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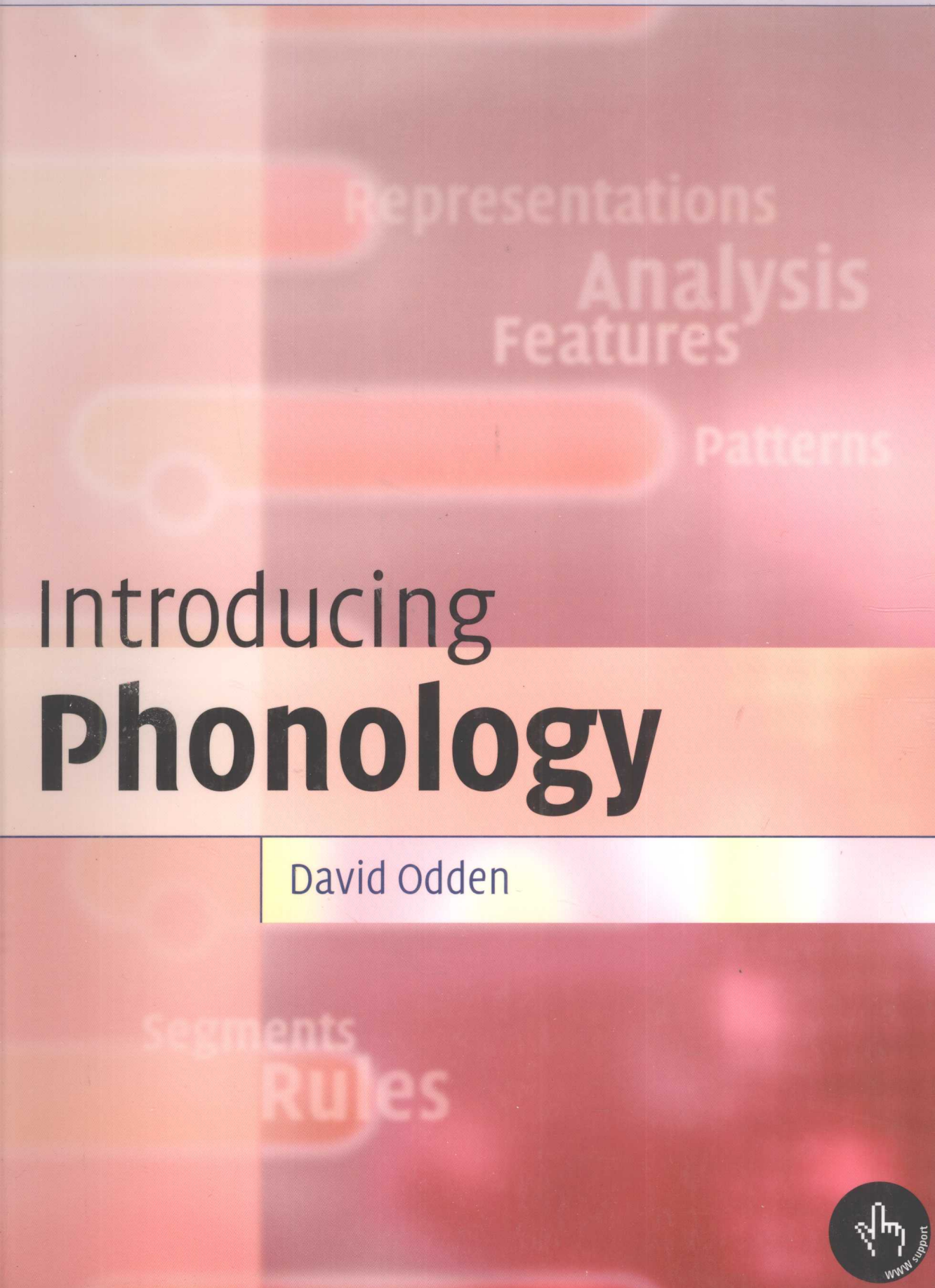

Introducing Phonology

David Odden

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About this book

This is an introductory textbook on phonological analysis, and does not assume any prior exposure to phonological concepts. The core of the book is intended to be used in a first course in phonology, and the chapters which focus specifically on analysis can easily be covered during a ten-week quarter. Insofar as it is a textbook in phonology, it is not a textbook in phonetics (though it does include the minimum coverage of phonetics required to do basic phonology), and if used in a combined phonetics and phonology course, a supplement to cover more details of acoustics, anatomy and articulation should be sought: Ladefoged 2001a would be an appropriate phonetics companion in such a course.

