

BOOK REVIEW

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A Review of The Acoustics of Crime: The New Science of Forensic Phonetics

REFERENCE: Hollien, H., *The Acoustics of Crime: The New Science of Forensic Phonetics*, Plenum Press, 233 Spring St., New York, NY 10013, 1990.

This is an excellent book by a leader in the field. Professor Hollien has been conducting research in some aspects of forensic phonetics (notably speaker identification) for almost a quarter of a century. He writes well and explains complex topics in a way that a layman can grasp easily. Any lawyer, law enforcement officer, scientist, or criminal who is concerned with acoustic evidence will profit from a thorough reading of this book.

The book begins with a good section on the acoustics and physiology of speech, which provides sufficient background for beginners in the field. Hollien is sometimes somewhat idiosyncratic in the terminology he uses in these introductory sections. The normal term for a plot of the amplitudes of the component frequencies in a sound is a spectrum. Hollien calls this an instantaneous spectrogram. I do not know any scientific journal in the field that allows this usage. Hollien coins the phrase "t-f-a spectrogram" for a three-dimensional plot in which time is shown on the abscissa (from left to right) frequency on the ordinate (bottom to top) and amplitude by relative darkness. The abbreviation "t-f-a" (for time-frequency-amplitude) is virtually unknown in the literature. This kind of display is normally simply called a spectrogram. But with these exceptions noted, these early sections provide a good basis for anyone needing to study forensic phonetic issues.

The section on recording techniques is mainly concerned with reel-to-reel tape recorders with very little mention of cassette recorders, which I find odd, as cassette recorders are nowadays equally important. There is a good section on techniques to use when listening to a tape, some of which were new to me, and I will certainly use in the future. For example, I had not used his technique of listening to a suitably filtered recording in one ear while playing an attenuated unfiltered version of the same recording into the other ear. This makes decoding some noisy tapes much easier. But Hollien omits a number of fairly common techniques that are also helpful. Most professional forensic phoneticians that I know use computers to supplement (not to replace) tape recorders as sources of sound. Using digitized speech, it is easy to play small parts of a recording over and over again. A portion of a recording can also be reproduced at a slower speed without the pitch being distorted (a useful technique for an experienced listener, but one that sometimes confuses an untrained observer). It is also helpful for a knowledgeable phonetician

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to be able to look at a spectrogram or a waveform of a recording as it is being played. All these techniques are readily available using commercial programs such as SoundEdit on a Macintosh recorder or C speech on an IBM. They do not replace the use of high fidelity tape recorders and associated hardware. But they are a great help in many cases.

The third part of the book, on speaker identification, is more uneven. There is a good overview of the problem. This is followed by an important chapter on speaker identification in which Hollien considers the use of sound spectrograms, the acoustic analyses that show the component frequencies of each sound. Analyses of this kind are sometimes called "voiceprints"—a terrible term, as it falsely implies that they are something like fingerprints. Hollien's biases concerning voiceprints are evident from the very beginning of the chapter on the topic. This chapter starts by stating that "Voiceprints are a problem that simply will not go away." He then goes on to note that "the proponents of this method of speaker identification claimed that their approach had been accepted by courts of law in 25 of the states within the United States, by two military courts, plus by two courts in Canada." Why does he say that this is a claim? Is he disputing the truth of this remark? He suggests that "voiceprints" face the "general disapproval by the relevant scientific community." But on the same page he says that there is "a lack of interest (or concern) about these issues by the relevant scientific community." If this community is disinterested how could they have a basis for disapproval?

Hollien is quite right to point to numerous deficiencies in the so-called "voiceprint technique" as it has often been practiced in the past. But one should not go to the other extreme and make it seem that sound spectrograms can be of no help in identifying voices. Spectrographic analyses clearly have evidential value. When I was presented with 20 min of a studio recording of the known voice of L. Ron Hubbard giving a Christmas message, and then another studio recording known to have been made one year later of allegedly the same voice, it was not difficult for me to make spectrographic analyses that showed that they were extremely likely to be the same voice, and therefore Mr. Hubbard was still alive. (I was right, as subsequent events later showed.) In other cases, given 10 s of a noisy bomb threat, I would agree with Hollien that spectrograms would be of no help in identifying an unknown caller. The use of sound spectrograms for speaker identification should not be regarded as a simple in or out issue. In some cases they should be kept out; but in other cases, they should be admitted as evidence.

Much of the chapter on computer approaches to speaker identification is given to an account of the work of Hollien's own group. This is fair enough in that his work on SAUSI (semiautomatic speaker identification) systems is extensive and well documented, unlike other work in this field, much of which is not in the public domain for commercial reasons. Hollien outlines his system that establishes a profile for each speaker in terms of a number of variables, such as the long-term frequency spectrum and various aspects of the fundamental frequency. He shows that this system looks promising, though much remains to be done before it can be regarded as fulfilling many forensic science needs.

There is a useful chapter summarizing work on psychological stress in which Hollien points out there are certain trends "speaking fundamental frequency, nonfluencies, vocal intensity and speaking rate are raised for stress," but "we do not have definitive information about the areas in question and anyone who tells you that they do is not being truthful." He also reviews work on vocal stress and lie detectors and concludes (as would I) that "voice analysis technique is of no value in the detection of deception."

The book ends with a chapter on ethics and responsibilities, which it is certainly appropriate to include. However, Hollien is occasionally long-winded and irrelevant, and this chapter contains too many generalities that could have been pruned. Furthermore, it does not discuss adequately the important matter of who is an expert on phonetic issues of forensic science importance. Is someone who teaches phonetics necessarily good at identifying voices? Does someone who uses a sound spectrograph almost daily necessarily

know anything about the way to distinguish spectrograms of different voices? Does being a Fellow of the Acoustical Society of America in the Speech Communication section mean that one should qualify as an expert on forensic speech issues? All these questions have come up in cases with which I have been associated. I suspect that Hollien would answer no to all of them (as I would). But I wish that he had explicitly said so.

These are, however, minor deficiencies, and Professor Hollien is to be congratulated on having produced a good book that will be useful to a wide range of people.