The Acoustic Characteristics of Vocal Twang

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Vocalists are capable of imitating many of the sound qualities of musical instruments. As with impersonation of sounds other humans make, a caricature of the main feature of the instrumental sound is produced. Vocal timbre can be flute-like, brass-like, or percussive. Often the desired sound quality is that of the instruments that accompany the voice. Give the vastly different geometry and material properties of the human airway compared to those of musical instruments, only one or two acoustic features can usually be imitated.

The word "twang" comes from the sound of a plucked guitar string. There is little in common between guitar strings transmitting sound to wooden plates and vocal folds transmitting sound through a 17 cm vocal tract, yet a common feature can be the clustering of frequencies produced. Woodhouse published frequency spectra of plucked guitar strings. Regardless of the pitch produced, the dominant harmonics clustered around 1500–2000 Hz. The fundamental frequency was never the dominant one.[1] Such a frequency spectrum can be approximated by shaping the vocal tract such that both the epilaryngeal and the pharyngeal airway are narrow. The bottom row of Figure 1 shows this airway configuration in comparison to other shapes that produce different voice qualities, such as neutral, yawn, ring, and call. On the right panel, the input impedance to the vocal tract is shown for each configuration in the 100–2000 Hz region. The thin line is input resistance and the thick line is input reactance. High positive reactance means that harmonics are reinforced by the vocal tract. Note that twang has the highest reactance between 800 Hz and 1600 Hz. (The ring configuration has its highest reactance in the 3000–4000 Hz range, not shown in Figure 1). With a variety of tongue and lip configurations, the impedance peaks in the 1000–2000 Hz range can be moved up and down, as well as closer together or farther apart. Saldias et al. have shown midsagittal airway images that clearly show the narrowing in the epilaryngeal and pharyngeal regions in twang phonation. They have also shown that the corresponding spectrum has a broad peak in the 1000–2000 Hz region.[2]

A second feature of twang is nonsteadiness. The spectrum of a plucked string does not remain constant. It is transient as the sound dies out. A sharp twang drifts to a more mellow twang. A singer can imitate this transient quality by keeping the vowel or vocal fold adduction variable. Country singers often

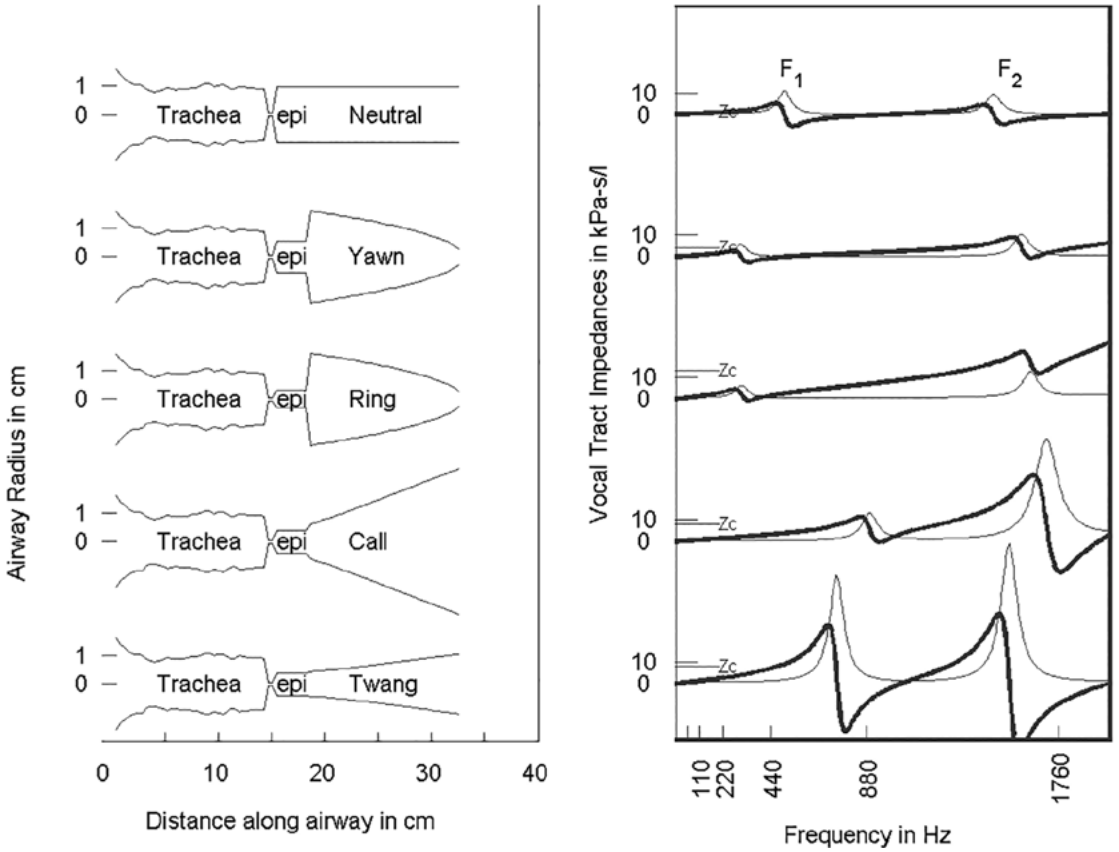

Figure 1. **(left) Airway shapes and (right) corresponding vocal tract input impedance over a 100-2000 Hz frequency range. Thin lines are resistances and thick lines are reactances.**

make their vowels more speech-like, drifting from one vowel to another with co-articulation. This is in contrast to classical singers, who often maintain a steady voice quality, thereby mimicking steady tone instruments, such as flutes, brasses, and bowed strings.

This author has had multiple conversations with singing teachers about what constitutes "twang" in the industry. In an audition, singers may be asked to produce a twang sound, but it comes out more like a belt or a pressed voice. My advice would be to listen carefully to the sound of a plucked steel string. Imitate that sound first in isolation, then embed that quality into running speech, and finally "sang a sawng" with it.

NOTES

1. J. Woodhouse, "Plucked Guitar Transients: Comparison of Measurements and Synthesis," *Acta Acustica united with Acustica* 90, no. 5 (September/October 2004): 945–965.
2. Marcelo Saldías, Anne-Maria Laukkanen, Marco Guzmán, Gonzalo, Maranda, Justin, Stoney, Paavo Alku, and Johan Sundberg, "The Vocal Tract in Loud Twang-Like Singing While Producing High and Low Pitches," *Journal of Voice* 35, no. 5 (September 2021): 807.e1–807.e23.