

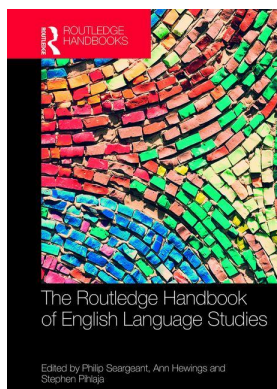
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# The phonology of English

*Robert Fuchs*

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**Keywords:** Phonology, acoustic phonetics, laboratory phonology, pronunciation models, language teaching, World Englishes, English as a Second Language, English as a Foreign Language, variation, diachronic phonology, intelligibility.

## Introduction

This chapter outlines some of the breadth and scope of the study of the phonology of English as well as its practical and social relevance. The definition of phonology adopted here is broad and includes not only the study of the sound system (phonology narrowly defined) but also its phonetic realisation and the production and perception of speech sounds. Some key terms relevant and necessary to the discussion that follows are described briefly in Figure 1. The definitions are partly based on Matthews (2014).

**Approximant:** A consonant that is produced by the articulators (e.g. the tongue) not moving as closely together as in the production of a fricative or plosive.

**FATE vowel:** The vowels of the English language are often referred to as belonging to specific lexical sets, i.e. a set of words including this vowel (a tradition that goes back to Wells 1982). One word from the set is used to refer to the whole set. For example, ‘FATE’ is used to refer to the set of words that include the vowel /eɪ/.

**Fricative:** A consonant that is produced by the articulators moving closer together than in the production of an approximant, but not completely blocking the airstream, as is the case for plosives.

**Plosive:** A consonant that is produced by the articulators moving closely together such that the airstream is completely blocked.

**Coda (of a syllable):** The consonants in a syllable that follow the vowel.

**High vowel:** A vowel that is articulated with the mouth opened to only a small degree (e.g. /i/).

**Front vowel:** A vowel that is articulated with the highest point of the tongue being positioned towards the front of the mouth (e.g. /a/).

**Aspirated:** A plosive that is followed by a short period during which the vocal folds do not vibrate.

The remainder of this section illustrates what implications the study of phonology has for other branches of linguistics as well as its relevance for society in general. The chapter then briefly sketches historical trends in phonology to provide a backdrop to the ensuing discussion of current approaches and key areas of dispute and debate as well as future directions in research on phonology.

### *Theoretical and practical relevance of the study of phonology*

Studying the phonology of English is of interest for both theoretical and practical reasons. Firstly, at an academic level, scholars are in pursuit of a better understanding of the sound system and its articulatory and acoustic realisation. While the phonology of a language can be usefully understood as involving a limited number of discrete phonemes, such as the consonant /r/ or the vowel /i/, the way these phonemes are articulated and their acoustic characteristics can differ drastically. An example of articulatory variation can be found in Scottish English (Schützler 2015), where the consonant /r/ can be realised as a tap or trill produced with the tip of the tongue (sometimes popularly known as a rolled ‘r’) or, alternatively, as an approximant as in standard British or American English (produced by raising the tongue towards the roof of the mouth without touching it). In terms of their physical manifestation, tapped/trilled /r/ and approximant /r/ are completely different sounds, yet speakers of English from all over the British Isles usually face no difficulty in recognising both as instances of the phoneme /r/. On the other hand, there is also acoustic variation, which is particularly noticeable in vowels, chiefly due to the fact that their acoustic characteristics depend in large part on the size of the oral cavity of the speaker, which can differ substantially between individuals. Men tend to have overall larger oral cavities and some acoustic effects of this, such as a deeper voice, are easily noticeable to laypeople. Still, variation between individuals is substantial and also extends to the acoustic make-up of vowels and other phonemes. For example, the acoustic characteristics of the vowel /i/ articulated by two people speaking the same dialect still tend to differ substantially, in a way that is distinct from but has similarities with the difference between a low and a high voice. However, recognising two instances of the vowel /i/ as pertaining to the same phoneme is a challenge that listeners overcome easily in a process that operates below the level of consciousness.

This kind of variation and how listeners deal with it in communication continues to interest researchers on a theoretical level. However, phonological and phonetic variation also has practical consequences. Miscommunication can occur when listeners are not familiar with the phonology of the variety that their interlocutor speaks. For example, in Hong Kong and Singapore English, it is not uncommon to find a merger between the vowels in ‘sheep’ and ‘ship’ (Brown and Deterding 2005; Hung 2000), potentially leading to confusion (on the part of the listener) between any of the large number of minimal pairs involving these two vowels. Apart from such cases of merged phonemes, miscommunication can also arise because the phonetic realisation of a phoneme in one variety does not match that in another. A case in point is the realisation of the FATE vowel in Australian English as [aɪ], giving rise to a well-known joke about an Australian abroad pointing out that they ‘came here to die’ (‘today’).

