



## Physical Anthropology Section – 2003

### H4 An Examination of the Petrographic Technique in the Analysis of Cementum Increments for the Determination of Age and Seasonality in Human Teeth

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The purpose of this presentation is to provide preliminary findings regarding the accuracy of cementum increments in determining age and seasonality in adult human teeth through the use of the petrographic techniques.

The 1950s witnessed the development and refinement of microscopic techniques specifically focused towards the estimation of age in humans. Gustafson (1950) examined multiple points on thin sections of teeth and found that, with some degree of accuracy, one could attempt to estimate age for an individual through observable changes. Wildlife biologists began to use microscopic analysis on non-human teeth to examine the cementum. By counting the layers of cementum in a particular tooth, age as well as season of death (seasonality) of mammals could be determined. It was not until the 1980s that anthropologists would attempt age estimates based on examinations of cementum increments in human teeth. It would take twenty years before anyone published on the possibility of the determination of seasonality in human teeth.

Why is cementum incrementation important to or even necessary for anthropology? To answer this question, one need only look at a fragmentary burial to see that teeth are one of the most durable elements of the human body. The techniques that anthropologists use in estimating age are only as useful as the available remains. Pubic symphysis degeneration, auricular surface changes, rib end changes, all of these techniques will require elements that often suffer damage, scavenging, or are completely missing from a burial or skeletal recovery. It is the intent of this study to demonstrate that cementum increment analysis, through the use of hard sectioning (petrographic) techniques, can be a valuable tool for providing accurate data on age and season of death.

This study is a preliminary examination of the use of petrographic techniques to view cementum increments and via these increments, determine age and seasonality. Before any work is conducted, each tooth is cleaned and measurements are taken for general documentation including, tooth length and width, crown height, and root length. Each tooth is coded with a number letter combination (protecting the identity and information for each tooth) and embedded in epoxy. Once the epoxy hardens, the tooth is cut with a diamond-wafering saw. Longitudinal sections are chosen over cross sections so as to allow viewing of the entire tooth root. Each half of the tooth is affixed to a slide with epoxy, labeled with the code of the tooth, and sent through a diamond-wafering saw, further reducing the tooth. Sections not attached to slides are labeled and stored for future sectioning. After cutting is complete, each slide section is ground down on a glass plate with 600 grit silicon carbide until the section is thin enough for the cementum increments to be visible. Thickness of each section varies depending on the tooth and when clear visibility of the cementum increments is apparent.

When a section is ground down to an appropriate thickness, it is viewed under a microscope using transmitted cross-polarized light. The entire length of the tooth root is examined. Increments are counted at the location that offers the best visibility (this varies from tooth to tooth). Counting the opaque lines and adding that count to the eruption date of the tooth being examined establish band count. Seasonality is determined by observing the outermost cementum increment. According to available research, opaque bands tend to correlate to winter seasons or seasons of slow growth while translucent bands tend to correlate to summer seasons or seasons of accelerated growth.

Results of preliminary research demonstrate that cementum increments are visible in human teeth using the petrographic technique. Sections examined thus far seem to demonstrate a positive correlation between cementum increments and age for individuals between 18-60 years of age (correlation decreases as age increases); however, results for correlation with seasonality were not conclusive. More research is necessary. Larger samples of teeth from forensic and historic material, as well as dental extractions of known age and seasonality will be valuable in determining accuracy, correlation, and examining the factors that influence variation within cementum increments.

#### Age Determination, Cementum Increments, Season of Death