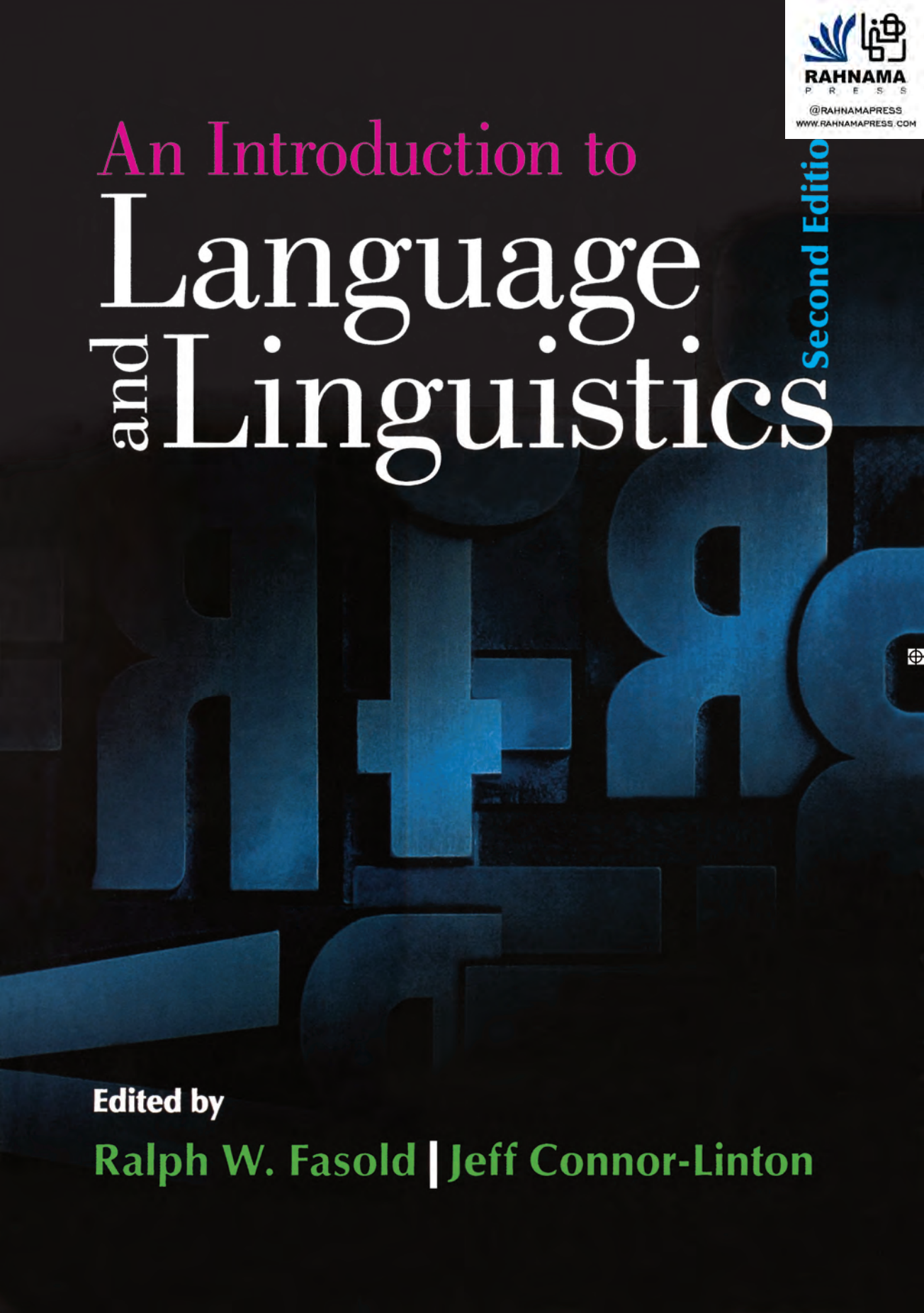
An Introduction to Language and Linguistics

Second Editio



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Introduction

"History is universal and basic," a history professor said during a faculty meeting, "It's about every event that involves all people at all times and in all places." "Yes," observed his colleague from linguistics, "but how would you record and interpret that history without language?" Indeed, it is hard to imagine how there could even be history without language, without a means to pass a record of what has happened from one generation to the next through retold stories and sagas, even before written records. Much of the history (and prehistory) of the human species consists of the development and adaptation of various tools to meet a broad range of needs: think of the wheel, the domestication of animals, the steam engine, computers, and the internet. The development and refinement of these and all other tools could not have been accomplished without language.

