



A39 A New Version Release of 3D-ID Geometric Morphometric Classification of Crania for Forensic Scientists

Ann H. Ross, PhD*, North Carolina State University, Raleigh, NC 27695-7614; Dennis E. Slice, PhD, Florida State University, Tallahassee, FL 32306-4120; Desiré Brits, PhD, University of the Witwatersrand, Johannesburg, Gauteng 2193, SOUTH AFRICA; Tamara L. Lottering, BSc, University of the Witwatersrand, Johannesburg, Gauteng, SOUTH AFRICA; Candice Small, PhD, University of the Witwatersrand, Johannesburg, Gauteng 1709, SOUTH AFRICA

Learning Overview: After attending this presentation, attendees will understand how to use 3D-ID (www.3d-id.org) to estimate ancestry and biological sex with coordinate data in forensic contexts.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating an easy-to-use and freely available software that can be applied to estimate ancestry on a global scale.

Ancestry estimation is a critical component of the biological profile and in human identification. Traditionally, the estimation of ancestral origin is one of the most difficult parameters of the biological profile to assess, with accurate estimation hinging largely on the experience of the observer. Ancestry has traditionally been oversimplified as a trifecta of the continental populations of Asia, Europe, and Africa. However, this view ignores underlying microevolutionary forces such as gene flow, drift, and migrations that have shaped craniofacial form. 3D-ID addresses this limitation by grouping individuals based on known ethnohistorical origins.

3D-ID applies modern geometric morphometric analyses of three-dimensional landmark coordinates that provides more anatomical information than traditional linear caliper-derived methods. However, these newer modalities have yet to be widely applied in forensic anthropology and victim identification. One of the main humanitarian concerns is the identification of undocumented border crossers at the national and international level. This latest version of the software provides the tools to address this global humanitarian crisis of mass migration of individuals escaping wars, starvation, and displacement within and outside our borders. New reference samples have been added to the latest version of 3D-ID and include West African ($n=93$), East African ($n=36$), Nigerian ($n=30$), Syrian ($n=43$), and Colombian ($n=71$) samples. The Nigerian sample was not grouped with the West African sample as it was found to vary significantly from the other samples included (e.g., Cameroon, Togo, Benin, Liberia, etc.). The sample from Colombia was also not grouped with the South American sample until the extent of variation among the groups (e.g., Chile, Peru) can be validated. The reference population included in the software totals 2,372 individuals from around the world. Another new feature added to the software to facilitate ease of use is that the practitioner can now digitize directly into the software without having to format the coordinate data.

The software was tested on a sample of Black South Africans ($n=100$) from the Raymond A. Dart Collection of Human Skeletons that is not included in the software's reference population. The software had an 89% correct classification rate classifying 8 of the South African crania into "African" and 81 individuals into "African American" reference samples, which reflects the variation present on the African continent and underscores the need for addressing the migrant crisis on a global scale.

This project was funded by a National Institute of Justice grant and a Forensic Technology Center of Excellence-RTI grant.

Ancestry, Geometric Morphometrics, Software