Apart from variation at the segmental level (i.e. the level of the phoneme), variation at the suprasegmental level (above the level of the phoneme) may also have consequences for communication. Many postcolonial varieties of English are thought to have a tendency towards a syllable-timed rhythm, for example Singapore English (Deterding 2001) and Indian English (Fuchs 2016a). In these varieties, consecutive vowels tend to be less variable in duration and loudness than in British or American English, which are stress-timed. (For a non-technical introduction to speech rhythm, see Fuchs 2014.) It has been argued that for

speakers of such syllable-timed varieties the stress-timed rhythm of British and American English decreases intelligibility (Kirkpatrick et al. 2008: 360). Put differently, a speaker of a syllable-timed variety might likewise find syllable-timed talkers easier to understand than stress-timed talkers.

Another sense in which phonological and phonetic variation transcends the purely theoretical is its social evaluation. Language is a powerful social marker, and we (mostly) subconsciously align our linguistic ‘fingerprint’ with individuals and groups that we feel close to. Over the long run, this process helps speakers express their social identity. This linguistic fingerprint can, in turn, be used by others to interpret our social affiliations. This process can give rise to pleasant occasions, such as when we recognise someone as originating from the same town or village. Nevertheless, the recognition that an interlocutor belongs to a different social or ethnic group can also lead to discrimination. As Squires and Chadwick (2006) found, even as little information as that contained in a single word may suffice. Conducted in the United States, this study showed that African Americans were recognised after saying ‘hello’ over the phone and invited significantly less often to view properties than Caucasian Americans by real-estate agents.

### *Historical perspectives*

The dominant approach in phonology in the early 20th century was structuralism, which regarded language not as consisting merely of distinct, unorganised units (e.g. speech sounds), but viewed these units as belonging to an ordered system. Crucially, these units derive their function from being in opposition to each other. Thus, the English vowel /i/ is characterised by being in opposition to other vowels, e.g. /u/, in that there are minimal pairs that are distinguished by this contrast, e.g. ‘beat’ /bit/ and ‘boot’ /but/. Explaining the historical development of phonology was another important focus of structuralist research (see Salmons and Honeybone 2015). Historical change was described by reference to sound laws, and research also explored structural and functional factors causing sound changes. Thus, a factor contributing to the loss of the fricative /x/, which still existed in Old English, is thought to be the lack of a voiced counterpart. Today, some of the concepts central to the structuralist approach are once again considered to be relevant in finding explanations for phonological change.

However, during a period beginning in the middle of the 20th century, most concepts central to the structuralist approach were eclipsed by a new approach to phonology that broke with many traditional concepts. Phonology in the generative tradition sought to explain the sound system of a language by virtue of deriving its ‘surface’ structure from an underlying or ‘deep’ structure through the application of rules. A well-known example illustrating this concept is the absence of voiced obstruents (plosives such as /d/ and fricatives such as /z/) in the syllable coda in several languages such as German and Polish. Nevertheless, simply stating that voiced obstruents do not occur in syllable codas in these languages fails to account for an alternation between voiced and voiceless obstruents in cases such as German ‘Hund’ /hʊnt/ (‘dog’) and ‘Hunde’ /ˈhʊndə/ (‘dogs’), where in the latter the consonant in question gets resyllabified and assigned to the onset of the syllable that includes the plural morpheme. Generative phonology accounts for such alternations by positing an underlying or deep phonological structure, from which the surface structure is derived through the application of rules. Thus, the surface form /hʊnt/ can be derived from the underlying /hʊnd/ by application of a rule that devoices voiced coda obstruents. Meanwhile, the plural /ˈhʊndə/ can be derived through the addition of the plural morpheme, so that the rule prohibiting voiced coda obstruents is not applicable since /d/ is now the onset of the second syllable.

While generative phonology as initially conceived is rarely practised any more, it gave rise to a plethora of frameworks often collectively referred to as ‘formal’ approaches to phonology. A particularly popular one is Optimality Theory, where the derivation of surface forms is resolved through a constraint-based selection of the optimal output among several candidates. Constraints can be understood as requirements imposed on the surface form. While they can be violated, they are ordered hierarchically, with violations of higher-ranked constraints being considered more severe. In addition, a particular group of constraints demands faithfulness to the underlying form, for example, in terms of features such as voicing. In the previous example, a ‘no voiced coda obstruent’ constraint would have to be ranked higher than a ‘faithfulness in voicing’ constraint so as to lead to /hʌnt/ winning out over /hɒnd/ for the singular ‘dog’.

