A mechanical model of vocalization

November 23 2009

When people speak, sing, or shout, they produce sound by pushing air over their vocal folds -- bits of muscle and tissue that manipulate the air flow and vibrate within it. When someone has polyps or some other problem with their vocal folds, the airflow can be altered, affecting the sound production.

"Voice disorders affect 30 percent of the general population and up to 60 percent of educators," says Plesniak. "The objective of our work is to develop a detailed understanding of the phonation process, which will enable the development of computational models."

Wanting to better characterize the physics of this process, George Washington University professor Michael Plesniak and his doctoral student Byron Erath teamed up with speech pathologists a few years ago, while Plesniak was at Purdue University, to investigate the velocity field and flow structures in the airflow that occur when a person speaks.

Plesniak and his students constructed a mechanical model of the vocal folds that had motorized, programmable components that can alter their shape and motion in various ways to mimic vocal folds. By placing this model in a wind tunnel, they examine normal vocalization and common pathologies like the formation of polyps and cysts.

An important feature of the model, says Plesniak, is that it is seven-and-a-half times larger than the actual physiology, which allows the dynamics to be studied in greater detail. The ultimate goal, he adds, is to create tools to help surgeons make preoperative assessments of how a vocal

tract surgery will affect an individual's voice.

More information: The talk "The development of supraglottal flow structures during speech" by Byron Erath and Michael Plesniak is at 4:14 p.m. on Monday, November 23, 2009. Abstract: meetings.aps.org/Meeting/DFD09/Event/111753

Source: American Institute of Physics