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The First IT Revolution

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This sentence is a time machine. I composed it a long time before you opened this book and read it. Yet here are my words after all this time, pristinely preserved, as good as new. The marvelous technology that allows the past to speak directly to the future in this way is by now so pervasive that we take it for granted: it is writing.

Imagine a world without writing. Obviously there would be no books: no novels, no encyclopedias, no cookbooks, no textbooks, no telephone books, no scriptures, no diaries, no travel guides. There would be no ball-points, no typewriters, no word processors, no Internet, no magazines, no movie credits, no shopping lists, no newspapers, no tax returns. But such lists of objects almost miss the point. The world we live in has been indelibly marked by the written word, shaped by the technology of writing over thousands of years. Ancient kings proclaimed their authority and promulgated their laws in writing. Scribes administered great empires by writing, their knowledge of recording and retrieving information essential to governing complex societies. Religious traditions were passed on through the generations and spread to others, in writing. Scientific and technological progress was achieved and disseminated through writing. Accounts in trade and commerce could be kept because of writing. Nearly every step of civilization has been mediated through writing. A world without writing would bear scant resemblance to the one we now live in.

Writing is a virtual necessity to the societies anthropologists call *civilizations*. A civilization is distinguished from other societies by the

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complexity of its social organization, by its construction of cities and large public buildings, and by the economic specialization of its members, many of whom are not directly involved in food procurement or production. A civilization, with its taxation and tribute systems, its trade, and its public works, requires a sophisticated system of record keeping. And so the early civilizations of Mesopotamia, Egypt, China, Mesoamerica, and (probably) India all developed a system of writing. Only the Andean civilization of the Incas and their predecessors instead invented an intricate system of keeping records on knotted, color-coded strings. These *quipus* are still poorly understood but probably did not express their users' language the way writing does.

Early writing had three essential functions. It was used in state administration and display, in trade and commerce, and in religion. The ancient Sumerians invented writing for administration and trade. The ancient Chinese used it to record what questions they had asked of Heaven. The ancient Maya used it to establish the divine authority of kings, and the ancient Egyptians used it to gain eternal life. In the case of trade and administration, the advantage of keeping written records is clear. The natural affinity of writing with religion is less transparent, but may well stem from the relative permanence – immortality, almost – of the written word. From ancient Egypt to the modern world, writing has been used to mark burials (bestowing a form of immortality on the deceased), as well as to dedicate offerings and record the words of God. Literature, which we now tend to consider the essence of written language, was a much later development – and in the case of some literate cultures, never developed at all.

Writing was invented from scratch at least three times: in Mesopotamia, in China, and in Mesoamerica. In Egypt and in the Indus Valley, writing may also have been invented independently, or the basic idea may have been borrowed from Mesopotamia. When the first words were written down in what is now southern Iraq in the late fourth millennium BC, history was made in more senses than one, for it is writing that separates history from prehistory – the time that can be studied through written records from the time that can be studied only through archaeology. Thanks to the time-machine technology of writing, a selection of the thoughts and words of earlier peoples have come down to us.

Writing is one of the most important human inventions of all time. It is rivaled by agriculture, the wheel, and the controlled use of fire, but

by little else. The goal of this book is to shed light on how this remarkable technology actually works, where it came from, what it has done for us, and why it looks so different in different parts of the world.

Writing and Language

Writing was invented to solve a particular problem: information only existed if someone could remember it. Once it was gone from memory, it was gone for good. As human societies became more complex, those attempting to control them found that their memories were overtaxed. What they needed was an external storage device. What they came up with is writing.

Let's say I owe you five dollars. If I say "I will repay you next April," the words are gone the instant I utter them. They exist only in my memory and in the memory of anyone who has heard me. And who is to say I will continue to remember them? You may well want more lasting evidence of my promise. Nowadays I could record my words electronically, but the inventors of writing lived more than five millennia before the invention of the phonograph, the tape recorder, or the digital voice recorder. Nor was capturing human speech their intention; they needed a way to record *information*. The memories of nonliterate people are good, but they are far from infallible, and the human memory was not made for book-keeping.

