

# SPEECH

## Dances of the Vocal Tract

by Louis Goldstein and Philip Rubin

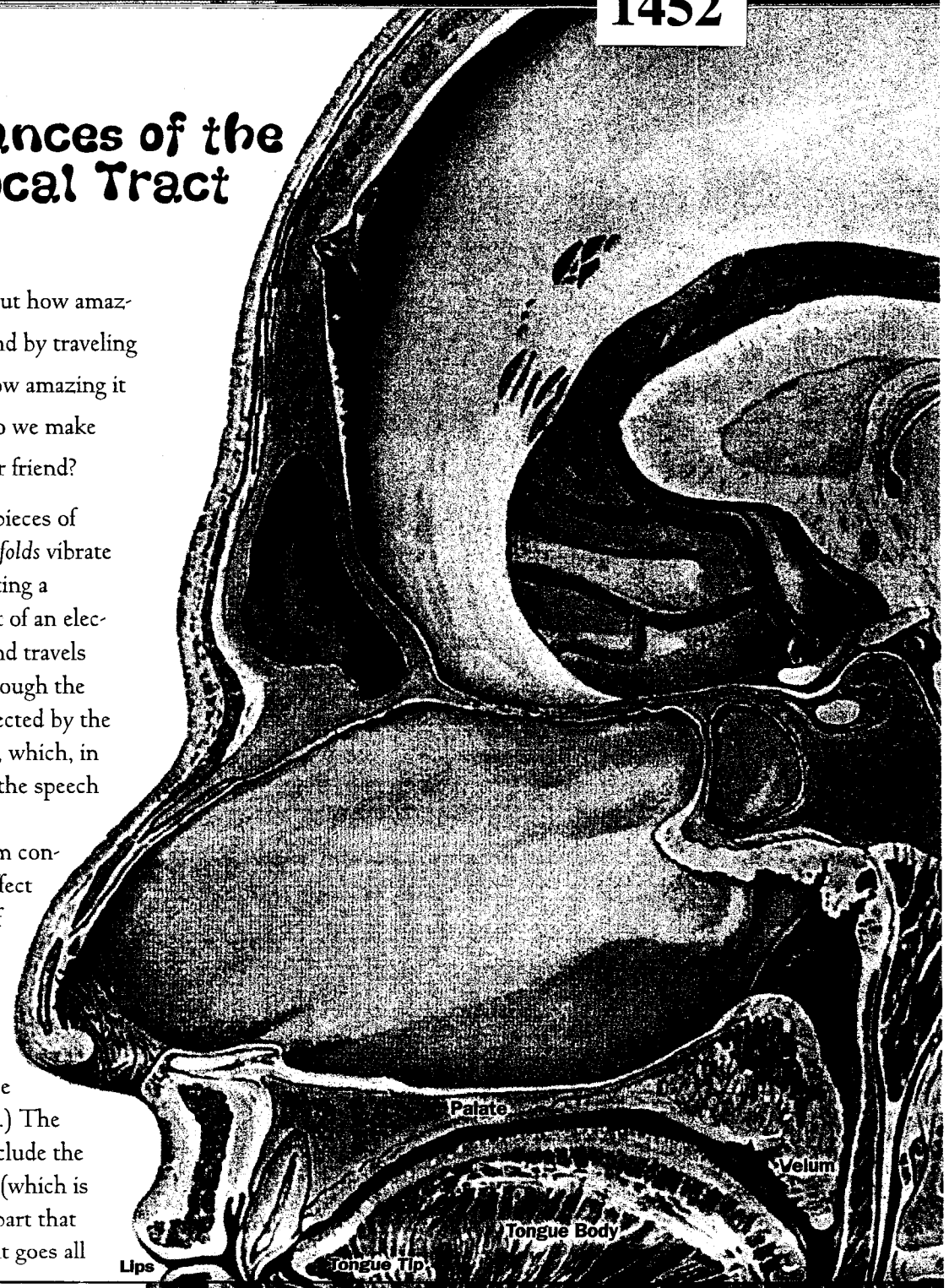
**W**hen you talk on your cell phone, you might think about how amazing it is that words leave your mouth and reach a friend by traveling through the airwaves. But do you ever think about how amazing it is that you are able to say those words in the first place? How do we make sounds that form words and sentences that have meaning to our friend?

If you pay close attention to what's happening inside your mouth when you speak, you'll notice that sometimes your lips come together and sometimes your tongue hits the roof of your mouth. (These actions happen so rapidly that you usually don't notice them.) In fact, there are other moving parts between your lips and your throat that together form a hidden tube called the *vocal tract*. Action in the vocal tract enables us to speak.

The moving parts within the vocal tract are called *speech articulators*. You can see the tube and some of the articulators in our illustration. When you say a word, the articulators perform a kind of dance. (If you had X-ray vision, you would be able to see the articulators in motion.) Each word has an associated dance. So, saying a particular

passes through it, two pieces of muscle called the *vocal folds* vibrate like rubber bands, creating a buzzing sound like that of an electric shaver. As the sound travels from the larynx out through the mouth or nose, it is affected by the shape of the vocal tract, which, in turn, is determined by the speech articulators.