The human capacity for self-awareness and abstract thought is facilitated by language, if not dependent upon it. The ability to transfer complex information, to discuss the meaning of events and possible outcomes of alternative actions, to share feelings and ideas – all these are impossible without language. The origins of language are shrouded in obscurity, but archaeological records suggest that communication with language emerged about 200,000 years ago. The ability of an individual to model the world for him/herself and to communicate using language was probably the single most advantageous evolutionary adaptation of the human species.

Defining language

As one can imagine, a precise definition of language is not easy to provide, because the language phenomenon is complex and has many facets. Slightly modifying a definition provided by Finegan and Besnier (1989), we might define language as a *finite system of elements and principles that make it possible for speakers to construct sentences to do particular communicative jobs*. The part of the system that allows speakers to produce and interpret grammatical sentences is called **grammatical competence**. It includes the knowledge of which speech sounds are part of a given language and how they may and may not be strung together. Grammatical competence also includes knowing the meanings signified by different sound sequences in a language and how to combine those units of meaning into words, phrases, and sentences. Grammatical competence is what allows a speaker of English to string together twenty-one sounds that sound something like "The dog chased the cat up the tree" and allows another speaker of English to understand what dogs, cats,

and trees are, what chasing is, and which way is up. Further, grammatical competence is what allows these speakers of English to share the understanding that it was the dog doing the chasing and that it was the cat that went up the tree. Of course this does not apply only to English. Grammatical competence contributes similarly to comprehension in all human languages.

But people use language to do far more than just communicate the literal meanings of grammatical sentences. The sentence "The dog chased the cat up the tree" might be used to accomplish a wide variety of jobs: to narrate part of a story, to complain to the dog's owner, to help the cat's owner find his pet. The second part of the definition, "to do particular communicative jobs," refers to **communicative competence**. The most frequent "job" that people do with language is communicate with other people.

Grammatical competence is almost useless for human interaction without communicative competence. In fact, a lot of the actual use of language is not in sentences at all, but in discourse units larger and smaller than sentences, some grammatical (in the technical sense used in formal linguistics), some not. To be effective, speakers have to combine grammatical competence with the knowledge of how to *use* grammatical sentences (and other pieces of linguistic structure) *appropriately* for the purpose and context at hand. The two taken together comprise *communicative competence*. Communicative competence – the knowledge included in grammatical competence plus the ability to use that knowledge to accomplish a wide range of communicative jobs – constitutes *language*.

Universal properties of language

Over thousands of years of evolution, the human species developed a vocal tract flexible enough to produce a wide range of distinguishable sounds and the ability to perceive differences among those sounds. But most important, the human species developed the ability to use these sounds in systems which could communicate meaning. No one knows just how this happened. Perhaps mental capacities that had evolved for a variety of other adaptive purposes (like fine motor hand–eye coordination) were "re-purposed" to support a complex symbolic and communicative system. Perhaps some mental capacities are exclusively dedicated to language and evolved more gradually along with the increasing complexity of human communication. Or perhaps once they reached a certain level of neurological and cognitive complexity, the synapses of the brain "reorganized" themselves, making the development of language possible.

Although languages differ in many ways, they are all made possible by the same genetic information, they are all processed by the brain in basically the same ways, and, not surprisingly, they all share certain fundamental "design features" and structural characteristics that enable them to work the way they do. For example, although different languages use different sets of sounds, their sounds are organized and combined according to just a few principles. If there were no shared, universal features of language, we would expect the sounds of languages and their combinations to vary randomly. Instead, the sounds of languages and their combinations are limited and systematic. Likewise, all languages follow similar constraints on how they can combine words into phrases and sentences.

