and the magnitude of the correlation showed clear gender effects. Results will be discussed in terms of the linkage between planar kinematic data and acoustic data in predicting speech-intelligibility deficits. [Work supported by NIH DC03723 and DC000820.]

4pSC10. Effects of central dopaminergic stimulation by apomorphine on producing sentence focus in speech production in Parkinson's disease—a preliminary report. Q. Emily Wang (Dept. of Commun. Disord. and Sci., Rush Univ., Rush-Presbyterian-St. Luke's Medical Ctr., Chicago, IL 60612), Yi Xu (Northwestern Univ., Evanston, IL 60208), Katie Kompoliti, and Christopher G. Goetz (Rush Univ., Rush-Presbyterian-St. Luke's Medical Ctr., Chicago, IL 60612)

It is well documented that when a sentence focus is produced, the f_0-range of the word under focus is expanded while the f_0-range of the post-focus words is suppressed. It is also a well-known fact that individuals with Parkinson's disease (PD) exhibit reduced ability in pitch modulation, resulting in a perceptual quality of ''monopitch'' in connected speech. Although the use of dopaminergic stimulation improves other physical symptoms such as balance and walking in PD, it is unclear whether a similar effect will be found on vocal folds, producing an improvement in patients' ability in pitch modulation. In this study, five nondemented English-speaking individuals with a clinical diagnosis of idiopathic PD (Hoehn and Yahr stage 3 and 4, off) were examined for their ability in pitch modulation in association with Apomorphine, a nonergot dopamine agonist. Two six-word sentences with four sentence focus variations each were used. Subjects randomly produced three repetitions of each focused version at baseline and two clinical conditions: injected with placebo or apomorphine. Perception tests and acoustic analyses were conducted to determine changes in these patients' ability to produce sentence focus. Implications of the findings are discussed in terms of speech motor control.

4pSC11. A quasi-one-dimensional model for speech production. Wei Zhao, Zhaoyan Zhang, Steven H. Frankel, and Luc Mongeau (School of Mech. Eng., Purdue Univ., West Lafayette, IN 47907)

A quasi-one-dimensional model for speech production was developed. The unsteady quasi-one-dimensional Euler equations with temporal and spatial area variation were solved using a fourth-order accurate Runge–Kutta scheme for time integration and a sixth-order compact finite-difference scheme for spatial discretization. A model for wall friction was used, and a model for the pressure loss associated with flow separation at the glottis was derived. The code was validated by calculations of steady isentropic flow through a nozzle and an acoustic standing wave in a tube with uniform cross-sectional area. A simple geometry was then used to simulate the acoustic wave generated in the vocal tract. The results are in qualitative agreement with data from experiments obtained using a dynamic model of the larynx. [Work supported by NIH DCO 3577-02, RO1 grant from NICDC.]

4pSC12. Articulatory speech synthesis and the analysis of boundary conditions. Jun Huang, Stephen Levinson (Univ. of Illinois, 405 N. Mathews Ave., Urbana, IL 61801, jhuang@ifp.uiuc.edu), Scott Slimon, and Don Davis (Electric Boat Corp., Groton, CT 06340)

In this work, a computational fluid dynamics (CFD) approach was used to model the unsteady fluid flow in idealized human vocal tracts. The speech waveform synthesis was based on the slightly compressible Reynolds-averaged Navier–Stokes (RANS) equations. A K-epsilon turbulence model has been used to represent the effects of turbulence. The vocal tract geometry was determined from the mid-sagittal cut through the three-dimensional vocal tract shape. The moving vocal tract shapes during the speech articulation were estimated using interpolation technique. The excitation signal for the simulation was accomplished by specifying a time-varying area at the inlet to the bottom of the pharyngeal cavity and a sawtooth waveform was used to represent the area variation in time. Different boundary conditions were applied at the inlet of the vocal tract. One is based on specifying the volume velocity and the other is based upon specifying the particle velocity, respectively. We will further analyze the effects of different boundary conditions using an analogy of transmission line T-network. Finally, we will present the waveform and spectrum of some synthesized voiced sounds based on the above CFD approach and boundary conditions. [This work was supported by Motorola and NSF.]

4pSC13. Glottal pressure profiles for a diameter of 0.04 cm. Ronald C. Scherer and Daoud Shinwari (Dept. of Commun. Disord., Bowling Green State Univ., Bowling Green, OH 43403, ronalds@bgnet.bgsu.edu)

Computer models of phonation often rely on aerodynamic equations for flow through the glottis. Usually the aerodynamic equations have come from empirical work with steady-flow models made from hard material. The equations simplify the pressure-flow-geometry relations through the larynx. The model used here (model M5) has 14 pressure taps on the vocal folds to give rather complete pressure profiles. Pressure profiles will be reported for symmetric glottal shapes, a minimal diameter of 0.04 cm, and nine glottal angles (uniform; convergent, and divergent 5, 10, 20, and 40 deg) for transglottal pressures of 3, 5, 10, and 15 cm H_2O. The glottis is rectangular in the anterior–posterior direction, with a glottal length of 1.2 cm. Results indicated that the pressure coefficient for the glottal entrance ranged from 1.09 to 1.60 with an average of 1.33 (compared to van den Berg's 1.375). The value decreased as flow increased for any specific glottal angle. The transglottal pressure coefficient ranged from 1.00 to 1.82 with an average of 1.28. The average value for the uniform glottis was 1.63. Values decreased as flow increased. Pressure profiles will be compared to predictions from current glottal aerodynamic equations. [Work supported by NIH Grant 1R01DC03577.]

4pSC14. Syllable-boundary magnitudes from jaw movement patterns. Bryan Pardo and Osamu Fujimura (Speech and Hearing Sci., The Ohio State Univ., 1070 Carmack Rd., Columbus, OH 43210-1002)

The C/D model [O. Fujimura, J. Acoust. Soc. Jpn. (E) **13**, 39–48 (1992)] describes rhythmic patterns of utterances by amplitude-controlled pulse trains, each pulse representing a syllable or a boundary. The syllable magnitude (pulse height) controls mandibular movement. Assuming a direct proportional relation between the two variables, the syllable magnitude for each occurrence of five, nine, and Pine under various prominence conditions was inferred using Erickson's Pine Street dialogue data [Erickson, Fujimura, and Pardo, Lang. Speech **41**, 395–413 (1998)], which contained repeated corrections of the street address. A computational procedure has been devised to process semi-automatically microbeam data produced by two male and two female speakers. The timing of each syllable pulse was determined using the iceberg method [O. Fujimura, J. Acoust. Soc. Am. **99**]. Syllable durations were determined in proportion to the syllable magnitudes. Boundary magnitudes were represented by the gaps among syllable durations. The syllable and boundary durations thus determined reasonably agreed with acoustic durations. [This work was supported in part by NSF Grant Nos. SBR-951199B, SBR-9809046, and BCS-9977018 (O. Fujimura) and by ATR/MIC, Japan.]