The main emphasis of this book is developing the foundational skills needed to analyze phonological data, especially systems of phonological alternations. For this reason, there is significantly less emphasis on presenting the various theoretical positions which phonologists have taken over the years. Theory cannot be entirely avoided, indeed it is impossible to state generalizations about a particular language without a theory which gives you a basis for postulating general rules. The very question of what the raw data are must be interpreted in the context of a theory, thus analysis needs theory. Equally, theories are formal models which impose structure on data – theories are theories *about* data – so theories need data, hence analysis. The theoretical issues that are discussed herein are chosen because they represent issues which have come up many times in phonology, because they are fundamental issues, and especially because they allow exploration of the deeper philosophical issues involved in theory construction and testing.

Acknowledgments

A number of colleagues have read and commented on versions of this book. I would like to thank Lee Bickmore, Patrik Bye, Chet Creider, Lisa Dobrin, Kathleen Currie Hall, Sharon Hargus, Tsan Huang, Beth Hume, Keith Johnson, Ellen Kaisse, Susannah Levi, Marcelino Liphola, Mary Paster, Charles Reiss, Richard Wright, and especially Mary Bradshaw for their valuable comments on earlier drafts. Andrew Winnard and Juliet Davis-Berry have also provided valuable comments during the stage of final revisions, and Heather Curtis provided assistance in the production of the drawings. I would also like to thank students at the University of Western Ontario, University of Washington, University of Tromsø, Ohio State University, Kyungpook National University, Concordia University, and the 2003 *LSA Summer Institute at MSU*, for serving as a sounding board for various parts of this book.

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Finally, I would like to acknowledge my debt to authors of various source books, in particular Whitley 1978, Halle and Clements 1983, and especially Kenstowicz and Kisseberth 1979.

A note on languages

The languages which provided data for this book are listed below. The name of the language is given, followed by the genetic affiliation and location of the language, finally the source of the data ("FN" indicates that the data come from my own field notes). Genetic affiliation typically gives the lowest level of the language tree which is likely to be widely known, so Bantu languages will be cited as "Bantu," and Tiv will be cited as "Benue-Congo," even though "Bantu" is a part of Benue-Congo and "Tiv" is a specific language in the Tivoid group of the Southern languages in Bantoid. Locations will generally list one country but sometimes more; since language boundaries rarely respect national boundaries, it is to be understood that the listed country (or countries) is the primary location where the language is spoken, especially the particular dialect used; or this may be the country the language historically originates from (the Yiddish-speaking population of the US appears to be larger than that of any one country in Eastern Europe, due to recent population movements).

Akan [Volta-Congo; Ghana]: Dolphyne 1988; Charles Marfo p.c.

Amharic [Semitic; Ethiopia]: Whitley 1978; Grover Hudson p.c.

Angas [Chadic; Nigeria]: FN.

Arabela [Zaparoan; Peru]: Rich 1963.

Aramaic (Azerbaijani) [Semitic; Azerbaijan]: Hoberman 1988.

Araucanian [Araucanian; Argentina, Chile]: Echeverría and Contreras 1965; Hayes 1995.

Armenian [Indo-European; Armenia, Iran, Turkey]: Vaux 1998 and p.c.

Axininca Campa [Arawakan; Peru]: Payne 1981 and p.c.

Bedouin Hijazi Arabic [Semitic; Saudi Arabia]: Al-Mozainy 1981 and p.c.

Bukusu [Bantu; Kenya]: Nasiombe Mutonyi p.c.