1 The sounds of language

KEY TERMS

- *acoustic phonetics*
- *active and passive articulators*
- *allophone*
- *alternation*
- *articulatory phonetics*
- *complementary distribution*
- *derivation*
- *distinctive features*
- *fundamental frequency*
- *formant*
- *intonation*
- *manner of articulation*
- *minimal pair*
- *natural class*
- *obstruent*
- *phoneme*
- *phonology*
- *phonotactic constraint*
- *pitch track*
- *place of articulation*
- *sonorant*
- *sonority*
- *source-filter theory*
- *spectrogram*
- *stress*
- *suprasegmentals*
- *syllable structure*
- *tone*
- *vocal tract*
- *voicing*
- *waveform*

CHAPTER PREVIEW

This chapter is about the sounds of speech. Without sound, communication can still take place – with a nod or a wave, a photograph, or a drawing. There can even be language without sound: those who cannot hear use languages based on manual signs instead. Yet for most of us most of the time, getting our message across involves encoding it in sounds. Even when we write, we use symbols that are based on speech (though sometimes not very directly).

The study of the sounds of speech can be divided into the disciplines of **phonetics** and **phonology**. Phonetics studies speech sounds as physical objects. Phoneticians ask questions such as:

- **How are speech sounds made?**
- **How do physical characteristics make people sound different?**
- **How many different sounds do languages use?**
- **How are different languages and dialects distinguished by the sounds they use?**
- **How does sound travel through the air?**
- **How is it registered by the ears?**
- **How can we measure speech?**

Phonology studies how languages organize sounds into different patterns. Phonologists ask questions such as:

- **How do languages organize sounds to distinguish different words?**
- **How do languages restrict, or constrain, sequences of sounds?**
- **What sorts of changes (alternations) do sounds undergo if sequences arise that don't obey the restrictions?**
- **How are sounds organized into larger constituents (syllables, words, phrases)?**
- **How are these patterns the same, and how are they different, across languages and dialects?**

We begin with phonetics, the study of how speech sounds are made and perceived, and then discuss phonology, the study of how a language organizes those speech sounds into a meaningful system.

GOALS

The goals of this chapter are to:

- **describe the basic anatomy of the vocal tract**
- **explain how the structures in the vocal tract are controlled to make speech sounds**
- **show how to transcribe English words using IPA transcription**
- **describe the basic properties of suprasegmental aspects of speech, and how languages differ in their use of them**
- **describe some of the physical properties of sound waves**
- **interpret some basic aspects of waveforms, pitch tracks, and spectrograms**
- **explain phonemic and allophonic distributions**
- **describe some of the most common phonological alternations**
- **introduce some of the major goals of phonological theories**

You pick up the phone and say "Hello?" into the receiver. The voice on the line responds "Hi!" and with this one syllable your brain is flooded with information. You recognize, first, the content of the message: a conventional greeting in English, distinct from the similar-sounding farewell (*bye!*), question (*how?* or *why?*), or command (*Fly!*). But you also probably recognize the identity of the person speaking, with or without caller ID, and get a sense of his or her mental state: excited, bored, happy, or angry. If you can't identify the person, you can still probably tell if the speaker is male or female, figure out whether he or she is a native speaker of English, and make a pretty good guess about where he or she is from. How can all this information be packed into a single word?

Speech sounds in fact constitute an elaborate multilevel code, to which every competent speaker holds the key. Meanings are mapped into sound sequences in the brain of the speaker, which sends commands for vocal tract movements, which produce characteristic vibrations in the air or on the phone line, which impact on the ear and auditory nerve of the listener, whose brain decodes the message, factoring out the aspects of the signal that correspond to the message and those that correspond to the characteristics of the

messenger, recreating the sound sequence, and thus the meaning, that the speaker intends. This chapter is about how this process of encoding and decoding takes place in the organization, production, and perception of speech sounds.

Articulatory phonetics

The tools of phonetics

One of the biggest obstacles phoneticians face is that they can't see the objects they are studying. You can't see the tongue as it's moving around inside someone's mouth; you can't see the sound waves traveling through the air; you can't see the vibration of the fluid in the inner ear. Since ancient times, however, phoneticians have made the best use of the information they had access to, employing careful listening, measuring, modeling, and notation. In addition, more sophisticated devices have been developed within the past decades – devices such as Magnetic Resonance Imaging (MRI), sonography, and digital acoustic analysis. Figure 1.1 shows some pictures of the vocal tract as seen by these devices.

