The question of whether a speaker can be identified by his or her voice has figured in legal cases for at least 350 years. In 1660, the executioner of King Charles I of England was identified in a court of law solely by means of his voice (as his face had been concealed by a black hood). In 1934, Col. Charles Lindbergh, having been prompted by a District Attorney, overcame his earlier reluctance and identified the voice of a suspect as that of his son's kidnapper -- more than two years after that fateful event. In 2012, the friends and family of Trayvon Martin identified his voice in the shouted calls for help on a 911 recording, but the friends and family of George Zimmerman drew the opposite conclusion from the very same shouts.

Jurors tend to give great credence to witnesses who were at the scene of a crime, and earwitness testimony is subject to even fewer courtroom challenges than is eyewitness testimony. But remarkably little evidence has been gathered for the purpose of determining how reliably earwitnesses make correct identifications. One of the few studies conducted under carefully controlled conditions probed the ability of a world-renowned linguist to recognize personally-familiar speakers. The success rate was only 66%, and would likely have been even lower if a less-skilled listener, less-familiar speakers, or shorter, degraded, or distorted (e.g., shouted) stimuli had been involved, or if identical twins were included among the speakers. Moreover, there is at least some experimental evidence that listener expectations affect earwitness identification.

Other voice identification strategies that have been presented as evidence in the courtroom are analyses of recorded voices that rely on solid scientific principles such as acoustic phonetics. These may involve spectrograms -- printouts of the acoustic output of the speaker's vocal tract -- or the newer "reassigned" spectrograms, which are targeted, phase-enhanced images of this same acoustic output. Again, the success rate has much to do with the quality of the recording (sufficient length and clarity are essential) and also with the skill of the analyst (expert phoneticians perform significantly better than laypersons).

In this course we will examine the success rate of all of these methods, and in addition consider their robustness in the presence of noise, and also under mimicry and disguise. Students will receive instruction in some of the most promising speaker-identification strategies developed to date, and will be challenged to identify voices, objectively, on their own. The main emphasis will be on the scientific analysis of the recorded voice, based on precise measurements of vocal overtones, the pitch of the voice, speech rate, the 'open quotient' of the vocal cords, and other characteristics such as breathiness and creak.

As a way of understanding the articulatory differences that underlie the acoustic differences, we will study the architecture of the larynx, and also its development (along with the
supralaryngeal articulators) from childhood through adolescence and adulthood, in normal subjects and in those with dwarfism.

Grades for this course will be based on a critical review of a journal article or other (pre-approved) source; on class participation, including the creation and evaluation of voice comparisons; and on a final paper. Any necessary instruction in the theory and methodology of phonetics (the study of sounds) will be provided in class for the benefit of those who are new to linguistics. There are no prerequisites for this course.

Course information:
Time and place: Mondays and Wednesdays, 2 to 3:20 pm in Kaprelian 166
Instructor contact: Sandra Ferrari Disner, Ph.D. sdisner@usc.edu
Office hours: Monday 11 – noon and Friday 11 - noon in GFS 301n

The components of the final grade will be weighted as follows:
• term paper, representing original research, and its presentation in week 15 (50%).
• critical review of one of the assigned readings, or other (pre-approved) source (15%)
• class participation and creation and interpretation of speech demos (35%)

The textbook for this course is Foundations of Voice Studies, by Jody Kreiman and Diana Sidtis (Wiley-Blackwell 2011). A copy will be on loan shortly in Leavey Library. The textbook will be supplemented by articles provided on Blackboard by the instructor.

January 12: [class meeting cancelled]

January 14: Overview
“Who Said That?” (Solan & Tiersma 2005)
“The Law Is Not Science” (Ladefoged 2004)

January 21, 26 and 28: Earwitness identification
“The ability of listeners to identify voices” (Ladefoged and Ladefoged 1980)
“Expectation affects identification by listening” (Ladefoged 1978)
Foundations of Voice Studies, chapter 7

February 2 and 4: Tutorial on the fundamentals of acoustic phonetics
Vowels and Consonants (Ladefoged & Disner 2012) , chapters 3-6

February 9: Voice quality: physical, psychological, and social characteristics
Foundations of Voice Studies, chapter 1 “Introduction”

February 11: Voice quality (continued)
Foundations of Voice Studies, §2.6 and §2.7 only
February 18 & 23: A testable model of how speakers differ
*Foundations of Voice Studies*, read §8.3 and review §1.3
“The Phonetic description of voice quality” (Laver 1980)

February 25 & March 2: Making and interpreting sound spectrograms
*A Course in Phonetics*, ch. 8 (Ladefoged & Johnson 2011)
“A Simple guide to using Praat” (Li 2010)

March 4 & 9: Sound spectrograms (continued)
*Foundations of Voice Studies*, read §10.1-10.2.2
“Hearing Voices: Speaker Identification in American Courts” (Solan & Tiersma 2003)

March 11 & 23: Developmental changes in the vocal articulators, and gender differences
*Foundations of Voice Studies*, chapter 4 “Physical Characteristics and the Voice”
(only pp. 110-130 and 150-155)
“Inferring speakers' physical attributes from their voices” (Krauss et al. 2002)

March 25 & 30: The differing identification rates of familiar and unfamiliar voices
Special guest: Prof. Jody Kreiman, Dept of Head & Neck Surgery, UCLA
*Foundations of Voice Studies*, chapter 5 “Recognizing Speaker Identity from Voice”
(pp. 156-179 only)
“Unfamiliar voice discrimination and familiar voice recognition are independent and unordered abilities” (Van Lancker & Kreiman 1987).

April 1: The vocal folds in motion: reassigned spectrograms
“A Spectrogram for the twenty-first century” (Fulop & Fitz 2006)

April 6 & 8: Dialect variation: cues from regional accents of the US and around the world.
Special guest: Prof. Louis Goldstein, USC Dept. of Linguistics and Haskins Laboratories
“The Judicial Testing of Linguistic Theory” (Labov 1988)

April 13 & 15: The effects of mimicry and disguise
“Effects of selected vocal disguise” (Reich & Duke 1979)
“Detection of imitated voices” (Eriksson et al., 2010)
*Foundations of Voice Studies*, §7.2.4 and §7.2.5

April 20 & 22: Conclusions
“Current methods in forensic speaker identification” (Cambier-Langeveld 2007)
“Speaker Recognition and Forensic Phonetics” (Nolan 1997)

April 27 & 29: Discussion of projects (preliminary version only; final due in exam week)

May 11 (2 – 4 pm): Submission of term papers (in the classroom)
Bibliography of Required and Optional Readings


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Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 10.00 http://scampus.usc.edu/university-student-conduct-code/ The recommended
sanctions are located in Appendix A: http://scampus.usc.edu/files/2011/08/appendix_a.pdf. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.