Analysis of Dental Traits from Revolutionary War Dentition

Lauren E. Wright
Department of Anthropology
Mentor: Dr. Jaimin Weets

Introduction

In the spring of 1776 smallpox was rampant among troops that were stationed in northern New York. As a result, a hospital was created at Fort George in Lake George, NY, where many soldiers succumbed to the disease and were then buried in the surrounding area. In February 2019, an unmarked burial ground that contained over 30 individuals was disturbed during construction, leaving many of the remains damaged and commingled. Due to the nature of the burial ground, the identities of these individuals are unknown, but bioarchaeologists at the New York State Museum have partially reconstructed many, which has allowed for further research regarding their identities. This research project explores the potential ancestry of these individuals by analyzing nonmetric traits on dental remains.

Dental morphology and nonmetric trait expressions are thought to be highly heritable, and genetic research has shown that genes play a large role in trait expression (Scott et al. 2018, 162). This means that familial relationships can potentially be established based on data collected about nonmetric traits. Many morphological traits are also seen more frequently in certain demographic areas (Hillson 1998, 101). When comparing nonmetric data from a sample with world population frequencies, possible ancestries can be determined based on the prevalence of trait expression.

Methods

For this research project the dental remains of 30 individuals from the unmarked burial ground were assessed using the Arizona State University Dental Anthropology System. This standardized system is used to document and assess morphological variations by recording trait occurrence, location, and level of trait expression (Turner et al. 1991, 14). This data was then inputted into an Excel spreadsheet. For comparison, standardized reference molds of different levels of trait expression were also used to ensure consistency when scoring these traits. Examples of these molds can be seen in Figures 1 and 2.

After scoring the dentition, statistical analyses were run using SPSS ver.25 to determine potential ancestry of the group and to assess relationships within the sample. As shown in Table 1 and Figure 3, a total 12 dental traits were used to compare the group of 30 individuals from the unmarked burial ground to world regional populations for ancestry estimation. In the second statistical analysis, 11 individuals were removed from the data set due to a lack of observable data, which left 19 individuals for comparison to one another across 33 dental traits, as shown in Table 2 and Figure 4.

Results

Dental nonmetric trait information from world regional population traits was used for comparison when conducting statistical analyses, as seen in Table 1. These populations include Western Europe, West Africa, Melanesia, Polynesia, and North and South America (Scott and Turner 2000, 178-235). Breakpoints as outlined by Scott and Turner (178-235) were consulted for each trait, and then an average frequency was calculated for the population. Multidimensional scaling was used to assess relationships between the sample and world populations, as illustrated in Figure 3. What I found is that the distance between the sample (labelled X on Figure 3) falls closest to Western European populations. There is some spatial closeness to Melanesian population data, however dental characteristics for this group tend to fall somewhere in the middle of world regional biodistancing research, so this was not an unexpected result (Scott and Turner 2000). Based on this statistical information, I have concluded that the individuals from the burial ground are most likely of Western European descent.

Using multidimensional scaling statistics, relationships between individuals found at the burial ground were assessed on the basis of 33 nonmetric dental traits, as listed in Table 2. As highlighted in Figure 4, there are several clusters circled in purple that are outliers from the main red groups clustered in the center. There are two separate groupings of outliers on the right side of Figure 4 (individuals 1 and 8 and then individuals 10 and 29) that are distanced from the rest of the group. There are also four other outliers (individuals 11, 9,18, and 21) that are outliers from the central group. In the central group of individuals, as marked by red circles, there are two main clusters. This clustering could indicate that the are familial ties between the individuals in each group as nonmetric traits are hereditary.