### Current approaches and critical issues

Despite all their differences, what the approaches briefly described in the previous section have in common is that most research within these frameworks is based on empirical evidence that comes either from introspection (such as when a native speaker of German states that /hɒnd/ is not a permissible phonological string in this language, but /hʌnt/ is) or from simple observation of speakers without the help of any analysis of the acoustic signal. The latter is also called impressionistic analysis, a term that, despite its seemingly negative connotation, is usually used in a neutral way.

The alternative to the impressionistic method is instrumental or acoustic analysis, that is, the analysis of the physical properties of human speech with the help of specialised technology. When desktop computers became widely available in the 1990s, they not only enabled linguists to analyse large amounts of data on the syntax and lexis of human languages through the compilation of corpora, but also provided computing power for the analysis of human speech. Previously, the equipment required for this kind of research was not in widespread use in linguistics departments (although there certainly were exceptions), and a considerable amount of the work in this area came from the field of electrical engineering and telecommunications companies. While both continue to contribute to acoustic phonetics, the computing power available today has led to the spread of instrumental phonetics also among English linguists and philologists, and its use can be taught from the undergraduate level.

The basis of acoustic phonetics is an awareness of speech as a physical entity, consisting of variations in (air) pressure, or sound waves. Many of these sound waves are periodic in a way that is similar to the recurrent movement of a swinging pendulum. Intonation, for example, is realised through the vibration of the vocal folds, where fast vibration gives rise to high pitch and slow vibration to low pitch. In English, questions commonly end in high pitch and declarative sentences in low pitch. However, due to ongoing language change over the last decades, more and more speakers end some of their declarative sentences in high pitch, a phenomenon formally known as high rising terminals. More informally, it used to be called ‘Valley girl talk’, due to its origins among young female Californians, but has since spread to speakers of either gender in many native varieties of English (Britain 1992; Fletcher and Harrington 2001). Another periodic element of human speech is found in vowels and certain consonants (nasals and approximants). The complex signal of these periodic sounds can be decomposed into simpler components to yield a frequency profile for a particular segment. These profiles show that certain areas in the frequency spectrum are louder (i.e. have more energy) than others. Areas of high energy are called formants, and the first three of these are sufficient to distinguish vowel, nasal and approximant phonemes from each other.

Although it can make the research process more time-consuming, what makes acoustic phonetics arguably superior to impressionistic phonetics for many research questions is its objectivity. Acoustic measurements of a single sound can be repeated by several investigators and will generally lead to the same result, which is not necessarily the case with impressionistic phonetics. Moreover, acoustic analyses allow more fine-grained measures. For example, in modern British English and a number of other varieties, /l/ in codas (such as in ‘hold’) is sometimes not realised as [l], but as a vowel, a phenomenon known as l-vocalisation (Johnson and Britain 2007). While in some instances it may be easy to impressionistically categorise individual pronunciations as vocalised or not, in many cases a firm decision might be difficult. Acoustic measurements can resolve this, and can arrive at intermediate categorisations, thus placing a specific pronunciation somewhere along the continuum from fully vocalised to fully consonantal. Extending the analysis to measurements of several words and speakers, one could also ask whether other factors play a role, such as phonological context (Is l-vocalisation more pronounced/frequent after certain vowels?) or word frequency (Is l-vocalisation more pronounced/frequent in common words?) Eventually, an analyst may then rank speakers according to how frequently and strongly they vocalise their /l/s, and whether, say, younger speakers use this feature more consistently than older speakers, which could be an indicator of ongoing language change.

Acoustic measurements can also help researchers shed light on questions such as the merger between the vowels in words such as ‘ship’ and ‘sheep’ in varieties like Singapore and Hong Kong English (Deterding 2003; Sung 2015). This contrast is sometimes referred to as involving a short (‘ship’) and long vowel (‘sheep’), but in fact the acoustic basis of the contrast in British and American English is both one of vowel quantity (the vowel has a longer duration in ‘sheep’ than in ‘ship’) and vowel quality (the vowel is higher and more front in ‘sheep’ than in ‘ship’). Gathering reliable data on these two dimensions would be next to impossible with impressionistic methods. An acoustic phonetics approach, on the other hand, allows researchers to gather reproducible and quantitative data that can be subjected to statistical analysis in order to determine whether speakers of Singapore and Hong Kong English distinguish these vowels in terms of quantity and/or quality, or, alternatively, whether they are merged. Further, just as with the example of l-vocalisation discussed above, one might also ask whether these varieties are homogeneous in this respect, or whether the phenomenon under study is sensitive to factors such as exposure to English during childhood and education or socioeconomic background.