With these aids, what have we learned about how humans make and hear speech sounds?

The vocal tract

Basically, sound is vibrating air. Speaking means using your **vocal tract** (lungs, **trachea**, **larynx**, mouth, and nose) to get air moving and vibrating, and then shaping that movement in different ways. Figure 1.2 shows a diagram of the upper parts of the vocal tract.

Most speech sounds are made with air exiting the lungs; therefore, speech begins with breath. To begin to speak, you pull down your diaphragm, the big muscle that separates your chest cavity from your stomach. This enlarges the lungs, which draws air in. Then the diaphragm relaxes and the muscles around the ribs contract, slowly squeezing the lungs and forcing the air out and up the windpipe, or **trachea**.

At the top of the trachea is a little box of cartilage, called the larynx (the "Adam's apple"). Inside the larynx, two folds of soft tissue, called the **vocal folds** (sometimes called "vocal cords"), lie across the top of the trachea. If the vocal folds are held in the correct position with the correct tension, the air flowing out of the trachea causes them to flap open and closed very quickly (around 200 times per second). You can feel this opening and closing motion as vibration in your throat. Find your larynx (you should be able to feel the bump of the Adam's apple at the front of your throat), and then hum a tune. Muscles attached to the cartilages of the larynx allow you to adjust the tension of the folds, thus adjusting the rate of vibration and raising or lowering the pitch. The faster the vibration, the higher the pitch of the voice. Other muscles also allow you to draw the folds apart so that no vibration occurs.