Catalan [Romance; Spain]: Lleo 1970, Kenstowicz and Kisseberth 1979; Wheeler 1979; Hualde 1992.

Chamorro [Austronesian; Guam]. Topping 1968; Topping and Dungca 1973; Kenstowicz and Kisseberth 1979; Chung 1983.

Chukchi [Chukotko-Kamchatkan; Russia]: Krauss 1981.

Digo [Bantu; Kenya and Tanzania]: Kisseberth 1984.

Efik [Benue-Congo; Nigeria]: FN.

Eggon [Benue-Congo; Nigeria]: Ladefoged and Maddieson 1996.

Evenki [Tungusic; Russia]: Konstantinova 1964; Nedjalkov 1997; Bulatova and Grenoble 1999.

Ewe (Anlo) [Volta-Congo; Benin]: Clements 1978.

Farsi [Indo-European; Iran]: Obolensky, Panah and Nouri 1963; Cowan and Rakušan 1998.

Finnish. [Uralic; Finland, Russia]: Whitney 1956; Lehtinen 1963; Anders Holmberg p.c.

Fula [West Atlantic; West Africa]: Paradis 1992.

Gã [Volta-Congo; Ghana]: FN in collaboration with Mary Paster.

Luganda [Bantu; Uganda]: Cole 1967; Snoxall 1967.

Gen [Kwa; Togo]: FN.

Greek [Indo-European; Greece]: Georgios Tserdanelis p.c.

Hebrew [Semitic; Israel]: Kenstowicz and Kisseberth 1979.

Hehe [Bantu; Tanzania]: FN in collaboration with Mary Odden.

Holoholo [Bantu; Congo]: Coupez 1955.

Hungarian [Uralic; Hungary]: Vago 1980, Kenesei, Vago and Fenyvesi 1998, 2000.

Icelandic [Germanic; Iceland]: Einarsson 1945; Jónsson 1966; Oresnik 1985.

Japanese [Japanese; Japan]: Martin 1975.

Jita [Bantu; Tanzania]: Downing 1996.

Kamba [Bantu; Kenya]: FN in collaboration with Ruth Roberts-Kohno.