These examples illustrate how phonetic measurements (e.g. the duration and quality of the vowels in ‘sheep’ and ‘ship’) can shed light on phonological questions (whether these vowels are merged or maintained as separate phonemes). This approach is sometimes called laboratory phonology, and, more narrowly defined, associated with the *Journal of Laboratory Phonology* and an eponymous conference series. More broadly, much of the research published in leading phonetics journals such as the *Journal of Phonetics* and the *Journal of the Acoustical Society of America* operate within the same paradigm, as does most of the phonetic research published in journals concerned with the English language, such as *English Language & Linguistics*, *English World-Wide* and *World Englishes*. Laboratory phonology is characterised by the use of ‘laboratory methods to discover and explain the sound structure of human language’ and views language as ‘a phenomenon of nature’, which explicitly includes the social relevance of language (Pierrehumbert et al. 2000: 274), in contrast to the formal methods described earlier. In addition to studying the production of speech, laboratory phonology also encompasses the study of how speech is perceived.

Research based on this framework relies on a body of data, often audio recordings, and this data is sometimes gathered specifically for a single study. However, for well-researched

languages such as English, it increasingly also comes from phonological corpora. Nevertheless, most corpora of natural language, in so far as they include spoken language, still only comprise an orthographic transcription of speech. The principal reasons for this are logistical and practical. A written corpus of several million words takes up, by today's standards, negligible amounts of disk space. By comparison, digital audio recordings of several million words of speech were until recently difficult to ship and store on standard computer equipment. This is because good quality audio data takes up large amounts of disk space. How much exactly depends on specific parameters, but with commonly used settings one minute of audio data takes up 10 MB, or 600 MB per hour (44.1 kHz, 32-bit, mono). A moderately sized corpus can comprise more than 100 hours of speech.

Reducing file sizes by compressing audio data with codecs such as mp3 is inadvisable for acoustic analysis since the compression process invariably involves loss of information. At higher bit rates (that is, retaining a better quality, implying larger files) it may be difficult to auditorily discern the difference between original and compressed files, but some acoustic information is invariably lost, which may affect the analysis. If the data is for some reason only available in a compressed format, results of acoustic analyses may still be reliable, but have to be interpreted with care (Fuchs and Maxwell 2016). If possible, lossy compression codecs such as mp3 should be avoided. Consequently, phonological corpora typically consist of uncompressed audio (as well as some level of annotation, e.g. a phonemic transcription that is time-aligned with the audio recordings) and an increasing number of such corpora is becoming available to researchers.

As this section has shown, acoustic analysis provides an empirical basis for the study of phonology. The following section will discuss how this approach currently impacts key areas of dispute and debate in research on World Englishes, pronunciation models and language teaching.

## Key areas of dispute and debate

### *Phonological variation in World Englishes*

English is currently the most widely spoken second language (see Pecorari, this volume). Its rise as the world's Lingua Franca is in large part due to a prolonged period of British colonial activity and the subsequent domination of the world economy first by the United Kingdom and later the United States of America. While the status of English as a Lingua Franca would suggest that its use mainly occurs when people from different countries interact, many former colonies have retained English for internal use, and in many of these countries it continues to be used alongside local languages (see Schneider, this volume). The geographical separation from the British mainland and the fact that the local population learnt English mostly as a second language led to the emergence of new varieties of English in these territories. Varieties spoken in these countries belong to what Kachru (1985) called the Outer Circle, whereas those spoken in countries where English is a native language for most of the population belong to the Inner Circle. Alternatively, Outer Circle varieties are also sometimes known as World Englishes or New Englishes (see Bolton, this volume). These varieties differ from each other and from British English, and such differences can be found on all levels of the language system, including pragmatics, syntax, lexis and phonology. It may be difficult to determine in any formal way whether differences on any of these levels are greater than on the others. Nevertheless, phonological differences are likely to play a major role. A case in point is that, on the acrolectal level (the subvariety used by educated speakers in formal contexts),

syntactic differences are mostly a question of frequency. For example, the present perfect is more common in Indian English than in other varieties (Fuchs 2016b), but it is not completely absent from any acrolectal variety. By contrast, phonological differences abound even on the acrolectal level and may lead to communication breakdown when interlocutors are not familiar with each other's accents (see examples in the introduction).