So is there any way to keep my promise alive? How can we be sure exactly what has been said, or thought, or done? I could tell someone else, who would tell someone else, who would tell someone else . . . and, as in the party game "telephone," where each person whispers a message to the next person in a circle, the message would be very different by the end. But let's say I write down the words on a piece of paper and pass the paper around the circle. The words are just the same at the end as at the beginning. There is no amusing party game left, but there is instead reliable transmission of information.

This is the essence of writing. Writing represents language, but it outlasts the spoken word. The oldest examples of writing have lasted over five thousand years. Others will last only until I press my computer's delete key. But all have the potential to outlast the words I speak, or the words I put together in my head. A spoken (or mentally composed) message unfolds in *time*, one word replacing the previous

one as it is uttered. Writing arranges the message in *space*, each word following the previous one in a line. Writing is therefore a process of translating time into space.

Being spatial, writing is visible. But being visible is not crucial to its definition. Braille, discussed further in Chapter 15, is a kind of writing designed to be felt with the fingers. It represents letters as a series of raised bumps that can be read by touch. In both reading by touch and reading by sight, time has been translated into space. There are also forms of language, such as American Sign Language (ASL), that are not writing but are inherently visible and spatial. Sign languages are akin to spoken languages in their essential properties: they too unfold in time. Like spoken words, signed words are gone the moment they are produced. By contrast, writing is a transformation of language into something permanent, a technology applied to the natural languages we learn instinctively as children.

Writing takes words and turns them into objects, visible or tangible. Written down, words remain on the page like butterflies stuck onto boards with pins. They can be examined, analyzed, and dissected. They can be pointed to and discussed. Spoken or signed words, by contrast, are inherently ephemeral. As a result, written language often seems more real to us than spoken language. In a highly literate culture it is easy to confuse writing with language itself, since much communication is mediated by writing, and the standards of written language influence our sense of "proper" language. But writing is not the basic, primary form of language, nor is it necessary to language.

Humans everywhere use language. It is a natural and normal human behavior. Although babies are not born speaking a language, all children who are raised around other people, who can perceive the language spoken around them (they are not, say, deaf in an environment where no sign language is used), and who are within normal range in certain mental and physical facilities will inevitably learn at least one language. They pick up their mother tongue naturally over the first few years of life. Indeed they cannot really be taught it and will resist instruction if parents try too hard to correct their baby talk. Reading and writing do not come so naturally and must be taught. By the time children learn to read and write, the vast majority of their language learning (other than further vocabulary growth and sometimes second-language study) has already taken place.

As far as we can tell, language has been with us since the human race began. By contrast, writing is not a fundamental aspect of human life despite the profound impact it has had on human history. All human societies have had language, but many have had no writing. The *Ethnologue* database counts 7,164 languages spoken (or signed) in the world today. An uncountable number of others were once spoken but are now dead. The exact tally of extant languages is open to dispute, as it is often difficult to determine which forms of speech are varieties of a single language and which are different languages; also, languages change constantly, and two language varieties may grow into distinct languages (especially in the absence of a common written form); languages may also die out, and are now doing so at increasing rates. While as many as 4,169 languages have been given a written form, many of these writing systems are not used to any great extent. No more than a hundred languages are represented by a substantial literary tradition.

Although writing is secondary to spoken language, it often enjoys higher prestige. Writing is generally done more deliberately than speaking, so finished written pieces are much more carefully crafted than a typical spoken utterance. Written texts may thus convey their message more precisely, adding to the sense that writing is worth more than speech. Until the development of modern recording and broadcasting techniques, writing could reach a larger audience than the spoken word, and continue to communicate to people over a long period of time. Writing is associated with education, and education with wealth and power. The small percentage of languages that have a well-established written tradition include those of national and international influence. Most of the unwritten languages are spoken by minority groups, and many of these languages are not expected to survive the twenty-first century. Language conservation efforts must therefore include the development of writing systems and literacy programs or, where relevant, the preservation or revival of traditional forms of writing.