Karok [Hokan; USA]; Bright 1957, Kenstowicz and Kisseberth 1979.
Keley-i [Austronesian; Phillipines]: Kenstowicz and Kisseberth 1979; Lou Hohulin p.c.
Kenyang [Bantu; Cameroun]: FN.
Kera [Chadic; Chad]: Ebert 1975; Kenstowicz and Kisseberth 1979.
Kerewe [Bantu; Tanzania]: FN.
Kikuyu [Bantu; Kenya]: Clements 1984.
Kimatuumbi [Bantu; Tanzania]: FN.
Kipsigis [Nilotic; Kenya]: FN.
Klamath [Penutian; USA]: Barker 1963, 1964.
Koasati [Muskogean; Louisiana]: Kimball 1991.
Kolami [Dravidian; India]: Emeneau 1961.
Korean [Korean; Korea]: Martin 1992; Younghee Chung, Noju Kim and Misun Seo p.c.
Koromfe [Gur; Bourkina Fasso]: Rennison 1997.
Kotoko [Chadic; Cameroun]: FN.
Krachi [Kwa; Ghana]: Snider 1990.
Kuria [Bantu; Kenya]: FN.
Lamba [Bantu; Zambia]: Doke 1938, Kenstowicz and Kisseberth 1979.
Lardil [Pama-Nyungan; Australia]: Klokeid 1976.
Latin [Indo-European; Italy]: Allen and Greenough 1983; Hale and Buck 1966.
Lithuanian [Indo-European; Lithuania]: Dambriunas et al. 1966; Ambrazas 1997; Mathiassen 1996.
Lomongo [Bantu; Congo]: Hulstaert 1961.
Lulubo [Nilo-Saharan; Sudan]: Andersen 1987.
Makonde [Bantu; Mozambique]: Marcelino Liphola p.c.
Maltese [Semitic; Malta]: Aquilina 1965; Borg and Azzopardi-Alexandre 1997; Brame 1972; Hume 1996.
Manipuri [Sino-Tibetan; India, Myanmar, Bangaladesh]: Bhat and Ningomba 1997.
Maranungku [Australian: Australia]: Tryon 1970; Hayes 1995.
Margyi [Chadic; Nigeria]: Hoffmann 1963.
Mende [Mande; Liberia, Sierra Leone]: Leben 1978.
Mixtec [Mixtecan; Mexico]: Pike 1948; Goldsmith 1990.
Mohawk [Hokan; USA]: Postal 1968; Beatty 1974; Michelson 1988 and p.c.
Mongolian [Altaic; Mongolia]: Hangin 1968.
Nkore [Bantu; Uganda]: FN in collaboration with Robert Poletto.
Norwegian [Germanic; Norway]: Ove Lorentz p.c.
Osage [Siouan; Oklahoma]: Gleason 1955.
Ossetic [Indo-European; Georgia, Russia]: Abaev 1964; Whitley 1978.
Palauan [Austronesian; Palau]: Josephs 1975; Flora 1974.
Polish [Slavic; Poland]: Kenstowicz and Kisseberth 1979.
Quechua (Cuzco) [Quechua; Peru]: Bills et al. 1969; Cusihuamán 1976, 1978.
Saami [Uralic; Sápmi (Norway, Sweden, Finland, Russia)]: FN in collaboration with Curt Rice and Berit Anne Bals.
Sakha (Yakhut) [Altaic; Russia]: Krueger 1962; Nadezhda Vinokurova p.c.
Samoan [Austronesian; Samoa]: Milner 1966.
Serbo-Croatian [Slavic; Yugoslavia] Kenstowicz and Kisseberth 1979; Wayles Browne, Svetlana Godjevac and Andrea Sims p.c.
Setswana [Bantu; Botswana]: Cole 1955, Snyman, Shole and Le Roux 1990.
Shambaa [Bantu; Tanzania]: FN.
Shona [Bantu; Zimbabwe]: FN.
Swati [Bantu; Swaziland]: FN.
Slave [Athapaskan; Canada]. Rice 1989.
Slovak [Slavic; Slovakia]: Kenstowicz 1972; Rubach 1993.
Somali [Cushitic; Somalia]: Andrzejewski 1964; Kenstowicz 1994; Saeed 1993, 1999
Sundanese [Austronesian; Indonesia]: FN.
Syrian Arabic [Semitic; Syria]: Cowell 1964.
Tera [Chadic; Nigeria]: Newman.
Thai [Daic; Thailand]: Halle and Clements 1983.
Tibetan [Sino-Tibetan; Tibet]: FN.
Tiv [Benue-Congo; Nigeria]: Arnott 1964; Goldsmith 1976.
Tohono 'O'odham (Papago) [Uto-Aztecan; USA]: Saxton 1963, Saxton and Saxton 1969, Whitley 1978.
Tonkawa [Coahuiltecan; USA]: Hoijer 1933.
Turkish [Altaic; Turkey] Lees 1961, Foster 1969, Halle and Clements 1983.
Ukrainian (Sadžava, Standard) [Slavic; Ukraine]: Carlton 1971; Kenstowicz and Kisseberth 1979; Press and Pugh 1994 (Standard); Popova 1972 (Sadžava).

Vata [Kru; Côte d'Ivoire]: Kaye 1982.
Votic [Uralic; Russia]: Ariste 1968.
Warao [Warao; Venezuela] Osborn 1966, Hayes 1995.
Weri [Goilalan: New Guinea]: Boxwell and Boxwell 1966; Hayes 1995.
Wintu [Penutian; USA]: Pitkin 1984.
Woleaian [Austronesia; Micronesia]: Sohn 1975.
Yawelmani [Penutian; USA]: Newman 1944; Kenstowicz and Kisseberth 1979.
Yekhee (Etsako) [Edoid; Nigeria]: Elimelech 1978.
Yiddish [Germanic; Eastern Europe]: Neil Jacobs p.c.
Yoruba [Kwa; Nigeria]: Akinlabi 1984.

