## H23 A New Metric Procedure for the Estimation of Sex and Ancestry From the Human Innominate

*Alexandra R. Klales, BA*, Jennifer M. Vollner, BS*, and Stephen D. Ousley, PhD, Mercyhurst College, Department of Anthropology & Applied Forensic Science Program, 501 East 38th Street, Erie, PA 16546*

After attending this presentation, attendees will learn of a new metric approach to estimate sex and ancestry of the human innominate that utilizes both easily repeatable measurements and well defined landmarks. Attendees will also learn of the benefits of using a Microscribe digitizer to calculate the aforementioned measurements and for data collection.

Sex and ancestry estimation are essential for the assessment of biological profile in both forensic cases and in bioarchaeological analysis. In turn these estimations are necessary to asses other aspects of biological profile such as stature and age. This presentation will impact the forensic community by demonstrating an approach that combines both old and new metric sex and ancestry estimation techniques of the human innominate which are both more reliable and more accurate than previously published methods.

The human innominate has previously been examined through multiple metric and non-metric studies and, based on morphological characteristics, has been determined by many to be the most accurate bone for sex estimation. However, in light of *Daubert vs. Merrell Dow Pharmaceuticals, Inc.* (1993), most previous methods fail to meet the *Daubert* requirements or are of questionable reliability and validity; therefore, an opportunity to improve upon past research is presented. In addition, an attempt was made to examine the usefulness of these measurements for ancestry estimation.

A sample of 77 left innominates from the Hamann-Todd Collection, housed at the Cleveland Museum of Natural History, was utilized in this study. All individuals were adults, at least 19 years of age, of known sex and ancestry. A total of 22 measurements were taken by two observers, first as a preliminary study using sliding calipers, and then at a later date using a Microscribe G2 Digitizer to acquire 21 landmarks representing the previous 22 measurements. All data was then entered into Fordisc
3.0 (Jantz & Ousley, 2005) and analyzed through discriminant function analysis (DFA) with forward stepwise selection for sex, ancestry, and for joint sex-ancestry estimation.

This study used a sample of individuals of documented sex, ancestry, and age to achieve the following goals: (1) to qualify previously studied non-metric sex estimation traits through metric analyses, (2) to test previously defined metric methods for reliability and validity, (3) to refine previously published measurements by developing new landmark definitions that are easily understood and landmarks that are easily identifiable and produce reliable measurements, (4) to analyze the significance and utility of the new measurements through discriminant function analysis, and (5) to compare the concordance of measurements taken with calipers to those taken with a Microscribe digitizer. Furthermore, this study investigates the effectiveness of these measurements in ancestry estimation and also in joint sex-ancestry estimation.

Initial results indicate that measurements from the current study show greater reliability and validity with the use of discriminant function analysis than previously published measurements, while also producing a known error rate in accordance with the *Daubert* requirements. Benefits of using the digitizer include: increased data recording efficiency, fewer data entry errors, and the localization of landmarks in 3-D space. The current study will positively benefit future sex estimation using the innominate and will demonstrate the advantages of digitizing the innominate over the use of sliding calipers, though either can be used for sex estimation using DFA. In addition to sex estimation, the current study will also discuss the effectiveness of using the innominate to estimate ancestry and simultaneous sex and ancestry.

**Innominate, Sex and Ancestry Estimation, Discriminant Function Analysis**

 ** Presenting Author*