Traits Used for World Pop. Comparisons		
Groove Pattern	Cusp 6 – Lower Molar 1	Double-shoveling
Cusp Number – Lower Molar 1	Cusp 7 – Lower Molar 1	Hypocone
Cusp Number – Lower Molar 2	Winging	Cusp 5 - Upper Molar 1
Deflecting Wrinkle	Shoveling	Carabelli's Cusp - Upper Molar 1

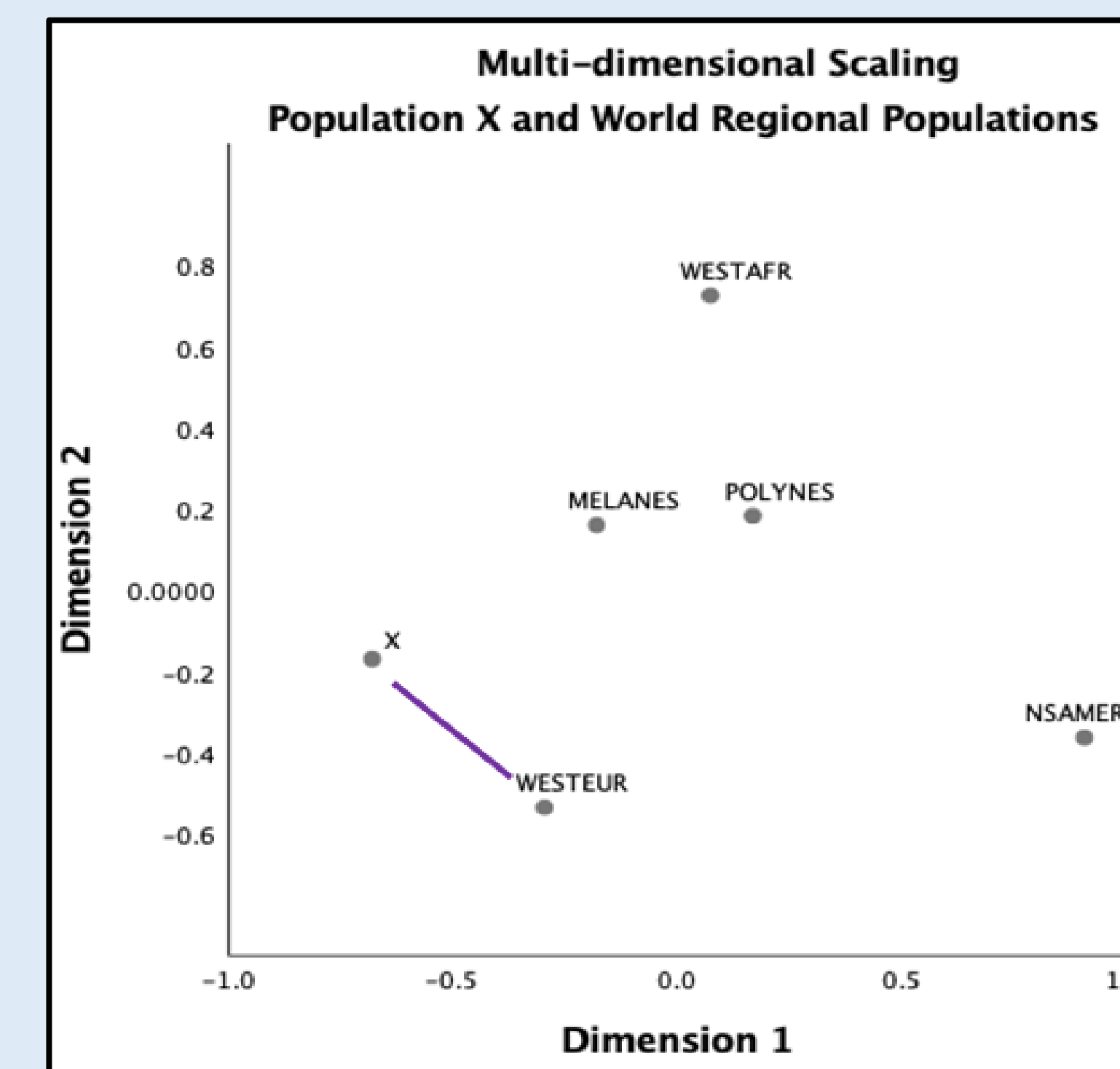Table 1: Traits used for comparison with world population frequencies.

