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# Spectral Analysis of Candidates' Nonverbal Vocal Communication: Predicting U.S. Presidential Election Outcomes*

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*Fast Fourier Transform acoustic analysis of the fundamental frequency of candidates' voices in 19 nationally televised U.S. presidential debates from the eight elections including debates held since 1960, in conjunction with subsequent factor analysis, shows that this nonverbal frequency, below .5 kHz, can reveal the debating candidates' relative social dominance. Further analysis presents evidence that the candidates' nonverbal vocalizations offer a precise metric of their relative dominance or commanding presence in the presidential campaign: when this metric is compared statistically with the candidates' popular vote percentages for the U.S. presidency, it accurately predicts the popular vote outcomes in all of those eight elections.*

In previous research by the senior author and colleagues (Gregory 1983, 1986), interview partners were found to adapt frequencies of their voices to one another in the course of their interaction. Subsequent work has refined the theory and method in this line of research by showing that the acoustic adaptation phenomenon resides beneath .5 kHz, otherwise known as the fundamental frequency of phonation ($F_0$) and perceived as beneath .5 kHz, is unique in the vocal adaptation literature.

The $F_0$ is a critical component of human vocalization. When the voice is filtered electronically, however, allowing only the $F_0$ to pass, the resulting sound is perceived as a low-pitched and segmented hum absent of any clearly discernible verbal content. When experimental subjects' vocal frequencies beneath $F_0$ are filtered from the normal con-

pitch in the vocal spectrum (Gregory 1994; Gregory, Dagan, and Webster 1997; Gregory and Webster 1996; Gregory, Webster, and Huang 1993). Although the adaptation phenomenon in conversations and interviews has been reported widely by linguistic, social psychological, and communication researchers (Burgoon, Dillman, and Stern 1993; Burgoon, Stern, and Dillman 1995; Capella 1981; Chapple 1940; Jaffe and Feldstein 1970; Natale 1975), the method used, employing spectral analysis of the frequency band versational signal (leaving behind a crisp, clear verbal signal), the perceived quality of interaction, as evaluated by outside judges hearing an unfiltered version of the experimental subjects' conversational exchange, is diminished significantly (Gregory et al. 2000; Gregory et al. 1997). Thus it is evident from previous studies that the low-frequency band beneath $F_0$ is crucial for communicating critical social information.

Analysis of the $F_0$ in interacting partners' voices also indicates partners' relative social status (Gregory et al. 2000; Gregory and Webster 1996). This observation fits well with Giles and Coupland's (1991a, 1991b) communication accommodation theory, known as CAT, whereby persons of lower social status accommodate their nonverbal vocal patterns to persons of higher status; the latter modify their vocal patterns relatively little. CAT was used in previous research (Gregory and Webster 1996) to explain the acoustic accom-

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