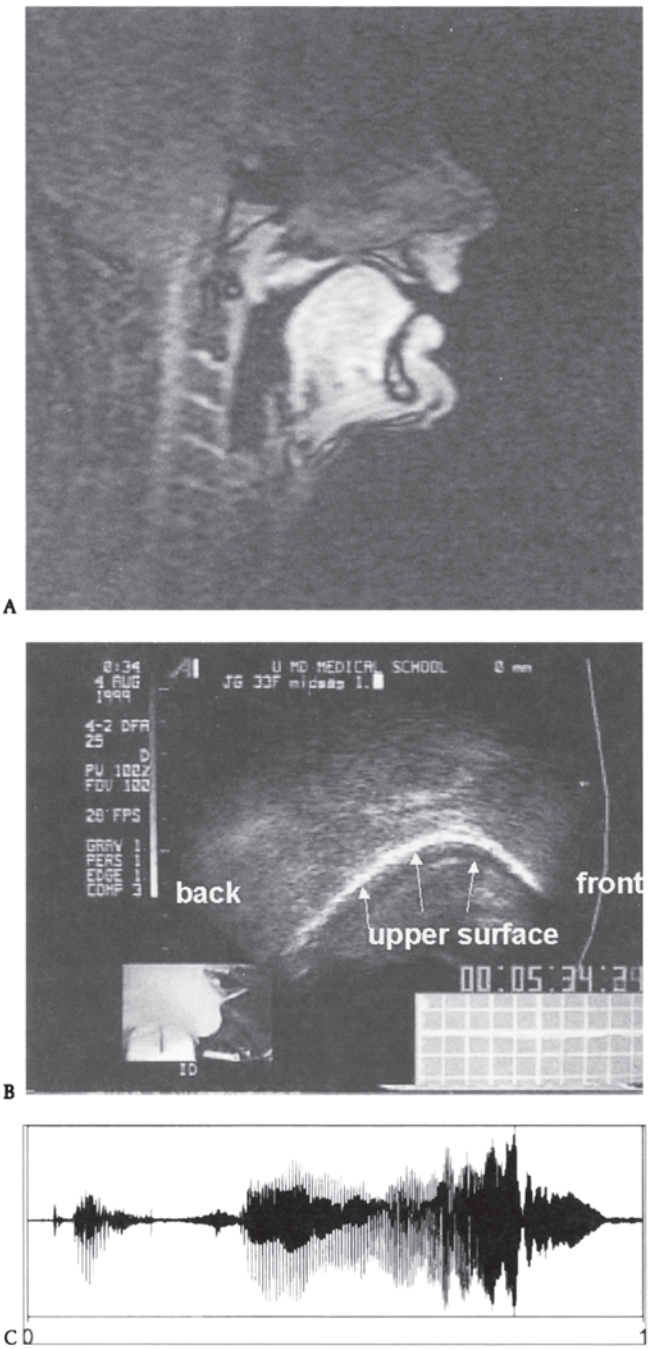

Figure 1.1 Views of the vocal tract. A. A magnetic resonance image of a mid-sagittal section (sideways slice) of the vocal tract. B. A sonograph image of the surface of the tongue. C. A digital waveform showing sound pressure variations during one second of speech. (Images A and B courtesy of Dr. Maureen Stone, Vocal Tract Visualization Laboratory, University of Maryland, Baltimore)

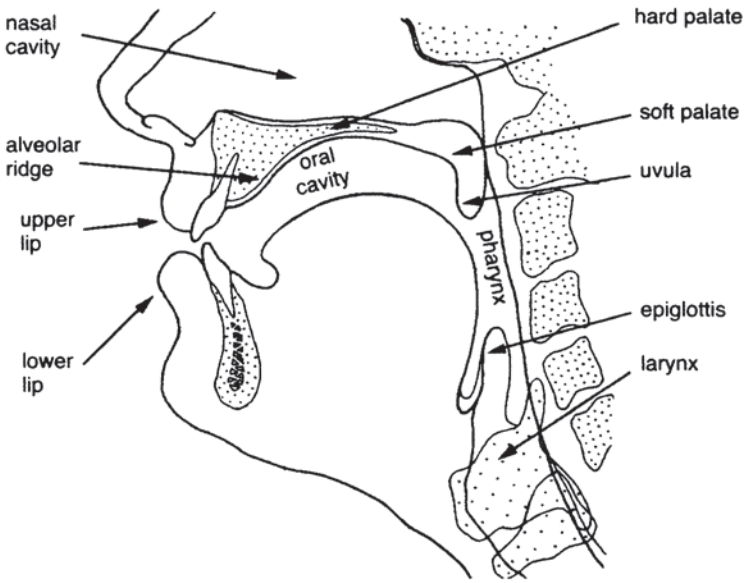

Figure 1.2 Parts of the vocal tract

Just above the larynx, at the base of the tongue, is the **epiglottis**. The epiglottis is a muscular structure that folds down over the larynx when you swallow to prevent food from going down into the lungs before it enters the passage to the stomach. The payoff for the risk of a larynx located low in the throat is an open area at the back of the mouth, the **pharynx**. The pharynx allows the tongue freedom for front and back movement. Other mammals, including nonhuman primates, have the larynx high up at the back of the mouth, connected to the nasal passages. Because they have no pharynx, chimps could never learn to talk. (This is why scientists who try to teach primates to communicate with language use gesture-based languages instead.)

Inside the mouth itself, there are many different structures – **active articulators** and **passive articulators** – that we use to shape speech sounds as the air passes through the vocal tract. The active articulators move toward the passive articulators in order to constrict and shape the air that is moving out from the lungs. Active articulators include the lips, which can be opened or closed, pursed or spread, and the tongue. What we usually see of the tongue is the small, pink tip, but it is actually a large mass of interconnected muscles that fills the floor of the mouth. Although the tongue has no bones or cartilage, different parts of the tongue can move fairly independently. The **tongue front** (including the **tongue tip** and the **tongue blade**, which extends a few centimeters back from the tip), the **tongue body** (the main mass of the tongue, also known as the dorsum), and the **tongue root** (the lowest part of the tongue, back in the pharynx), are considered separate active articulators.