The study of the phonology of World Englishes poses several theoretical and practical questions. On a theoretical level, there is a need to document the extent of variation and attempt to explain it. On a practical level, the existing variation has implications for international intelligibility and for what standards should be taught in various countries around the globe. These questions will be briefly discussed in turn.

The analysis of phonological variation in World Englishes started out by documenting the phonologies of individual varieties and was mostly of an impressionistic nature. A particularly early example is Bansal (1966/67), who found, for example, that voiceless plosives are unaspirated in all positions in Indian English, as they are in some other languages such as Spanish and French (whereas in British English, they are aspirated in simple onsets such as in 'ton'). Another example is that the phonemes /w/ and /v/ are merged, so that minimal pairs such as 'veal' and 'wheel' are pronounced the same. Impressionistic work continues to the present day. As recently as in 2004, the chapters on phonology in the to date most comprehensive reference work in the field, the *Handbook of Varieties of English* (Schneider and Kortmann 2004), are all based on impressionistic methods or approaches not described in any detail.

Nevertheless, the *Handbook* continues to be a valuable resource, as it provides information on phonological features and makes it easy to compare a large number of varieties. This allows researchers to form a somewhat more holistic picture of the extent of phonological variation in World Englishes. For instance, on the suprasegmental level, most Outer Circle Englishes tend to be syllable-timed, whereas most Inner Circle varieties of English show stress-timing (Fuchs 2016a: 87–96; Mesthrie 2008: 317). On the segmental level, many, though by no means all, Outer Circle varieties realise the GOAT and FACE vowels as the monophthongs [o] and [e] ([e] as in German 'Fehler' and French 'aller', not as in British English 'dress'), whereas many Inner Circle varieties realise these vowels as diphthongs.

As these examples show, there is great potential for more in-depth work based on rigorous methodologies such as acoustic phonetics on the one hand, and work that aims for a more holistic picture of phonological variation in varieties of English on the other. While efforts are being made to achieve these goals, similar initiatives in the area of morphosyntactic variation in varieties of English have arguably advanced further in this direction than research on phonological variation. For example, the electronic *World Atlas of Varieties of English* (eWAVE; Kortmann and Lunkenheimer 2013) contains information on 235 morphosyntactic features in 50 varieties of English and 26 English-based creoles and pidgins in the form of expert judgments (i.e. not empirical analyses). Users of the website can determine easily, for example, how widespread the extension of the progressive to stative verbs is (feature 88), such as in *What are you wanting?* (see also Gut and Fuchs 2013; van Rooy 2014). By contrast, no comparable resource on phonological variation exists.

One reason why research on phonological variation has arguably lagged behind work on morphosyntactic variation in varieties of English is, as argued in the previous section, that databases and corpora providing large amounts of data on various varieties have until recently not been available for phonological research. A case in point is that the *International Corpus of English* (ICE; Greenbaum 1991) contains 1 million words of written and (transcribed) spoken language for each of so far 12 varieties of English, and has become a widely used



resource for work on morphosyntactic and lexical variation. By comparison, the Nigerian component of ICE is the only completed component of the corpus so far to include the audio data of the spoken part of the corpus together with time-aligned transcriptions, which allows researchers to use the corpus for phonological research on this variety (Wunder et al. 2010). However, several of the ICE components that are currently being compiled will include both audio data and time-aligned transcriptions. This data as well as other resources will likely lead to more work on phonological variation across varieties of English, including which factors (such as influence from local languages, status as first or second language variety, geographical distance from Britain) are responsible for what amount and what kind of variation.

### *Pronunciation models*

Even though no complete analysis of this phonological variation exists as yet (and a ‘complete’ analysis may in any case be more of an ideal than a practically attainable goal), the existing evidence makes it clear that the amount of variation is substantial. As the examples discussed in the introduction suggest, this variation may lead to miscommunication or a breakdown in communication. From a practical perspective, this raises the question of how such a breakdown in communication can be avoided. The first section discussed the example of a speaker of Singapore English pronouncing the words ‘ship’ and ‘sheep’ in the same way. One solution to this might appear to be to urge speakers of Singapore English to pronounce these two words differently, perhaps in the way they are pronounced in British or American English. Indeed, many non-linguists might find this option attractive. Their case is bolstered by the fact that British and American English are the most widely used educational models and are by many non-linguists simply regarded as ‘standard’ or ‘good’ English. Even the Singaporean government seemed to agree with this perspective on standard English when (in the year 2000) it launched the ‘Speak Good English Movement’, encouraging Singaporeans to ‘Get it Right’ and ‘Be Understood. Not only in Singapore, Malaysia and Batam’ (Siemund et al. 2014). Thus, Singapore’s government is clearly exonormatively oriented, i.e. it urges Singaporeans to adopt an outside norm instead of a locally based, endonormative standard.