Designing a Writing System

Nowadays individuals faced with the task of designing a writing system for a language can draw on a wealth of literacy experience and linguistic theory. The original inventors had no such luxury. Later

pioneers had the benefit of knowing that writing was possible, but many of them still had to make most of it up as they went along.

Take King Njoya, for instance. King Ibrahim Njoya ruled the Bamum people of Cameroon from 1880 to 1931, the seventeenth king to rule from the ancient capital of Foumban (see map in the Appendix, Figure A.8). Njoya lived in a changing world, as strange people with strange new technologies encroached on traditional lands. To the north were invading Arabs, and they gave credit for their victories to a small book. Impressed, Njoya became a Muslim. Then Europeans came along with superior fire power. When asked where their strength came from, they also pointed to a book. Their book was larger, and their power the greater. Njoya therefore considered adopting Christianity, but could not accept its requirement of monogamy.

One thing was clear, however: writing was a powerful technology, and his people needed it. So in 1896 Njoya set out to invent a writing system for his Bamum language, gathering together his best thinkers and best artists to help him.

The job he faced was not an easy one. His advisors were bright, but none of them had any prior experience with writing, and so none knew how the technology worked. What kind of marks should Njoya design? What aspects of the Bamum language should be recorded?

Could he perhaps bypass the words of language and just record the thoughts he wanted to convey? When European scholars first encountered Egyptian hieroglyphs, they thought the elaborate drawings represented pure thought. They believed that the hieroglyphic signs were *ideograms* – symbols that stood for *ideas*, not specific words. This misunderstanding set the decipherment of Egyptian hieroglyphs back considerably. The ideogram hypothesis was more than just a bad guess for Egyptian, however. As it turns out, a full writing system that bypasses the encryption process of language is not possible. In other words, *information* separate from *language* is not the place to begin writing.

Iconographic systems of such a language-independent type do exist, but they are not writing in its strict sense. A road sign that shows a car skidding will convey its meaning whether you say to yourself, "Slippery when wet," or, "Watch out, you might skid," as you "read" it. Such an iconographic road sign is more useful in its sphere than one with written words, conveying its message quickly to drivers who may speak many different languages. Road sign iconography is not *less* than

writing, but it is *different*. Similarly, mathematical symbols and equations convey a meaning that can be expressed in any one of many languages, or even several ways within a language. What is essential in an expression such as $\int dx/(a+bx^2)^2$ is not what it sounds like in English words, but what mathematical operation it refers to. Mathematical notation is more fit for its function than written words.

The graphical systems of road signs and mathematics work – and even outperform writing in their sphere – because they apply within a very specific context. By contrast, one of the essential properties of human language is the infinite range of what can be communicated using only a finite number of basic words. If we could distill human thoughts into a finite number of concepts that could be written down, could we resist giving them names – *words*? No. We would "read" the symbols by pronouncing them as words. The symbols of a fully developed writing system cannot systematically bypass language.

So King Njoya's writing system had to encode language. But this conclusion did not make the problem much easier. The system of encoding and communicating information that we call *language* has many layers. Which layer or layers should Njoya make symbols for?

The most obvious layer of language is its words. However, to make a truly different symbol for each word of a language would result in far too many symbols. To take an example from English, the 160,000 entries of the second edition of *Webster's New World College Dictionary* would require 160,000 different symbols. But the number of entries in a dictionary actually underestimates the number of words in a language. For example, the entry for *girlish* also mentions *girlishly* and *girlishness* – both words of English, but not given their own entries. It would be silly, though, to try to create a writing system that had one symbol for *girl*, an entirely different one for *girls*, another completely different one for *girlish*, and yet others for *girlishly* and *girlishness*. The words *girl*, *girls*, *girlish*, *girlishly*, and *girlishness* have pieces in common. They all contain the piece *girl*, while *girlish*, *girlishly*, and *girlishness* share *-ish* as well. The *-ness* of *girlishness* and the *-ly* of *girlishly* are also pieces that recur over and over in English, while the *-s* of *girls* appears as an inflection on nearly every plural noun. These pieces of words are called *morphemes*. Some morphemes, like *girl*, can be words in themselves, while others, like *-ly*, cannot. There are far fewer morphemes in a language than words, particularly in languages that use inflection – morphemes that indicate plurality, tense, person agreement, and other grammatical