Abbreviations

abl	ablative
acc	accusative
ant	anterior
ATR	advanced tongue root
bk	back
c.g.	constricted glottis
cl	class
cons	consonantal
cont	continuant
cor	coronal
dat	dative
dB	decibel
del.rel	delayed release
dim	diminutive
distr	distributed
e.o.	each other
fem	feminine
gen	genitive
hi	high
Hz	Hertz
imp	imperative
intr	intransitive
lat	lateral
lo	low
loc	locative
masc	masculine
ms(c)	millisecond
nas	nasal
neut	neuter
nom	nominative
obj	object
pl	plural
poss	possessive
pres	present
rd	round
sg, sing	singular
s.g.	spread glottis
son	sonorant
sp	species
strid	strident
syl	syllabic
tns	tense
tr	transitive
vcd	voiced
vcls	voiceless
voi	voice
1	first person
2	second person
3	third person

Contents

CHAPTER

1 What is phonology?

PREVIEW

KEY TERMS

sound
symbol
transcription
grammar
continuous nature of speech
accuracy

This chapter introduces phonology, the study of the sound systems of language. Its key objective is to:

- introduce the notion of phonological rule
- explain the nature of sound as a physical phenomenon
- highlight the tradeoff between accuracy and usefulness in representing sound
- distinguish between phonetics and phonology
- contrast the continuous and discrete aspects of linguistic sounds
- introduce the notion of "sound as cognitive symbol"

Phonology is one of the core fields that composes the discipline of linguistics, which is defined as the scientific study of language structure. One way to understand what the subject matter of phonology is, is to contrast it with other fields within linguistics. A very brief explanation is that phonology is the study of sound structure in language, which is different from the study of sentence structure (syntax) or word structure (morphology), or how languages change over time (historical linguistics). This definition is very simple, and also inadequate. An important feature of the structure of a sentence is how it is pronounced – its sound structure. The pronunciation of a given word is also a fundamental part of the structure of the word. And certainly the principles of pronunciation in a language are subject to change over time. So the study of phonology eventually touches on other domains of linguistics.

An important question is how phonology differs from the closely related discipline of phonetics. Making a principled separation between phonetics and phonology is difficult – just as it is difficult to make a principled separation between physics and chemistry, or sociology and anthropology. A common characterization of the difference between phonetics and phonology is that phonetics deals with "actual" physical sounds as they are manifested in human speech, and concentrates on acoustic waveforms, formant values, measurements of duration measured in milliseconds, of amplitude and frequency, or in the physical principles underlying the production of sounds, which involves the study of resonances and the study of the muscles and other articulatory structures used to produce physical sounds. On the other hand, phonology, it is said, is an abstract cognitive system dealing with rules in a mental grammar: principles of subconscious "thought" as they relate to language sound. Yet once we look into the central questions of phonology in greater depth, we will find that the boundaries between the disciplines of phonetics and phonology are not entirely clear-cut. As research in both of these fields has progressed, it has become apparent that a better understanding of many issues in phonology requires that you bring phonetics into consideration, just as a phonological analysis is a prerequisite for any phonetic study of language.

1.1 Concerns of phonology

As a step towards understanding what phonology is, and especially how it differs from phonetics, we will consider some specific aspects of sound structure that would be part of a phonological analysis. The point which is most important to appreciate at this moment is that the "sounds" which phonology is concerned with are symbolic sounds – they are cognitive abstractions, which represent but are not the same as physical sounds.

The sounds of a language. One aspect of phonology considers what the "sounds" of a language are. We would want to take note in a description

of the phonology of English that we lack a particular vowel that exists in German in words like *schön* 'beautiful,' a vowel which is also found in French (spelled *eu*, as in *jeune* 'young'), or Norwegian (*øl* 'beer'). Similarly, the consonant spelled *th* in English *thing*, *path* does exist in English (as well as in Icelandic where it is spelled with the letter *þ*, or Modern Greek where it is spelled with *θ*, or Saami where it is spelled *ŧ*), but this sound does not occur in German or French, and it is not used in Latin American Spanish, although it does occur in Continental Spanish in words such as *cerveza* 'beer,' where by the spelling conventions of Spanish, the letters *c* and *z* represent the same sound as the one spelled *θ* (in Greek) or *th* (in English).