However, the Speak Good English Movement was singularly unsuccessful if measured by any noticeable shift towards British or American English, for which there is no evidence. In fact, some citizens responded by launching the ‘Save Our Singlish Campaign’ (Wee 2005), Singlish being the term used within and outside of Singapore for colloquial Singapore English. The existence of this campaign indicates that at least some Singaporeans do not regard Singapore English as erroneous or British and American English as the only valid ways of speaking English, and instead uphold a local variety.

The question of what standards should be used when teaching English to second and foreign language learners inspired a vigorous debate also among linguists (Kachru 1991; Quirk 1990). As far as the scholarly literature is concerned, one part of the debate has largely been resolved: Few linguists would claim today that British and American English are the only useful norms to be followed in the teaching of English. In Inner Circle countries (where English is used as a native language), a pluricentric approach has won out, whereby the variety that is locally used in formal contexts serves as a model for teaching. These local formal varieties tend to be mutually intelligible (although intelligibility is a subjective notion and also depends on an individual’s prior experience). Local colloquial varieties, on the other hand, diverge much more from each other and are in many cases not mutually intelligible. The local formal variety might be identified, for example, with the way newsreaders speak, whereas a more colloquial variety might be used in a local soap opera (although, as a

broadcast and scripted programme, this might still be more formal than a conversation among friends). Thus, in Inner Circle countries, both policy and practice largely follow endonormative standards.

By contrast, there is a continuing debate over what standards should be used in Outer Circle and Expanding Circle countries where English is used as an institutionalised second language or foreign language respectively. Three different positions can be broadly distinguished. Where an emerging local dialect of English exists, a compromise between exo- and endonormative standards is to teach a local educated standard for local usage and an international standard for international usage (in practice, British English, American English, or a mixture of the two). The latter might be required only for some of the learners of English in Outer Circle countries, since many of them will not use English for international communication. In fact, in a number of countries, such as India, most people who speak English use it rarely or not at all for international communication. This is due to the size of these countries, the importance of English as a national link language, the orientation of a large part of their economies to the local market and the limited means that most people have for international travel.

Another approach consists of focussing teaching on those pronunciation features that most impair international intelligibility (Jenkins 2000; Sewell 2010). Learners of English with the same first language often differ in their pronunciation from British or American English in similar ways, and some of these pronunciation errors are more likely to lead to misunderstandings in communication than others. This is partly due to the fact that the phonemes of the English language differ in frequency. Other things being equal, consistently mispronouncing a frequent phoneme is more likely to impair intelligibility than mispronouncing an infrequent phoneme. An additional criterion that can be used to prioritise goals in pronunciation teaching is ease of learnability, that is, how challenging it is for a learner to overcome a pronunciation error, which again depends in part on a learner's first language.

An approach to pronunciation teaching that is based on international intelligibility is compatible with the needs of both Outer and Expanding Circle contexts. An early example of this approach in an Outer Circle country is Bansal (1966/67), who proposes a modified endonormative Indian English pronunciation standard. More recent work studies contexts where English is used as a Lingua Franca across the Outer and Expanding circles, such as Deterding's (2013) analysis, which focuses on Southeast Asia.

### *Impact on language teaching*

It is difficult to estimate the impact of the recommendations formulated by linguists (for obvious reasons, we cannot compare our world to one where this debate has not taken place), and there is limited research on actual practices applied in pronunciation teaching. The existing research suggests that, in Expanding Circle countries, curricula and teaching practice tend to be relatively conservative and often explicitly or implicitly defer to British English, American English or native pronunciation norms that are not further defined. Intelligibility is accepted as a goal by some teachers (Grau 2005). Textbooks usually focus on communication among native speakers or learners with native speakers, but not Lingua Franca communication among non-native speakers. Some teachers and trainee teachers also tend to favour British or American pronunciation norms and feel that settling for intelligibility as the goal of pronunciation teaching would deprive students of the chance to achieve native-like pronunciation.

In many Outer Circle countries, the situation is more complex. There is a noticeable difference between policy and practice, the former usually being exonormatively oriented, whereas local teachers often speak with a local accent, which they then pass on to their

students. Moreover, local practices appear to depend in part on how much money can be spent on education. Governments in wealthy territories such as Hong Kong and Singapore have set up schemes to invite persons (not necessarily qualified as English teachers) from Inner Circle countries to teach English at local schools and the vigorous private education sector also employs teachers from such countries. While this is officially portrayed as a strategy to attract native speakers (and thus an exonormative policy), private schools, at least, tend to identify native speakers of English with Caucasian-looking people. The source of this prejudice appears to be located not so much among local teachers and principals, but among parents. These take a great interest in and invest substantial amounts of money and effort in the education of their children in the rich and newly industrialised countries of East and Southeast Asia, including Expanding Circle countries, where English is taught as a foreign language.