Figure 3: Lake George population compared to world regional populations. (Normalized Raw Stress = .01214; Dispersion Accounted For (D.A.F.) = .98786)

Traits Used for Individual Comparisons		
Winging - Upper Incisor 1	Metacone - Upper Molar 1	Canine Distal Accesory Ridge - Lower
Labial Curve	Metacone - Upper Molar 2	Premolar Lingual Cusps - Lower 1
Shoveling - Upper Incisor 1	Hypocone - Upper Molar 1	Premolar Lingual Cusps - Lower 2
Shoveling - Upper Incisor 2	Hypocone - Upper Molar 2	Anterior Fovea - Lower Molar 1
Double-shoveling - Upper Incisor 1	Cusp 5 - Upper Molar 1	Cusp Number - Lower Molar 1
Teburculum Dentale - Upper Incisor 1	Cusp 5 - Upper Molar 2	Cusp Number - Lower Molar 2
Teburculum Dentale - Upper Incisor 2	Carabelli's Cusp - Upper Molar 1	Deflecting Wrinkle - Lower Molar 1
Mesial Ridge - Upper Canine	Carabelli's Cusp - Upper Molar 2	Protostylid - Lower Molar 1
Canine Distal Accesory Ridge - Upper	Parastyle - Upper Molar 1	Cusp 5 - Lower Molar 1
Premolar Mesial & Distal Accesory Cusps	Shoveling - Lower Incisor 1	Cusp 6 - Lower Molar 1
Distosagittal Ridge	Shoveling - Lower Incisor 2	Cusp 7 - Lower Molar 1

Table 2: Traits used for comparisons between individuals found at the burial ground.
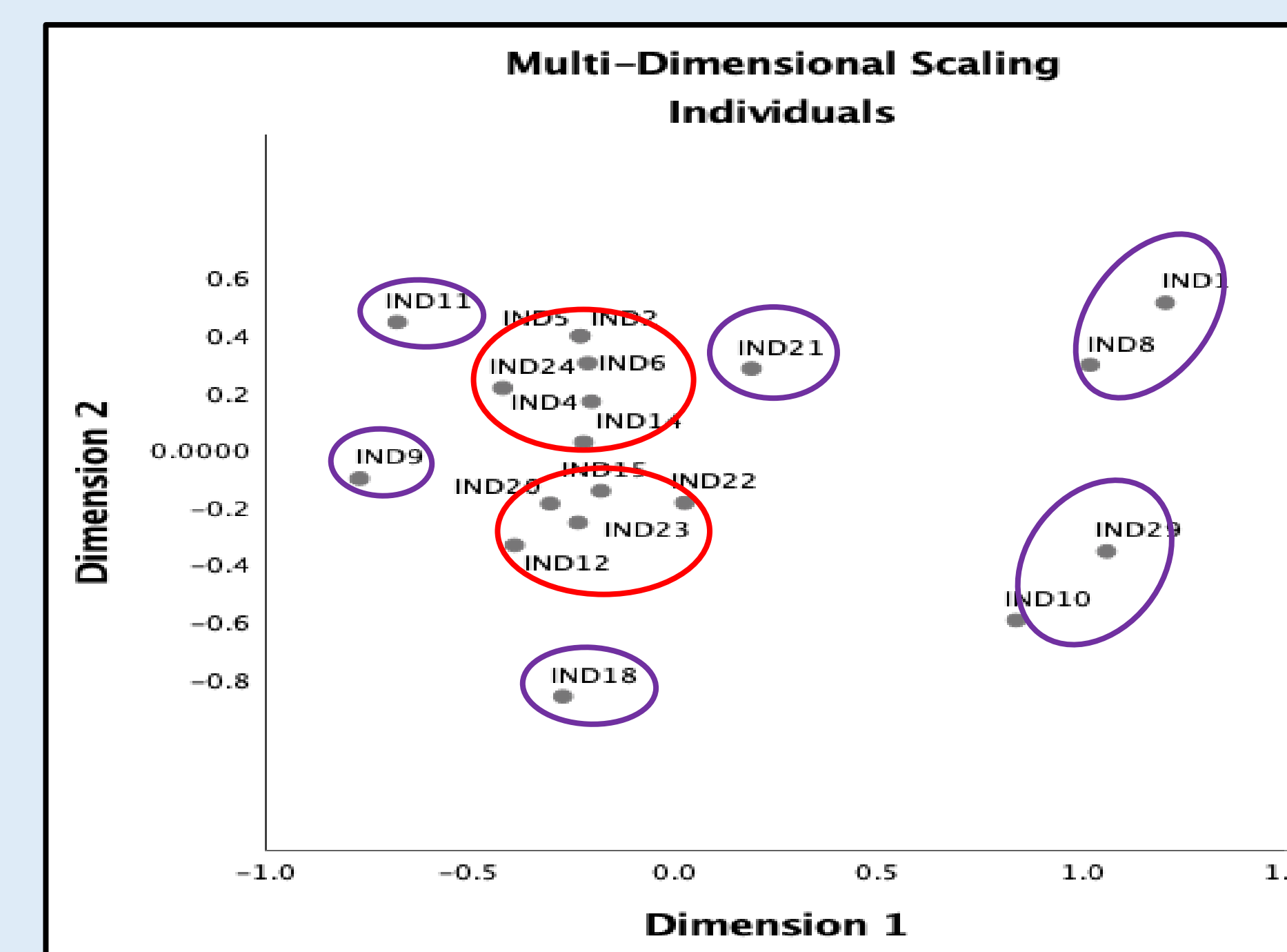

