H121   On Repeatability in Nature and Human Identification

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The goal of this presentation is to ask the scientific audience to re-evaluate the framework that has traditionally been the basis for human identification studies. A bottom-up rather than a top-down approach to studies involving human variation as it relates to identification is suggested.

This presentation will impact the forensic science community by demonstrating the utility of the human ear in image comparison cases and by offering an alternate conceptual framework for human identification.

The impetus for this presentation is a series of questions that arose during the trial of a 2008 robbery/homicide suspect from Michigan. The criminal act was captured on surveillance video and multiple images of the perpetrator's left ear were clearly visible. Forensic anthropologists at Michigan State University used a dynamic orientation protocol to capture comparable images of the suspect, morphological analysis, and superimposition to present compelling evidence that linked the offender's ear with the primary suspect in the case.

A question that is typically raised during cross-examination in such cases is, "Are all ears (fill in the structure) different?" One way to answer that question (the empirical, top-down approach) would be to say that no two ears have ever been shown to be exactly alike, based on the samples that have been analyzed. An expert witness could cite Iannarelli who famously is said to have compared some 10,000 ears and found all to be detectably different.[1-4] Then the question becomes, "Just because there were no two identical ears in a sample of 10,000, how do you know there won't be a pair of identical ears in a sample of 20,000 or 100,000?" It is impossible to answer such questions because that would require direct observation of all human ears.

Rather than the traditional empirical (top-down) approach, the question is posed; "Are all ears different?" is better answered with a bottom-up approach, based on the simple and long-accepted principle that nature never repeats itself. No two oak trees, snowflakes, zebra stripe patterns, fingerprint patterns, sets of teeth, irises, or ears are completely identical. Each organism and each component of an organism is produced by interactions among genetics, embryology, fetal development, and post-natal environmental influences. There is a DNA component (certain characteristics run in families); the embryology of any structure is complicated and related to a host of intrauterine variables including the endocrine environment and maternal nutrition; and then, not unlike shoe and tire prints, the anatomical feature will be altered by its continued exposure to an environment.

Of course, the challenge to the forensic community is to detect the anatomical variation that makes all structures unique and present it in such a way that it can be applied to human identification cases. While one scientist may be able to detect differences in some structure, it will be of no value unless the forensic community (and ultimately a lay audience) accepts the conclusion that the variation is individualizing.

There may be no doubt in anyone's mind that the two sets of ear images in the case presented represent the same individual. But can it be proven empirically? In reality, no. Theoretically? Only if nature repeats itself.

References:

1. Burge M, Burger W. Ear biometrics. Linz, Austria: Johannes Kepler University, 1999.
2. Choraś M. Ear biometrics based on geometrical method of feature extraction. Lect Notes Compute Sc 2004;3179:51-61.
3. Choraś M. Perspective methods of human identification: ear biometrics. Opto-Electron Rev 2008;16(1):85-96.
4. Abdel-Mottaleb M, Zhou J. Human ear recognition from face profile images. Lect Notes Compute Sc 2005;3832:786-92.

Human Identification, Image Comparison, Ears