features. The morphemes can be combined and recombined in so many ways that it is hard to say how many words a language actually has. It is not surprising, therefore, that no one has ever managed to create a usable form of writing that systematically uses the full words of a language, including their inflections, as its level of encoding. Some morphologically complex (but not inflected) words of Old Chinese received their own signs, but in the main it is morphemes that get encoded in written signs, not words.

A morpheme has two aspects, its *meaning* and its *pronunciation*. Writing systems that concentrate on representing morphemes – as complete meaning–pronunciation complexes – are called *logographic* or *morphographic*. The individual symbols are called *logograms* or *morphograms*, as shown in Figure 1.1. The term *logographic*, meaning "word-writing," is traditional, though it ignores the difference between

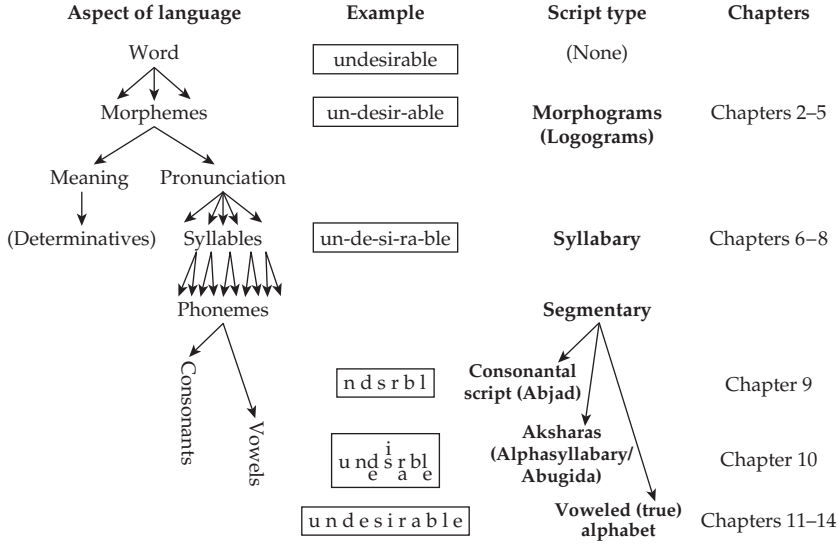

Figure 1.1 How different writing systems represent language. Morphograms, also known as logograms, represent morphemes, both their meaning and pronunciation, while syllabaries and segmentaries represent only pronunciation. In the column of examples, the word *undesirable* is used to illustrate how the various writing systems would divide up such a word. A morphographic system would use three symbols, a syllabary five, and so forth. In an akshara system, the vowels are written as appendages to the consonants and may appear above or below the line of consonants.

morphemes and words. On the other hand, the term *morphographic* ignores the fact that certain morphemes are privileged over others in the creation of such writing systems. That is, morphemes that can stand alone as uninflected words or serve as the core morphemes of inflected words (like *jump*) tend to receive their own signs, but inflectional affixes (like the *-ed*, *-s*, or *-ing* of *jumped*, *jumps*, and *jumping*) generally do not. Thus not all morpheme types are considered equal in such systems. One could perhaps call these systems *lexographic* or *lemmagraphic*, but these words have not come into fashion. (A *lexeme* is a family of inflected forms, like *jump*, *jumps*, *jumped*, and *jumping*, while a *lemma* is the uninflected form, like *jump*, that one finds listed in the dictionary as the basic word.)