Figure 4: Lake George population interrelationships. (Normalized Raw Stress = .01830; Dispersion Accounted For (D.A.F.) = .98170)

Conclusions

Based on this research, individuals from the unmarked burial ground in Lake George, NY are most likely to be of Western European ancestry. This data supports archaeological finds at the site consisting of buttons that were marked with the insignia of the First Battalion of Pennsylvania, a group that was composed mainly soldiers of Western European descent (Fort Ticonderoga PDF Publication 2019). Further research will be conducted in the future to explore potential familial ties between individuals. However, this research shows that there are some morphometric similarities between individuals 1 and 8, between individuals 10 and 29, and those in the two red clusters shown in Figure 4. Within those two major clusters it is highly expected that individuals 2 and 5 have some familial relationship. Potentially parent-child or sibling relationships. When referring directly to the collected data, I have found that individuals 1 and 8 share similarities in molar traits like the metacone and a large Carabelli's cusp. Individuals 10 and 29 both have slight shoveling, similar groove patterns, and additional premolar lingual cusps. While this data is not conclusive it does suggest possible relatedness, but further research will need to be conducted in the future. At this time, the identities of the individuals from this burial ground remains unknown, but with this research I hope to add to what is known of these forgotten peoples before they are reinterred for good.

Acknowledgments

References

Fort Ticonderoga. "1st-Pennsylvania Battalion". Last modified June, 2018. https://www.fortticonderoga.org/wpcontent/uploads/2019/06/1st-Pennsylvania-Battalionpdf

Hillson, Simon. Dental Anthropology. Cambridge: Cambridge University Press, 1998.

Scott, G. Richard, Turner II, Christy G., Townsend, Grant C., and Maria Martinon-Torres. The Anthropology of Modern Human Teeth. Cambridge: Cambridge University Press, 2018.

Richard G. Scott and Christy G. Turner II. The Anthropology of Modern Human Teeth. Cambridge: Cambridge University Press, 2000.

Turner II, Christy G., Nichol, Christian R., and G. Richard Scott. "Scoring procedures for key morphological traits of the permanent dentition: The Arizona State University Dental Anthropology System", Advances in Dental Anthropology (1991): 13-31.