The passive articulators lie along the top of the vocal tract. Run your tongue along the top of your mouth beginning behind your upper teeth. You will first encounter the **alveolar ridge**, the bony rise just behind your teeth. The **postalveolar** region arches

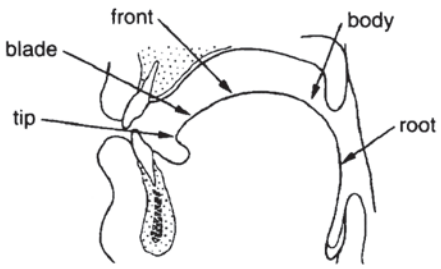

Figure 1.3 Areas of the tongue

from the alveolar ridge toward the **hard palate**, the roof of the mouth. If you curl your tongue very far back in your mouth, you can feel that the bony structure of the hard palate gives way to softer tissue, which is known as the **soft palate**, or **velum**. The velum is a muscular structure that regulates the velar port, the opening in the back of the mouth that connects the mouth and nose. When the velum is lowered, as it is for breathing and for some sounds such as [m] and [n], the port is open and air flows freely between the nose and lungs. (It's a phonetic convention to write the symbols for sounds within square brackets. See the following sections for more on phonetic writing.) When the velum is raised, as it is for most speech sounds, the opening to the nose is closed off and all the airstream is directed through the mouth. At the very end of the velum is the **uvula**, the little pink pendulum you can see hanging down in the back of your mouth when you open wide and say "ah."

Articulation

Speaking involves using the structures of the vocal tract in different ways to control and shape moving air. We can think of the speaker producing the right combinations by making "choices" about which active and passive articulators to use and about how different constrictions will be made. These choices are not conscious; they are automated from long practice, just like the muscular routines of walking or reaching. When you reach for a cup of coffee, you don't say to yourself, "OK, now contract the tricep, relax the bicep," etc. Instead, without much conscious thought you select a goal, such as "fingers to mug," and your long-practiced routines of motion execute the goal-directed movement. Speech works the same way. The movements of speech are goal-directed gestures. Each sound is comprised of a set of articulatory goals that will get the vocal tract in the right positions to make the sound you wish to make. An overall goal like "make an [m]" can be broken down into a set of subcomponents: "Close the lips," "open the velum," "make the vocal folds vibrate." These subroutines can be recombined in different ways to make different sounds, like a set of Lego blocks that can build a castle or a boat depending on the way they're put together.

The first choice is that of airstream mechanism: how will the speaker get the air moving in the first place? The usual choice is **pulmonic egressive** – that is, air moving out from the lungs. Most sounds used by most of the world's languages are pulmonic egressive.

However, it is also possible to get air moving in other ways, such as by moving the larynx up or down, or by popping little pockets of air made with the tongue against the roof of the mouth, as in clicks. (Clicks include the expression we write in English as *tsk tsk* or *tut tut*, but in some languages of southern Africa sounds such as these are incorporated into the stream of speech as regular consonants like [p] or [t] in English.) The rest of this chapter discusses only sounds that are pulmonic egressive.

The second choice is what to do with the vocal folds. Sounds produced with vocal fold vibration are **voiced**; sounds produced without vocal fold vibration are **voiceless**. If you place your finger on your larynx and produce a sustained [z], you should be able to feel the vibration, or voicing. If you switch to [s], a voiceless sound, the vibration ceases. For some sounds, as in the initial [p] in *pop*, the vocal folds are held apart far enough and long enough to allow an extra "puff of air" to exit the mouth at the end of the [p]. This is called **aspiration**. You can feel the extra release of air if you hold your fingertips an inch or so in front of your lips as you say *pop* or *pill*. Aspiration can be indicated by a superscripted *h*: [p^h].

Besides deciding what to do with the larynx, the speaker must decide whether the velum will be open or not. If the velum is open, so that air flows into the nose, the sound is **nasal** (like [m]). If the velum is closed, the sound is **oral**.

Finally, the speaker must decide which active articulator will be used to make a constriction (lips, tongue front, tongue body, tongue root), where the constriction will be made (the **place of articulation**), and what sort of constriction will be made (the **manner** of **articulation**). The various places of articulation are discussed in following sections; we turn first to the various manners of articulation.

Manners of articulation

The manners of articulation include: stop, fricative, affricate, approximant, and vowel.