Rules for combining sounds. Another aspect of language sound which a phonological analysis would take account of is that in any given language, certain combinations of sounds are allowed, but other combinations are systematically impossible. The fact that English has the words *brick*, *break*, *bridge*, *bread* is a clear indication that there is no restriction against having words begin with the consonant sequence *br*; besides these words, one can think of many more words beginning with *br* such as *bribe*, *brow* and so on. Similarly, there are many words which begin with *bl*, such as *blue*, *blatant*, *blast*, *blend*, *blink*, showing that there is no rule against words beginning with *bl*. It is also a fact that there is no word **blick*[1] in English, even though the similar words *blink*, *brick* do exist. The question is, why is there no word **blick* in English? The best explanation for the nonexistence of this word is simply that it is an accidental gap – not every logically possible combination of sounds which follows the rules of English phonology is found as an actual word of the language.

Native speakers of English have the intuition that while *blick* is not actually a word of English, it is a theoretically possible word of English, and such a word might easily enter the language, for example via the introduction of a new brand of detergent. Fifty years ago the English language did not have any word pronounced *bick*, but based on the existence of words like *big* and *pick*, that word would certainly have been included in the set of nonexistent but theoretically allowed words of English. Contemporary English, of course, actually does contain that word – spelled *Bic* – which is a type of pen.

While the nonexistence of *blick* in English is accidental, the exclusion from English of many other imaginable but nonexistent words is based on a principled restriction of the language. While there are words that begin with *sn* like *snake*, *snip* and *snort*, there are no words beginning with *bn*, and thus **bnick*, **bnark*, **bniddle* are not words of English. There simply are no words in English which begin with *bn*. Moreover, native speakers of English have a clear intuition that hypothetical **bnick*, **bnark*, **bniddle* could not be words of English. Similarly, there are no words in English which are pronounced with *pn* at the beginning, a fact which is not only demonstrated by the systematic lack of words such as **pnark*, **pnig*, **pnilge*,

1 The asterisk is used to indicate that a given word is non-existent or wrong.

but also by the fact that the word spelled *pneumonia* which derives from Ancient Greek (a language which does allow such consonant combinations) is pronounced without *p*. A description of the phonology of English would then provide a basis for characterizing such restrictions on sequences of sounds.

Variations in pronunciation. In addition to providing an account of possible versus impossible words in a language, a phonological analysis will explain other general patterns in the pronunciation of words. For example, there is a very general rule of English phonology which dictates that the plural suffix on nouns will be pronounced as [ɨz], represented in spelling as *es*, when the preceding consonant is one of a certain set of consonants including [š] (spelled *sh*) as in bushes, [č] (spelled as *ch*) as in *churches*, and [ǰ] (spelled *j*, *ge*, *dge*) as in *cages*, *bridges*. This pattern of pronunciation is not limited to the plural, so despite the difference in spelling, the possessive suffix *s*[2] is also subject to the same rules of pronunciation: thus, plural *bushes* is pronounced the same as the possessive *bush's*, and plural *churches* is pronounced the same as possessive *church's*.

This is the sense in which phonology is about the sounds of language. From the phonological perspective, a "sound" is a specific unit which combines with other such specific units, and which represent physical sounds.

1.2 Phonetics – what is physical sound?

Phonetics, on the other hand, is about the concrete, instrumentally measurable physical properties and production of these cognitive speech sounds. That being the case, we must ask a very basic question about phonetics (one which we also raise about phonology). Given that phonetics and phonology both study "sound" in language, what *are* sounds, and how does one *represent* the sounds of languages? The question of the physical reality of an object, and how to represent the object, is central in any science. If we have no understanding of the physical reality, we have no way of talking meaningfully about it. Before deciding *how* to represent a sound, we need to first consider *what* a sound is. To answer this question, we will look at two basic aspects of speech sounds as they are studied in phonetics, namely acoustics which is the study of the properties of the physical sound wave that we hear, and articulation, which is the study of how to modify the shape of the vocal tract, thereby producing a certain acoustic output (sound).