Further Information

If you would like to further discuss this research, you can contact me at wrightLe203@Potsdam.edu – Don't have time to read this poster right now? Scan this QR code to save it to your mobile device!
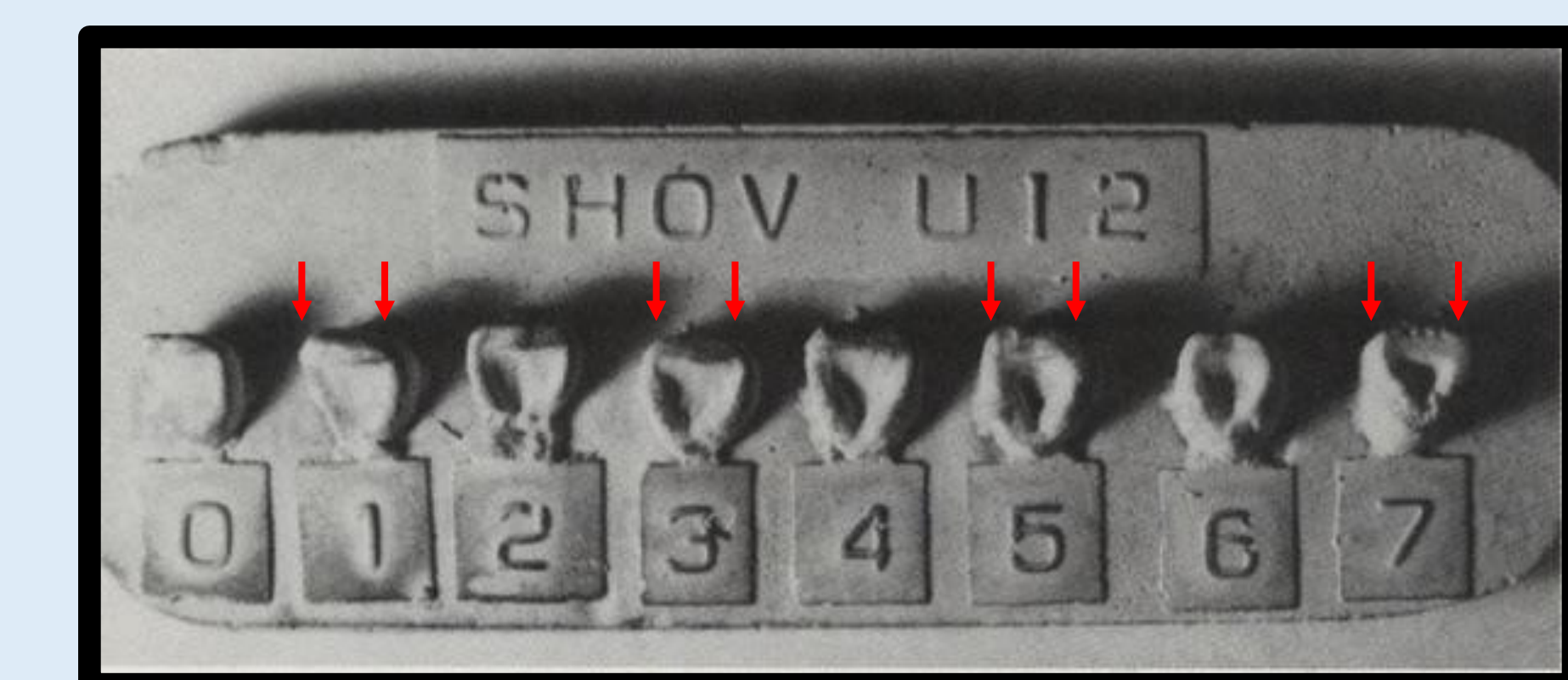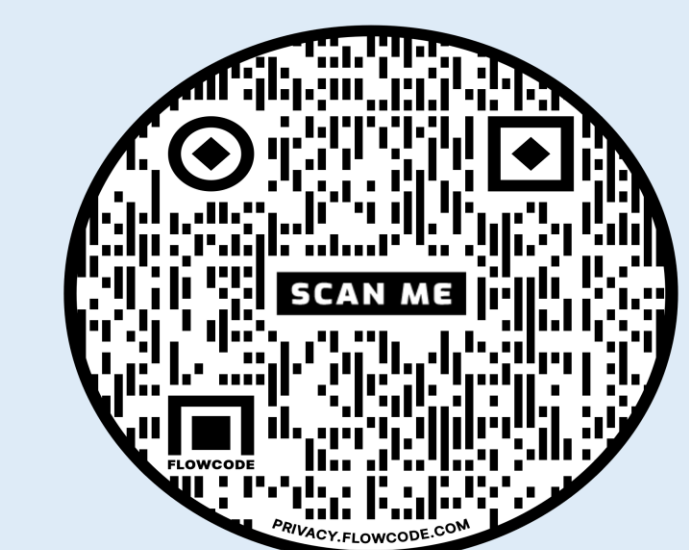

Figure 1: Dental cast displaying shoveling of the upper incisors. Photo Credit: Dr. Jaimin Weets

Figure 2: Dental cast displaying Carabelli's Cusp. Photo Credit: Dr. Jaimin Weets