovec, Ondřej Šefčík & Radim Sova), 281-96. Brno: Masarykova univerzita.

----. 2007. "Signum-theory in axiomatic functionalism (in margine *Ontological Questions in Linguistics* by Jan W. F. Mulder and Paul Rastall). *Sborník prací filozofické fakulty brněnské univerzity A* 55.5-18.

----. forthcoming. "Accent and diaereme in Czech". A pre-print version available here: <http://www.phil.muni.cz/linguistica/art/preprint/bic-accent.pdf>.

Borovičková, Blanka & Vladislav Maláč. 1967. *The Spectral Analysis of Czech Sound Combinations*. Praha: Academia.

Dankovičová, Jana. 1999. "Czech". *Handbook of the International Phonetic Association*, 70-3. Cambridge: Cambridge University Press.

- Davidson-Nielsen, Niels. 1978. *Neutralization and Archiphoneme. Two Phonological Concepts and Their History*. Copenhagen: Akademisk Forlag.
- Dickins, James. 1998. *Extended Axiomatic Functionalism*. Berlin – New York: Mouton de Gruyter.
- . 2007. *Sudanese Arabic: Phonematics and Syllable Structure*. Wiesbaden: Harrassowitz Verlag.
- Dinnsen, Daniel A. & Jan Charles-Luce. 1984. "Phonological neutralization, phonic implementation and individual differences". *Journal of Phonetics* 12.49-60.
- . 1987. "A reanalysis of Catalan devoicing". *Journal of Phonetics* 15.187-90.
- Duběda, Tomáš. 2005. *Jazyky a jejich zvuky – univerzálie a typologie ve fonetice a fonologii*. Praha: Karolinum.
- Fourakis, Marios & Gregory K. Iverson. 1984. "On the 'incomplete neutralization' of German final obstruents". *Phonetica* 41.140-9.
- Frinta, Antonín. 1909. *Novočeská výslovnost*. Praha: Česká Akademie císaře Františka Josefa pro vědy, slovenost a umění.
- Hála, Bohuslav. 1956. *Slabika, její podstata a vývoj*. Praha: Nakladatelství Československé akademie věd.
- . 1960. *Fonetické obrazy hlásek*. Praha: Státní pedagogické nakladatelství.
- . 1962. *Uvedení do fonetiky češtiny na obecně fonetickém základě*. Praha: Nakladatelství Československé akademie věd.
- (dir.). [1957₁] 1967₂. *Výslovnost spisovné češtiny I*. Praha: Academia.
- Hervey, Sándor G. J. 1972. "Mulder's 'axiomatic' linguistics". *Lingua* 28.348-79.
- . 1978. "On the extrapolation of phonological forms". *Lingua* 45.37-63.
- . 1984. "Phoneme-tables revisited". *La Linguistique* 20:2.133-43.
- . 1994. "Functionalism, Axiomatic". *The Encyclopedia of Language and Linguistics*, Vol. III. (eds. Ronald E. Asher & J. M. Y. Simpson), 1338-40. Oxford – New York: Pergamon Press.
- Heselwood, Barry. 2007. "Schwa and the phonotactics of RP English". *Transactions of the Philological Society* 105:2.148-87-
- . 2008. "Simultaneous phonemes in English". *Linguistica* ONLINE, <<http://www.phil.muni.cz/linguistica/art/heselwood/hes-001.pdf>>.

- Horálek, Karel. 1986. "Fonologie". *Mluvnice češtiny I* (dir. Jan Petr), 107-71. Praha: Academia.
- Hůrková, Jiřina. 1995. *Česká výslovnostní norma*. Praha: Scientia.
- Jakobson, Roman & Morris Halle. 1956. *Fundamentals of Language*. 'S-Gravenhage: Mouton & Co.
- Jassem, Wiktor & Lutosława Richter. 1989. "Neutralization of voicing in Polish obstruents". *Journal of Phonetics* 17.317-25.
- Krčmová, Marie. 2006. *Úvod do fonetiky a fonologie pro bohemisty*. Ostrava: Ostravská univerzita v Ostravě.
- Kučera, Henry. 1961. *The Phonology of Czech*. 's-Gravenhage: Mouton & Co.
- Lehiste, Ilse. 1965. "Juncture". *Proceedings of the Fifth International Congress of Phonetic Sciences* (eds.), 172-200. Basel – New York: S. Karger.
- Leška, Oldřich. 1972. "O souhláskových 'vznikových alternacích' v češtině". *Slovo a slovesnost* 33.84-5.
- Martinet, André. 1956. *La description phonologique avec application au parler franco-provençal d'Hauteville (Savoie)*. Genève/Paris: Librairie Droz.
- . [1957] 1965. "Substance phonique et traits distinctifs". *La linguistique synchronique* (ed. André Martinet), 124-40. Paris: Presses universitaires de France. (Previously published in *Bulletin de la Société Linguistique de Paris* 53 (1957), 72-85.)
- . [1939] 1965. "Un ou deux phonèmes". *La linguistique synchronique* (ed. André Martinet), 109-23. Paris: Presses universitaires de France. (Previously published in *Acta Linguistica* 1 (1939), 94-103.)
- Mascaró, Joan. 1987. "Underlying voicing recovability of finally devoiced obstruents in Catalan". *Journal of Phonetics* 15.183-6.
- Mathesius, Vilém. 1931. "O výrazové platnosti některých českých skupin hláskových". *Naše řeč* 15.38-40.
- McCalla, Kim I. 1983. "On distinctive features and phoneme tables, with special reference to the English consonants". *La Linguistique* 19:1.55-70.
- Mulder, Jan W. F. 1968. *Sets and Relations in Phonology: An axiomatic approach to the description of speech*. Oxford: Clarendon Press.