If the active and passive articulators are brought together to make a complete closure, so that airflow out of the mouth is completely cut off, the manner of articulation is a **stop**. The sounds [p], [t], and [k] in English are stops. Say the word *poppa* very slowly, and note that there is complete silence, with no air exiting the mouth, while the lips are closed for [p] in the middle of the word. You may even feel pressure building up behind the lips, as air continues flowing from the lungs and has nowhere to go. This pressure is released with a slight pop, or burst, when the lips are opened. The sound [m] is a nasal stop. Even though the velum is open and air flows freely out of the nose, so that you can hum a tune while producing an [m] sound, the manner of articulation is still a stop, because the lips are completely closed, as they were for [p]. (Try pinching your nose closed for a moment while you're humming a tune, and see what happens.)

If the articulators are brought close together but not closed completely, so that the stream of air that is forced between them becomes turbulent and noisy, the manner of articulation is a **fricative**. The sounds [s], [z], [f], and [v] are fricatives. **Affricates** combine a sequence of stop plus fricative in a single sound. The sound usually written *ch* in English is an affricate. Try saying the word *achoo* as slowly as possible, paying attention

to the movement of the tongue between the *a* and *oo* sounds. You first make a closure with the tongue front at or just behind the alveolar ridge, and then lower the tongue tip to let the air out through a narrow constriction slightly further back, between the tongue blade and postalveolar region.

If the active articulator moves to narrow the vocal tract, but not so much that fricative noise is created, the manner of articulation is an **approximant**. **Glides**, such as the sounds at the beginning of the words *yell* and *well*, are approximants, as are [l] and [r] in English. The *l*-sounds of the languages of the world are called **laterals**, because air flows out over the sides of the tongue. Try drawing out the initial sound in the word *lateral*. Now, without moving your tongue, take a deep breath in and out. You'll feel the air moving over the sides of the tongue. The *r*-sounds are called **rhotics**. The rhotic sounds of the languages of the world are quite varied, including quick taps of the tongue against the alveolar ridge, trills in which the tongue is set into vibration by air flowing over it, and the very odd shape of the American English [r], in which the body of the tongue is bunched up high and the tongue tip may be raised or curled backwards. (It is no surprise that non-native speakers of English have trouble with this sound.) Vowels are the most open manner of articulation. Different vowel sounds are made by moving the tongue body up or down, front or back, and by rounding or spreading the lips. During all vowel sounds, however, the vocal tract is relatively wide open, and air flows out freely. Oral stops, fricatives, and affricates together form a class of sounds called **obstruents**, because they make noise by obstructing the airflow in the vocal tract, causing a burst of sound as a closure is released or a hissing sound as the air passes through a narrow constriction. Nasal stops, approximants, and vowels (anything that's not an obstruent) form a class of sounds called **sonorants**. They make audible sounds not by obstructing the airflow, but by letting the air resonate. Sonorant sounds are almost always voiced. The vibration of the vocal folds causes the air inside the vocal tract to vibrate. If the vibration is strong enough, it produces an audible sound, like the ringing of a bell. Different vocal tract shapes (which we control by moving the active articulators) produce different patterns of vibration, which we hear as different sounds (more on this below). It is possible to produce voiceless sonorants, by moving a large volume of air through the open vocal tract. Languages like Hmong and Burmese use voiceless nasals. Listen carefully, and you'll hear that the [l] in an English word like *play* is also voiceless.

Writing sounds: transcription

Before we discuss the different places of articulation used in English and other languages, we have to consider how to write down different sounds. Descriptive phrases like "the sound at the beginning of the word *yell*" or "in the middle of *achoo*" are cumbersome. We need a **phonetic alphabet**. Writing down sounds using a phonetic alphabet is called **phonetic transcription**.

In 1888, the International Phonetic Association (based in Paris) tackled the problem of how to precisely describe any sound the members might encounter in their efforts to

A clear and up-to-date introduction to linguistics, this bestselling textbook addresses the full sc language, from the traditional subjects of structural linguistics (relating to sound, form, meaning language change) to the more specialized subjects of contextual linguistics (including discourse, dialect variation, language and culture, and the politics of language). There are also separate chapters on language and the brain, computational linguistics, writing, and first and second language learning. Extensively classroom-tested, this second edition has been revised to further support student learning, with numerous new examples, exercises, and textboxes to model and contextualize key concepts. Updated throughout to incorporate contemporary issues and events, it includes worked examples of phonological analyses and multiple examples of a variety of World Englishes. A rich collection of online resources completes the learning package.

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