elasticiy and viscosity were observed with the induced changes in hydra-

tion. These findings supported the hypothesis that hydration affects voice
production by altering tissue viscoelastic properties.

3aSC11. Analysis of asymmetric vocal fold vibrations in a finite-
element model. David A. Berry (UCLA School of Medicine, Div. of
Head and Neck Surgery, 31-24 Rehab Ctr., Los Angeles, CA 90095-1794,
daberry@ucla.edu) and Fari Alipour (Univ. of Iowa, Iowa City, IA
52242)

Asymmetric vibrations of a finite-element model of the vocal folds
were analyzed using the method of empirical eigenfunctions. In a previous
study of symmetric vibrations from the model, periodic vibrations yielded
two dominant eigenfunctions, which were related to the theoretical normal
modes of the model. In a more recent study, the method of empirical
eigenfunctions was applied to high-speed endoscopic imaging of vocal
fold vibration on human subjects, suggesting several mechanisms of ir-
regular vibration. However, in the in vivo study, the investigation of em-
pirical eigenfunctions was limited to the superior view provided by endo-
scopy. The results of the present computational study were compared with
the in vivo study, while providing additional information regarding vocal
fold vibration along the medial surface of the folds. Moreover, the com-
putational study allowed the asymmetric vibrations to be studied system-
atically as a function of tissue stiffness. [Work supported by Grant No.
R29 DC03072 from the National Institute on Deafness and Other Com-
munication Disorders.]

3aSC12. Wavelet analysis of turbulence in the glottal jet flow.
Fariborz Alipour (Dept. of Speech Pathol. and Audiol., Univ. of Iowa,
Iowa City, IA 52242-1012)

Airflow from the lungs drives the vocal folds into oscillation and exits
the glottis as a turbulent jet, even though laminar flow is documented
entering the glottis. Incomplete glottal closure may result in air leakage
that becomes turbulent. This turbulence is thought to be the main source
of breathiness in the voice. Few studies have measured degree of turbulent
noise in the glottis. This turbulent noise adds significant amounts of en-
ergy to the voice signal and cannot be extracted easily without changing
the voice. In this study, the turbulent jet was investigated in an excited
 canine larynx model with simultaneous recordings of air particle velocity,
subglottal pressure, airflow rate, and EGG signal for various conditions
of phonation. The velocity was measured with a constant-temperature hot-
wire anemometer system. To separate the turbulence from the periodic
component of the velocity signal, the technique of wavelet denoising was
employed. In this method, unlike the Fourier transform which decomposes
the signal into periodic components, wavelet denoising uses template
matching transform to approximate the signal with different resolution or
scale. Results indicate that the high resolution part contains the turbulent
noise. [Work supported by NIDCD Grant No. R01 DC03566.]

3aSC13. Effects of syllable position on F0 and duration in Mandarin
disyllabic words. Ching X. Xu and Yi Xu (Dept. of Commun. Sci. and
Disord., Northwestern Univ., Evanston, IL 60208, qxj@northwestern.edu)

In a previous attempt to fit a pitch target approximation model for F0
contours in Mandarin disyllabic words [Xu et al. (1999)], it was found
that the implementation of tonal targets required two sets of values for the
model parameters, one for each of the two syllable positions. This sug-
gests that syllable position may have an effect on the production of the
syllable. The present study is designed to further examine this position
effect. One-hundred-eleven disyllabic words with various tonal combina-
tions were read by native Mandarin speakers with two carrier sentences.
Duration and F0 analyses were performed. Preliminary results indicate
that a syllable has longer duration, higher F0, and closer-to-ideal F0 shape
when it is in the first position than in the second position. These results
agree with previous acoustic-phonetics findings about Mandarin
disyllabic words, and together they seem to suggest that the first syllable
in a disyllabic word is more stressed than the second one. Interestingly,
this appears to be at odds with current phonological theories about Man-
darin prosody, which maintain that the second syllable carries greater
weight than the first in a disyllabic foot. Possible causes for this discrep-
ancy will be discussed.

3aSC14. Experiment on pitch target approximation model for
generating Mandarin F0 contour. Xuejing Sun, Ching X. Xu, and Yi
Xu (Dept. of Commun. Sci. and Disord., Northwestern Univ., 2299 N.
Campus Dr., Evanston, IL 60208, sunxj@northwestern.edu)

In the present study, an experiment was conducted to generate F0
contours for Mandarin with a pitch target approximation model proposed
in Xu, Xu and Luo (1999). In this model, F0 contours in speech are
assumed to be resulting from asymptotic approximation to underlying
pitch targets that are either static or dynamic. The model parameters were
estimated through nonlinear regression using the Levenberg–Marquardt
algorithm. The speech corpus consisted of sentences from Voice of
America broadcasting news. After the regression analysis, sentences were
re-synthesized with the generated F0 using the TD-PSOLA technique.
Preliminary results indicate that F0 contours generated by the model are
close to the original both numerically and perceptually. Furthermore, most
underlying pitch targets obtained through the regression analysis seem to
match the models basic assumptions. However, it is also apparent that
information about both higher-level linguistic functionality and additional
low-level articulatory constraints is needed to account for the numerical
variations in the estimated parameters. In general, the results are encour-
aging as they show that the model can generate close-fitting F0 contours
even with strong linguistic assumptions. This suggests that it has the po-
tential to evolve into a system with the predictive power desirable for
intonation modeling.

3aSC15. Pitch peak alignment as a function of lexical and pragmatic
factors in two dialects of Serbian/Croatian. Rajka Smiljanic (Univ. of
Illinois at Urbana–Champaign, 707 S. Mathews, Urbana, IL 61801)

This study examines the patterns of pitch peak retraction under focus
in Serbian/Croatian (S/C). Acoustic measures of pitch peak alignment
were used to identify the effect of pragmatic focus on pitch realization in
two dialects of S/C with typologically distinct prosodic systems. In the
Belgrade dialect there is a lexically determined contrast between two tonal
alignments: early peak (‘‘falling accent’’) and late peak (‘‘rising accent’’).
In the Zagreb dialect there is no such lexical distinction; instead, each
word typically receives a pitch prominence on the stressed syllable. Sub-
jects produced target words with neutral intonation and with narrow/
contrastive focus. The peak alignment under these two pragmatic condi-
tions was shown to vary in the two dialects. Zagreb shows peak retraction
from late (neutral intonation) to early peak (narrow focus). In this way it is
similar to other stress languages (e.g., Spanish). Belgrade, with lexically
contrastive peak alignment, shows much less pragmatically conditioned
variation in the position of accentual peaks. The two types of pragmati-
cally conditioned alignment in Zagreb correspond closely to the two lex-
cially determined alignments of Belgrade. This suggests that the existence
of the lexical contrast limits the pitch variation due to the pragmatic in-
fluence, while in the absence of such contrast, pragmatic factors entirely
determine peak alignment.

3aSC16. Acoustic/prosodic characteristics of repetitions and
substitutions in medical dictations. Guergana K. Savova (Univ. of
Minnesota, Minneapolis, MN and Lernout & Hauspie, 5221 Edina
Industrial Blvd., Edina, MN 55439)

This paper describes the results of a pilot study on the acoustic char-
acteristics of two types of disfluencies exact repetitions and exact substi-
tutions. The study was conducted at Linguistic Technologies, Inc., a com-