- . 1975. "Linguistic theory, linguistic description and the speech phenomena". *La Linguistique* 11:1.87-104.
- . 1978. "Phonemes tables and the functional principle". *La Linguistique* 14:1.3-27. (Reprinted in Mulder & Hervey 1980: 104-21.)
- . 1987. "Effective methodology and effective phonological description". *La Linguistique* 23:2.19-42.
- . 1989. *Foundations of Axiomatic Linguistics*. Berlin – New York: Mouton de Gruyter.
- . 1998. "Epistemology and linguistics". *Productivity and Creativity: studies in general linguistics in honour of E. M. Uhlenbeck* (ed. Mark Janse), 115-60. Berlin: Mouton de Gruyter.
- . 1993. "Negativism as an effective methodology in linguistic description". *Linguistics and philosophy. The controversial interface* (eds. Rom Harré & Roy Harris), 179-97. Oxford – New York – Seoul – Tokyo: Pergamon Press.
- . 1996. "Methodology and description". *La Linguistique* 32:1.17-34.
- Mulder, Jan W. F. & Sándor G. J. Hervey. 1980. *The Strategy of Linguistics*. Edinburgh: Scottish Academic Press.
- Mulder, Jan W. F. & H. A. Hurren. 1968. "The English vowel-phonemes from a functionalist point of view, and a statement of their distribution". *La Linguistique* 1.43-60.
- Novotná, Jiřina. 1962. "K přepisu zvukové podoby některých hláskových skupin v češtině". *Naše řeč* 45.82-7.
- Palková, Zdena. 1997₂. *Fonetika a fonologie češtiny*. Praha: Karolinum.
- Port, Robert F. & Michael L. O'Dell. 1985. "Neutralization of syllable-final voicing in German". *Journal of Phonetics* 13.455-71.
- Port, Robert & Penny Crawford. 1989. "Incomplete neutralization and pragmatics in German". *Journal of Phonetics* 17.257-82.
- Romportl, Milan. 1973a. "Ř und das tschechische Konsonantensystem". *Studies in Phonetics*, 84-104.
- . 1973b. "On the Czech system of consonants". *Studies in Phonetics*, 105-17. Praha: Academia.
- Romportl, Milan (dir.). 1978. *Výslovnost spisovné češtiny*. Praha. Academia.
- de Saussure, Ferdinand. 1931₃. *Cours de linguistique générale*. Paris: Payot.

- Slowiaczek, Louisa M. & Daniel A. Dinnsen. 1985. "On the neutralizing status of Polish word-final devoicing". *Journal of Phonetics* 13.325-41.
- Slowiaczek, Louisa M. & Helena J. Szymanska. 1989. "Perception of word-final devoicing in Polish". *Journal of Phonetics* 17.205-12.
- Studenovský, David & Jindřich Trpák. 2004. "The duration of the Czech diphthong [ou̯] in comparison with vowel-vowel sequences". *Acta Universitatis Carolinae – Phonetica Pragensia* X.69.77.
- Šefčík, Ondřej. [2004] 2005. "Alternace konsonantů v češtině – fonotaktické a morfonologické modelování systému". *Linguistica* ONLINE, <<http://www.phil.muni.cz/linguistica/art/sefcik/sef-007.pdf>>. (Previously published in *Čeština – univerzália a špecifika* 5 (2004), 441-7.)
- . 2007. "K využití metriky ve fonologii". *Sborník prací filozofické fakulty brněnské univerzity A* 55.19-25.
- Trávníček, František. [1949₁] 1951. *Mluvnice spisovné češtiny I*. Praha: Melantrich.
- Trnka, Bohuslav. 1966a. "The distribution of vowel length and its frequency in Czech". *Prague Studies in Mathematical Linguistics* 1.11-6.
- . 1966b. *A Phonological Analysis of Present-Day Standard English* (Revised new edition). Tokyo: Hokuou Publishing Co.
- Trubetzkoy, Nikolai S. 1939. *Grundzüge der phonologie* (= *Travaux du Cercle Linguistique de Prague* 7). Prague: Jednota československých matematiků a fysiků.
- Vachek, Josef. 1968. *Dynamika fonologického systému současné spisovné češtiny*. Praha: Academia.
- . 2003. *Lingvistický slovník pražské školy*. Praha: Karolinum. (Czech edition of *Dictionnaire de linguistique de l'École de Prague* (1960))
- Walter, Henriette. 1982. "Pourquo des tableaux phonologique?". *La Linguistique* 18:2.21-31.
- Warner, Natasha, Allard Jongman, Joan Sereno & Rachèl Kemps. 2004. "Incomplete neutralization and other sub-phonemic durational differences in production and perception: evidence from Dutch". *Journal of Phonetics* 32.251-76.