The articulators form constricting devices that affect the shape and length of the vocal tract tube, somewhat as the trombone slide changes the length of that instrument. (In fact, our voice is a kind of instrument.) The constricting devices include the *main body of the tongue* (which is much bigger than the part that you see in the mirror; it goes all



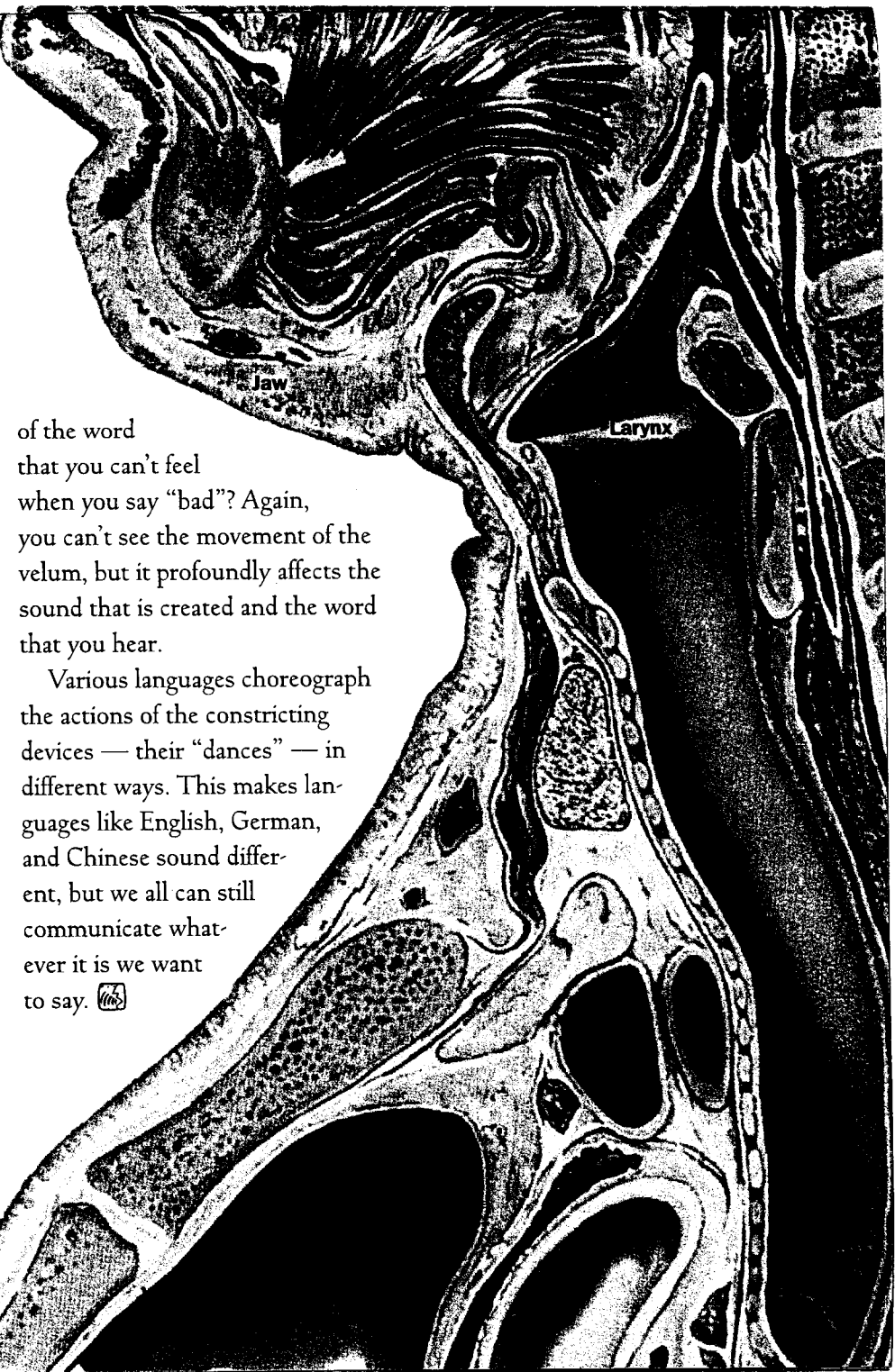
word to someone just means dancing the right dance. Your friend knows what dance corresponds to particular words, because your friend shares your language. She can't see the dance any more than you can, but she can hear the pattern of sound that it creates.

The dance of speech works a little bit like a musical instrument — a trombone, for example. The actual sound of a trombone is created by the trombonist's lips vibrating against the mouthpiece. Different notes are made by moving the instrument's sliding tube. This changes the length of the tube that the air has to pass through from mouthpiece to horn end. When the tube is longer, the sound of the note is lower; when it is shorter, the sound is higher. So, even with your eyes closed, you can tell if someone is lengthening or shortening the trombone by moving its slide.

Now let's see how this applies to the way we hear the word sounds of speech. In the vocal tract, sound is first made by vibration of a body called the *larynx*, which is sometimes called the "voice box." It sits atop the windpipe, and when air

the way down your throat), the *tip of the tongue* (which you can easily see in a mirror and feel on the roof of your mouth, also called the *palate*), the *lips*, and a small hidden flap of skin called the *velum*, (which works like a trap door to control the passage of air from the mouth through the nose).

The "dance steps" of the different constricting devices enable us to distinguish one word from another. For example, the word "bad" begins with a constricting action of the lips as the upper lip makes firm contact with the lower lip. (Watch someone say the word "bad," and you will see that happen.) Alternatively, the word "dad" begins with a constricting action of the tip of the tongue as it rises firmly against the upper teeth and the palate immediately behind it. This action is more hidden. You can't easily see it, but it affects the sound that is produced. If you start with the word "bad" and lower the velum trap door, you have the word "mad." Try resting your fingers gently on either side of your nose as you say the word "mad." Can you feel some vibration at the beginning



of the word that you can't feel when you say "bad"? Again, you can't see the movement of the velum, but it profoundly affects the sound that is created and the word that you hear.

Various languages choreograph the actions of the constricting devices — their "dances" — in different ways. This makes languages like English, German, and Chinese sound different, but we all can still communicate whatever it is we want to say. 🗣️

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