Although those of us who have been trained to use an alphabet find it natural to divide words up into individually written vowels and consonants (in other words, separating meaning from its pronunciation and representing only pronunciation), the first inventors of scripts did not. For them it was more natural to consider the morphemes as a whole. Core morphemes at least (those like *girl* or *jump* rather than *-ish* or *-ing*) can be uttered on their own in many languages and thus are natural units in which to think of language.

The first version of King Njoya's writing system was therefore morphographic. He compiled a list of little schematized pictures that could stand for individual morphemes. After a while he had 465 of them. A symbol for every morpheme in the language was clearly going to take a lot more than that. And so he was forced to a decision that all complete writing systems have had to make in some form and to some degree or another: he was obliged to begin using symbols to represent *pronunciation*.

The pronunciation (or *phonology*) of language also has several layers. Words are made of one or more morphemes, but they are also made of one or more *syllables* when they are pronounced. A word like *cat* has a single morpheme and a single syllable, but a word like *undesirable* contains three morphemes and five syllables. Thus a morphographic writing system for English would give *cat* one symbol and *undesirable* three, while a *syllabary* would give *cat* one and *undesirable* five. A syllabic system would lengthen the spelling of *undesirable* compared to the morphographic system but would lessen the number of symbols needed in all, as there are fewer distinct syllables in a language than there are distinct morphemes.

Accordingly, King Njoya converted a number of his symbols into *syllabograms*, standing for syllables – just a pronunciation, unconnected to any meaning. The meaning would come only when the syllabograms were put together to make up words. He worked on his script over a period of many years, ending with a syllabary of 73 signs, plus 10 numerals. He put the writing system to good use, compiling a law code, designing a calendar, and founding schools.

Other ways of writing were theoretically open to him. Syllabaries come in different kinds. Most represent only *core* syllables (containing only a single consonant followed by a short vowel, notated CV) and find a variety of workarounds to represent other kinds of syllables. A few include symbols for *closed* syllables (those that contain a final consonant, or CVC), and a very few writing systems of the world split the syllable in two, representing the consonant(s) at the beginning (the *onset*) with one symbol and the rest (the *rhyme*) with another.

More familiar to Westerners is the kind of writing system that ignores syllables entirely and looks at the individual sounds out of which syllables are made. This requires knowing what counts as an "individual sound." Consider for a moment the words *feel* and *leaf*. They appear to contain the same sounds, in reverse order. However, if you say the two words slowly, and pay close attention to your tongue as you say the *l*s, you may notice that the *l* in *feel* has the back of the tongue pulled back and upward compared to the *l* in *leaf*. Chances are, however, that you have never noticed it before. Similarly, the *p* in *spoof* is pronounced quite differently from the *p* in *poof* – you can blow out a candle by pronouncing the latter but not the former.

There are many such variations in sound that native speakers of a language disregard and typically have lost the ability to hear unless they have had training in phonetics. Native speakers of a given language will consider an entire range of sounds to be the "same." That "same sound" that native speakers perceive is called by linguists a *phoneme* of that language. The actual sounds of language are infinitely varied, as they are uttered by different people in different circumstances. It would be pointless to try to capture this variation in writing. But most languages have between 20 and 37 phonemes, and phonemes can be written down. An alphabet that is strictly phonemic would have the same number of letters as phonemes (though English does not).

Technicalities aside, an important point here about these abstract phonemes and syllables is that although writing represents information

about how words are pronounced, it does not record the identifying details of any individual utterance of those words. It records *language*, but not actual *speech*. Even in cases of dictation or courtroom stenography, much information about the actual speech is lost, such as intonation and emotional content. As a result, reading is not at all the same as listening to a recording (and can therefore, fortunately, proceed much faster).

