B105 Modeling 3D Facial Appearance in Relation to Sex, Genetic Ancestry, and Individual Genes Enables Facial Prediction From DNA

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After attending this presentation, attendees will better understand the variation in 3D facial shape across the globe and how it can vary with respect to sex, genetic ancestry, and individual genes. Attendees will also have a better idea of the methodological challenges involved in predicting complex physical traits using these three variables.

This presentation will impact the forensic scientific community by introducing an approach that represents an important advance in predicting physical appearance from genetic data.

Genomic knowledge, analytical methods, and technology are approaching a stage where questions regarding the evolutionary-genetic architectures underlying variation in human physical traits can be formulated and directly addressed. The recent successes in discovering the genes and histories of skin pigmentation provide compelling examples of this approach. This presentation will review these results and discuss the fundamental considerations in Genotype-to-Phenotype (G2P) mapping especially with regard to the definition and measurement of traits and the use of admixed populations to study recently evolved traits. Using facial features an example trait, both the benefits and challenges inherent in studying phenotypes that are not only multivariate, but are owing to complex patterns of modularity are also multipartite. An approach that has been recently developed to investigate facial variation, called Bootstrapped Response-based Imputation Modeling (BRIM) will also be discussed. This presentation will demonstrate how this technique was used to model the effects of sex, ancestry, and individual genes on the face.

BRIM is unique in that it allows for the compounding of multiple independent response variables into a single scalar customized to the predictor variable of interest. By combining subjective observer assessments of the face with these methods, the capacity to both discover and model the effects of genes on facial features has been demonstrated and provides support for the hypothesis that the pressures of sexual selection shaping the human face are both substantial and dynamic and have also affected the human facial perceptual facilities. These findings will be discussed in light of forensic predictions.

Criminalistics, Molecular Photofitting, Genetics