1.2.1 Acoustics

A "sound" is a complex pattern of rapid variations in air pressure, traveling from a sound source and striking the ear, which causes a series of neural signals to be received in the brain: this is true of speech, music and random noises.

2 This is the "apostrophe *s*" suffix found in *The child's shoe*, meaning 'the shoe owned by the child.'

Waveforms. A concrete way to visually represent a sound is with an acoustic waveform. A number of computer programs allow one to record sound into a file and display the result on the screen. This means one can visually inspect a representation of the physical pattern of the variation in air pressure. Figure 1 gives the waveforms of a particular instance of the English words *seed* and *Sid*.

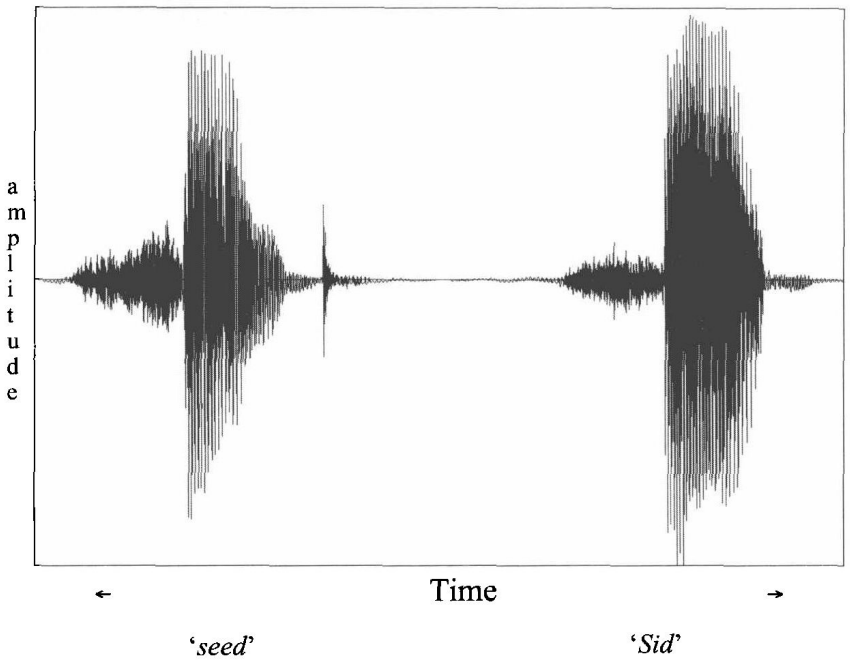

FIGURE 1
Waveforms of speech

The horizontal axis represents time, with the beginning of each word at the left and the end of the word at the right. The vertical axis represents displacement of air particles and correlates with the variations in atmospheric pressure that affect the ear. Positions with little variation from the vertical center of the graph represent smaller displacements of air particles, such as the portion that almost seems to be a straight horizontal line at the right side of each graph. Such minimal displacements from the center correspond to lower amplitude sounds. The portion in the middle where there is much greater vertical movement in the graph indicates that the sound at that point in time has higher amplitude. While such a direct representation of sounds is extremely accurate, it is also fairly uninformative.

The difference between these words lies in their vowels (*ee* versus *i*), which is the part in the middle where the fluctuations in the graph are greatest. It is difficult to see a consistent difference just looking at these pictures – though since these two vowels *are* systematically distinguished in English, it cannot be impossible. It is also very difficult to see similarities looking at actual waveforms. Consider figure 2 which gives different repetitions of these same words by the same speaker.

Absolute accuracy is impossible, both in recording and measurement. Scientific instruments discard information: microphones have limits on what they can capture, as do recording or digitizing devices. Any representation of a sound is a measurement, which is an idealization about an actual physical event.