Writing systems that represent individual phonemes are traditionally called *alphabets*. It is therefore inaccurate to refer to the "Chinese alphabet" or the "Japanese alphabet," as these writing systems do not operate at the phonemic level. Phonemic scripts can be further divided into several subtypes. Some, known as *consonantal scripts* or *abjads*, represent only or primarily consonants. Other phonemic scripts represent vowels with minor signs attached to or otherwise dependent on a preceding consonant. These are known as *akshara* systems or *alphasyllabaries*. Akshara systems often leave one default vowel unwritten, in which case they are also sometimes known as *abugidas*. Phonemic systems that give vowels and consonants equal status are *fully voweled alphabets*. In some cases, when they write both consonants and vowels as full letters one after another in a single line of writing as our Roman alphabet does, I will refer to them as *linear alphabets*. Nonlinear arrangements also exist, such as when Korean clusters its phonemic letters into syllables or the members of the Canadian Aboriginal Syllabics family of scripts indicate consonants by sign shape and vowels by sign orientation. In recent scholarship, following the usage of Peter Daniels, the term *alphabet* is sometimes reserved only for fully voweled alphabets. However, since the consonantal forerunners of the fully voweled alphabets (the early Semitic scripts described in Chapter 9) have traditionally been known as the "early alphabet," this change in meaning is perhaps unfortunate. To avoid ambiguity and controversy, the general category of phonemic scripts may be called *segmentaries*, as they write phonological segments, or phonemes.

All writing systems find themselves somewhere in the range from morphemic to phonemic, often with some mixture of type in its usage (see Figure 1.1). The more morphemic writing systems may also do a little to directly represent the semantic aspect of a morpheme in the form of clues to meaning known as *determinatives* (thus the written word for "cat" might include a symbol showing that it is an animal). But no writing system is so completely morphemic that it pays no

attention to the phonology (syllables and/or phonemes) of the language. Some scripts are fully phonological, however, representing either the phonemes or the syllables of the language. On the other hand, no written language is simply a record of uttered sounds: that is left up to a less significant invention, the phonograph, and its modern descendants.

The earliest writing systems were, like King Njoya's first efforts, all highly morphographic. Later writing systems are typically more phonologically based and use far fewer morphograms. This is not to say that morphographically based scripts are primitive. Morphograms have the advantage of using space very efficiently, needing only one sign per morpheme where alphabets need several. They are also more convenient in contexts where pronunciation varies significantly, making phonologically based writing hard to standardize. Yet a segmentary, with its limited number of signs, is the more easily memorized and can therefore spread faster in a context of limited schooling. What kind of writing system a language uses is largely determined by the accidents of history and by the properties of the language itself.

King Njoya's labors nearly went for nought. The French colonial forces burned his books and exiled him from Foumban in 1931. Despite Cameroonian independence in the early 1960s, Njoya's writing system was nearly forgotten. More recently, however, there have been efforts at revival. In the early years of the twenty-first century, Njoya's grandson, Sultan El Hadj Ibrahim Mbombo Njoya, sponsored classes in the syllabary at the royal palace in Foumban and collaborated with archivists to preserve historical documents written in the script. The Bamum Script and Archives Project, sponsored by the British Library, not only preserved important historical documents but inspired an upsurge of interest in the syllabary among the Bamum people. One result of the renewed interest is that the syllabary was accorded Unicode encoding, encouraging font design and facilitating digital use of the script. It remains to be seen, however, how much currency the Bamum syllabary will ever attain.

Other scripts have been luckier. Born into more propitious times, they have enjoyed a larger community of users and a more extensive history. The following chapters tell their stories.

First, in Chapters 2 through 5 are the stories of ancient morphographic systems – Mesopotamian cuneiform, Egyptian hieroglyphs, Chinese characters, and Maya glyphs – along with their syllabic or consonantal

compromises. Next, Chapters 6 through 8 tell of syllabaries, from the Bronze-Age Linear B used for Greek, through the two Japanese syllabaries, to the modern invention of the Cherokee script. Segmentaries follow, with consonantal scripts, akshara systems, and voweled alphabets in turn. While this typological tour starts with the earliest writing and ends with the linear alphabet used for modern English, the order is not meant to imply a journey from "primitive" to "advanced." All writing is a complex intellectual achievement; my intention in the following chapters is to celebrate this achievement – the first information technology revolution – in its many varied forms. Along the way the materials used for writing are also discussed, primary among them paper, whose invention is so crucial to the history of information storage that it deserves to be considered the second major information technology revolution. In Chapter 14 the effects of secondary writing technologies from the period of type – the third IT revolution – are considered, along with the globalization of the Roman alphabet. The final chapter considers writing in the digital age – the fourth IT revolution – and contemporary efforts at script invention and preservation.