By contrast, in less wealthy countries such as India, most schools cannot afford to hire English-speaking staff from Inner Circle countries. Thus, students are in practice taught a local standard as they learn the phonology of English from the model of their teachers. However, it is interesting to note that relatively wealthy upper-middle class Indians tend to send their children to expensive English-medium schools that could hire at least some teachers from Inner Circle countries and take other measures to teach exonormative pronunciation norms to their students. In these situations, an emerging endonormative model is adopted that local teachers call a ‘neutral accent’, by which they mean a general Indian English accent whose speakers do not show clear influence from their respective Indian first language. Thus, the practices of this section of the Indian education sector shed light on the increasing acceptance of Indian English because they have the means to adopt an exonormative standard, but clearly choose not to do so. Nevertheless, this is not explicitly acknowledged in official documents by clearly codifying this policy as an explicitly Indian, endonormative standard.

### Future directions

Research on English phonology is a vibrant and changing field, making it particularly challenging to predict how it will develop in the future. Nevertheless, from the current perspective, it seems likely that the following trends will shape the field.

#### *Semi-automatic annotation and corpus phonology*

Now that large amounts of audio data can be stored on affordable computer systems, the present challenge is how more data can be annotated and analysed in ways that reduce the amount of human intervention required. This implies first of all the production of time-aligned phonemic transcriptions, i.e. an annotation of human speech that indicates which phonemes occur in what order, and where they start and end. This very time-consuming process can be partly automated by using a process called forced alignment, which requires as input the audio recording, an orthographic transcription and an acoustic model of the phonology of the language that is automatically generated on previously manually annotated data (Gut and Fuchs 2017). Currently the output of this process still requires checking by human annotators for most applications. If this process can be further automated so that even less manual intervention is required, the amount of data available for phonological analyses could be dramatically increased. The phonetic transcription of human speech can be further (semi)automated if the orthographic transcription that is required for forced alignment can be generated through the use of speech recognition software. The application of this technique is at an earlier stage than that of forced alignment, but experimental services exist, such as

the Bavarian Archive for Speech Signals (available online, see references). In conjunction with data collection methods such as crowd-sourcing phonological data via smartphones (Leemann et al. 2016) and the wider availability of the equipment and software necessary to collect data, this could revolutionise the field. The emerging field of corpus phonology (Durand et al. 2014) is likely to play a crucial role in this process.

### *Diachronic phonology*

While historical corpora of written English have been available for decades, the study of phonology from a diachronic perspective is hampered by the fact that facilities to record sound were not available before the second half of the 19th century. Previously, evidence on phonological change came principally from documents produced by people with little or no formal education among whom spelling variation can continue to reflect pronunciation to a certain degree even after the standardisation of English spelling. Another source of data previously available is observations from contemporaries.

However, both of these sources of evidence are limited in their breadth. One emerging line of research addressing the relative lack of diachronic evidence attempts to make use of existing audio recordings and apply instrumental methods to them in order to provide acoustic evidence on the historical development of English phonology as well as the extent of regional variation. For example, a collection known as the Berliner Lautarchiv, containing recordings of British prisoners recorded during World War I in Germany, provides direct evidence of regional and social variation in British English at the start of the 20th century (Hickey 2017). A challenge that needs to be overcome in this type of research is the limited quality of early recordings, both in terms of noise and the limited frequency and time resolution of early recording equipment.

A related line of research looks at sound change across the lifespans of individuals. Previously, it was assumed that linguistic patterns, including phonology, are largely fixed after the end of adolescence. However, Harrington et al. (2000) found substantial change over time in the vowel system of Queen Elizabeth II in the same direction as among the general population. Future work on phonological and phonetic change in individuals will resolve the question of whether public figures such as Queen Elizabeth II are exceptional in following ongoing sound change in the community or whether many speakers do so.

