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## **Morphological Scoring of Dental Casts Using the Arizona State University Dental Anthropology System**

Jared Anton McCoy  
*University of Tennessee - Knoxville*

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# UNIVERSITY HONORS PROGRAM

## SENIOR PROJECT - APPROVAL

Name: Jared McCoy

College: Arts & Sciences Department: Anthropology

Faculty Mentor: Dr. Murray Marks

PROJECT TITLE: Morphological Scoring of Dental  
Casts Using the A.S.U.P.A.S.

I have reviewed this completed senior honors thesis with this student and certify that it is a project commensurate with honors level undergraduate research in this field.

Signed: Murray K. Marks, Faculty Mentor

Date: 5.7.04

Comments (Optional):

*Mr. McCoy has independently worked this semester qualifying dental morphological data from prehistoric Hawaiian Islands. The purpose of this research was twofold; 1) document (collect data) on this heretofore unknown collection of dental casts and 2) provide him the crucial experience/practice in recognizing dental morphological structures that will be important for his dental school requirements. Jared, as mentioned, worked with little supervision after initial exposure to the techniques and materials and demonstrates a penchant for research and independent thinking. These casts have been stored since initially collected over fifty years ago and this data will be utilized to provide a dental morphological assessment, across time,*

between ancient and modern (Sennodant)  
groups. Such will help the clinical  
administration of health care to native Hawaiians.  
In short, it has been a pleasure mentoring  
Mr. McCoy. By his performance in Dental  
School is similar, that experience will  
be most successful.

Murray R. Marks  
Assoc. Professor

Morphological Scoring of Dental  
Casts Using The Arizona State  
University Dental Anthropology  
System

Jared A. McCoy

The tissues that make up the human dentition are the most mineralized and most durable tissues in the human body. Teeth can maintain their form for long periods of time and make up about 90% of the fossil record. Therefore, the morphology of the human mouth is very important to anthropologists. The Arizona State University Dental Anthropology System is a morphological scoring system used by anthropologists to collect data on the human dentition.

In my Senior Honors Project I used the Arizona State University Dental Anthropology System to take morphological data on dental casts from Hawaii. Some of the dental casts were from living Hawaiians, Japanese, fossils recovered in Hawaii, and other unknown groups. I chose this as my Senior Honors Project because dental morphology is also very important in the field of dentistry, and I have been pursuing a career in dentistry for seven years.

The traits observed by the Arizona State University Dental Anthropology System are reliable and easily observed. They can be identified if the dentition has become degraded, and they have no sex dimorphism. Also, these traits "powerfully characterize populations for



affinity studies."<sup>1</sup> The following is a description of the traits observed.

**Tooth status:** The presence/absence of each tooth as well as the degree of attrition.

**Winging:** Rotation of the upper central incisors either mesiolingually or distolingually.

**Shoveling:** The presence of lingual marginal ridges on the upper incisors and canines.

**Labial Convexity:** The degree of curvature on the labial surface of the upper incisors.

**Double-shoveling:** The presence of labial marginal ridges on the upper incisors, canines, and first premolars.

**Interruption Groove:** Grooves on the upper incisors, which cross the cingulum and often continue down the root.

**Tuberculum Dentale:** Ridges or cusps of various degrees on the lingual surface of the upper incisors and canines.

**Canine Mesial Ridge:** The variation of size of the mesiolingual marginal ridge of the upper canine in relation to the distolingual marginal ridge.

**Canine Distal Accessory Ridge:** A ridge can appear in the distolingual fossa between the tooth apex and the distolingual marginal ridge of the upper and lower canines.

**Premolar Mesial and Distal Accessory Cusps:** Small accessory cusps can appear at the mesial and/or distal ends of the upper premolars.

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<sup>1</sup> Scott, G. Richard, Christy G. Turner II, and Christian R. Nichol. "Scoring Procedures for Key Morphological Traits of the Permanent Dentition: The Arizona State University Dental Anthropology System." *Advances in Dental Anthropology* (1991): 12.

Meatcone: The size of the distobuccal cusp.

Hypocone: The size of the distolingual cusp.  
Cusp 5: A fifth cusp can appear in the distal fovea of the upper molars between the metacone and the hypocone.

Carabelli's Trait: A groove, pit, depression, or cusp can appear on the lingual surface of the mesiolingual cusp of the upper molars.

Parastyle: A pit or cusp can appear on the buccal surface of the mesiobuccal cusp.

Peg-Shaped Incisor: The lateral incisors can be reduced in size or take on a peg shape.

Odontome: Pin-sized, spike-shaped enamel and dentin projection occurring on the premolar occlusal surface.

Premolar Lingual Cusp Variation: The variation of number and size of the cusps on the lower premolars.

Groove Pattern: The pattern of the groove of the lower molars.

Cusp Number: The number of cusps on the lower molars.

Deflecting Wrinkle: The variation of the medial ridge on cusp 2 of the lower first molar.

Distal Trigonid Crest: A rare condition where a ridge forms between cusps 1 and 2 on the lower molars.

Protostylid: A pit, groove, or paramolar cusp found on the buccal surface of cusp 1 of the lower molars.

Cusp 6: A cusp that can appear in the distal fovea of the lower molars lingual to cusp 5.

Cusp 7: A cusp that can appear in the lingual groove between cusps 2 and 4 of the lower molars.

The intention of the Arizona State University Dental Anthropology System is to create a standard for scoring morphological traits that can be reproduced consistently between observers. In order to help create consistency, plaques are used to give a visual description for many of the traits. On these plaques are examples of each degree of expression of the traits being observed. However, often the observed trait falls between two degrees of expression, and different observers may score the trait at either degree of expression. This can create a small amount of inconsistency between observers.

Another problem I encountered with this project was the poor condition of the dentition. Some of the dental casts only had one jaw instead of two. Most of the dental casts from the recovered fossils were difficult or impossible to score because several teeth were missing. Often there were more teeth missing than were present. Also, there was a high degree of attrition on most of the casts as well.



Because the teeth were so worn several of the traits were unable to be observed. The traits that did show expression even though attrition was high led to a higher degree of inconsistency between observers. These traits were faint and the degree of their expression was based less on the plaques, and more on individual judgment.

Even with these problems data was taken from several hundred dentitions. Most of the dental casts taken from the living Hawaiians were in excellent condition and provided complete and detailed data. The dental casts taken from the living Japanese were more degraded than the Hawaiians, but still provided solid data. The data collecting process proved beneficial to me because I have become very familiar with the human dentition. I can distinguish the differences between the four types of teeth as well as the differences between teeth of the same type. I can determine if the tooth comes from the upper or lower jaw and quite often I can also determine if it comes from the left side or the right side. In addition, I became familiar with many traits of the dentition that can vary between individuals. I am quite certain that my Senior Honors Project has

benefited me and I am sure that it will prove  
valuable to me in my pursuit of a career in  
dentistry.