Transliteration

A book about writing systems faces one significant obstacle: transliteration. The phonemes, syllables, and morphemes recorded by the world's writing systems cannot all be recast into the Roman alphabet in a single, unambiguous way. The languages of the world contain some 600 distinct consonants and 200 different vowels. Not all of these languages have yet been converted into writing, but clearly there needs to be a way to translate the scripts we do not know into one we recognize, so that we know what they say. Many languages already have established ways of being transliterated into the Roman alphabet or use the Roman alphabet themselves. For many transliterated languages the general operative principle is "consonants as in English, vowels as in Italian." Such a system glosses over a lot, as there are only so many consonants in English and only a few vowels in Italian. Furthermore, languages that already use the Roman alphabet do so in many different, mutually incompatible ways.

In my best attempt to navigate these complexities, I will use standard spellings and transliteration systems where their meaning is clear, but

will supplement them where necessary with the International Phonetic Alphabet (IPA). The IPA is designed to represent all the phonemes of human languages. By transcribing an alphabet into the IPA we can tell what phonemes that alphabet encodes: it is a sort of decoder ring for alphabets. For other types of scripts, an IPA transcription tells us the phonemes included in the syllable or morpheme that a written sign represents.

The IPA is reprinted in the appendix (Figure A.1). Examples of English phonemes transcribed into the IPA are given in Figure A.2. When using IPA symbols to describe a pronunciation, I will write them between square brackets. This is to emphasize that what is being referred to is a *sound*, not a letter of the Roman alphabet. Thus **b** is a letter, but [b] is a sound. In many cases the IPA symbol represents the same sound that the Roman letter does in English, but this is not always so, especially in the case of vowels, where the symbols taken from the Roman alphabet generally have the sound values that they do in most continental European languages (such as Italian).

Sounds that do not occur in English will be explained where relevant in later chapters. However, much can be learned about them from studying the IPA charts. The purpose of laying out the IPA vowel and consonant symbols in charts is that even if your language does not contain a particular sound, you can get a fairly good idea of what it sounds like from the description and its place on the chart. For instance, English does not have the [x] sound. However, the consonant chart describes it as a fricative, in the same row as [f], [v], [θ], [ð], [s], and [z], which do occur in English (as in ***f****ine*, ***v****ine*, ***th****in*, ***th****ine*, ***s****in*, and ***z****en*). A fricative is, like any of these sounds, a sound that you can keep on making (unlike a plosive, such as [b]), but that makes a turbulent sound of rushing air (unlike, say, [l]). The column [x] is in shows that it is a "velar" sound. This tells us that it is made in the same part of the mouth as [k] and [g], at the soft palate toward the back. It is therefore the "ch" sound of Scottish *loch* or German *ach*. Most English speakers find this sound impossible to pronounce correctly. However, with the IPA they can at least talk about it, even if they can't produce it.

The vowel chart also has many sounds that English does not possess, such as [y]. This vowel is described by the chart as "close" and "front." Even if those terms do not mean anything to you, you can tell from the chart that it is similar to [i], the vowel in English *s****ee***. But unlike [i], it is "rounded." This means that it is made with pursed lips, like [u], the

vowel in *f**oo**d*. If you say [i] and then try to say it with your lips pursed, you may manage the vowel [y]. Most English speakers have a great deal of trouble with it. It is the vowel sound in French *t**u***.

A full understanding of the IPA is not necessary to this book. However, if you find yourself wondering what sounds the symbols in a script actually refer to, you can get a rough idea by using the IPA chart. You can also access recordings of the sounds represented by the various symbols on the International Phonetic Association's website, www.internationalphoneticassociation.org.