### *Variation within World Englishes*

Research on phonological variation in dialects of English across the world has so far mostly concentrated on educated speakers, that is, people who have received English-medium education and a substantial amount of formal education, often including a university degree. This bias is closely tied to the origins of the field. World Englishes were often perceived in- and outside academia as highly variable and including a substantial number of errors due to first language influence. One crucial aim of the field was to establish that a subset of the population uses focussed, that is, relatively stable, varieties that are on the way to being, or have already implicitly been, established as local standards. Research on language and dialect standardisation in the early modern and modern world indicates that it is the variety used by the educated and ruling elite that is selected as the standard. This knowledge motivated the study of the phonologies of educated speakers of World Englishes, with the assumption that their way of speaking English will likely be the basis for each of the individual emerging standard varieties.

While this argument continues to be valid, the field has arguably matured so much that an exclusive focus on this group of speakers is no longer required. The idea that World Englishes are not simply learner varieties has by now been broadly accepted in English linguistics. However, besides educated speakers of, say, Indian English, who use English as a second language, there are also speakers with different backgrounds. In fact, English is used in many Outer Circle countries as a native language, as a second language, and as a foreign language by varying numbers of people. Singapore, for example, is perhaps the most widely known case of a society that recently started a transition towards children acquiring English as a (sometimes additional) native language. However, such cases also occur in countries like India. At the same time, English continues to be used by a certain section of the Indian population as a second language, but is also learnt as a foreign language by another part of the Indian population who need just a limited knowledge of English for specific purposes (such as in the service industry). Studying the linguistic processes and outcomes of these distinct uses of English, especially from a phonological perspective, will help us develop a more complete picture of the diversity of English phonology.

### *Intelligibility*

As discussed previously, intelligibility is seen by many researchers and educators as an important aim when teaching English to foreign and second language speakers. This is a laudable goal, given that more than half of all cases of communication breakdown in English as a Lingua Franca communication are due to unintelligible pronunciations (Jenkins 2000; Deterding 2013). However, the notion of intelligibility is also problematic. A conceptual definition is straightforward: A word pronounced in an intelligible manner is one that a listener can identify. By contrast, drawing up a list of pronunciation features that are intelligible or not is challenging, yet educators need to know which features of their students' pronunciation they need to focus on in pedagogical work.

A list of (un)intelligible pronunciation features is difficult to come by because intelligibility depends on a range of factors. First of all, instead of stating that a certain speaker's accent is intelligible or not, it is more accurate to refer to specific pronunciation features as intelligible (Sewell 2010). For example, the realisation of the FATE vowel in Australian English as [aɪ], referred to earlier, might cause a loss of intelligibility for some listeners. More specifically, previous familiarity with this variety likely increases the intelligibility of this feature (Abeywickrama 2013: 61), pointing to a further variable that influences intelligibility. Finally, a question that is as yet unresolved is whether accents similar to the listener's own accent are more intelligible than dissimilar ones (Major et al. 2002).

It is clearly an important goal of research at the intersection of phonetics and English Language Teaching as well as English as a Lingua Franca to draw up specific and actionable lists of intelligible pronunciation features and curricula. Still, before this aim can be achieved, research on intelligibility will have to provide a more comprehensive account of which variables influence intelligibility. Without more research filling this gap, the principle of international intelligibility as a goal in English Language Teaching risks remaining so abstract that its full potential cannot be harnessed.

### **Conclusion**

This chapter has illustrated the theoretical, practical and social implications of the study of English phonology. These include topics belonging to the core areas of English linguistics,

such as the historical development of the English language, as well as areas of practical applications, such as English Language Teaching.

### Further reading

- Gut, U. (2009) *Introduction to English Phonetics and Phonology*. Frankfurt: Peter Lang. This textbook provides an accessible introduction to English phonetics and phonology for readers with some knowledge of English linguistics and little previous knowledge of phonetics and phonology.
- Ladefoged, P. (1996) *Elements of Acoustic Phonetics*. Chicago: University of Chicago Press. An introduction to acoustic phonetics suitable for readers with no previous knowledge in this area.
- Hayward, K. (2000) *Experimental Phonetics: An Introduction*. Abingdon: Routledge. This textbook discusses a variety of important concepts in acoustic phonetics and is recommended for readers with at least basic knowledge of acoustic phonetics.
- Durand, J., U. Gut and G. Kristoffersen (eds) (2014) *The Oxford Handbook of Corpus Phonology*. Oxford: Oxford University Press. This handbook provides an overview of the emerging field of corpus phonology.
- Schneider, E. W. and B. Kortmann (eds) (2004) *A Handbook of Varieties of English*. Berlin: Mouton de Gruyter. This handbook continues to be the most comprehensive source of information on variation, including phonological variation, in varieties of English.

### Related topics

- English and colonialism
- World Englishes: disciplinary debates and future directions
- Contact Englishes
- Sociolinguistics: studying English and its social relations.

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