

# Lecture 3: Odontochronology & Introduction to the Projects

# What can we do with tooth sections?

- 1. Reconstruct the chronology of dental development
- 2. Reconstruct the pattern of stress during dental development
- 3. Estimate life history variables in extinct species

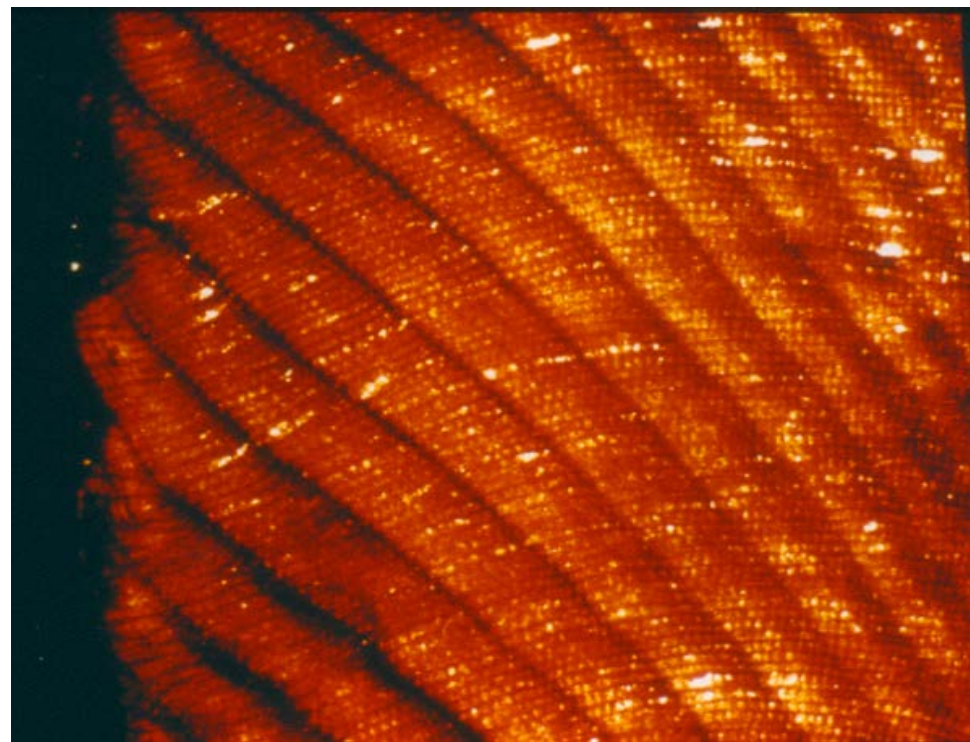
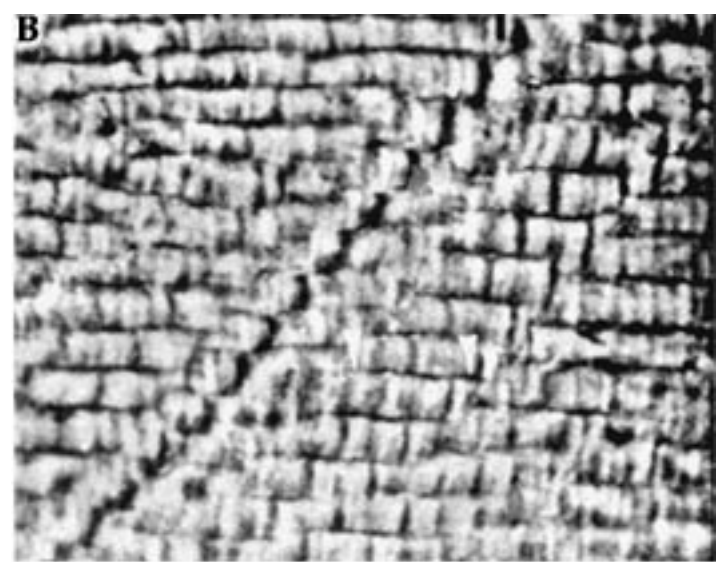
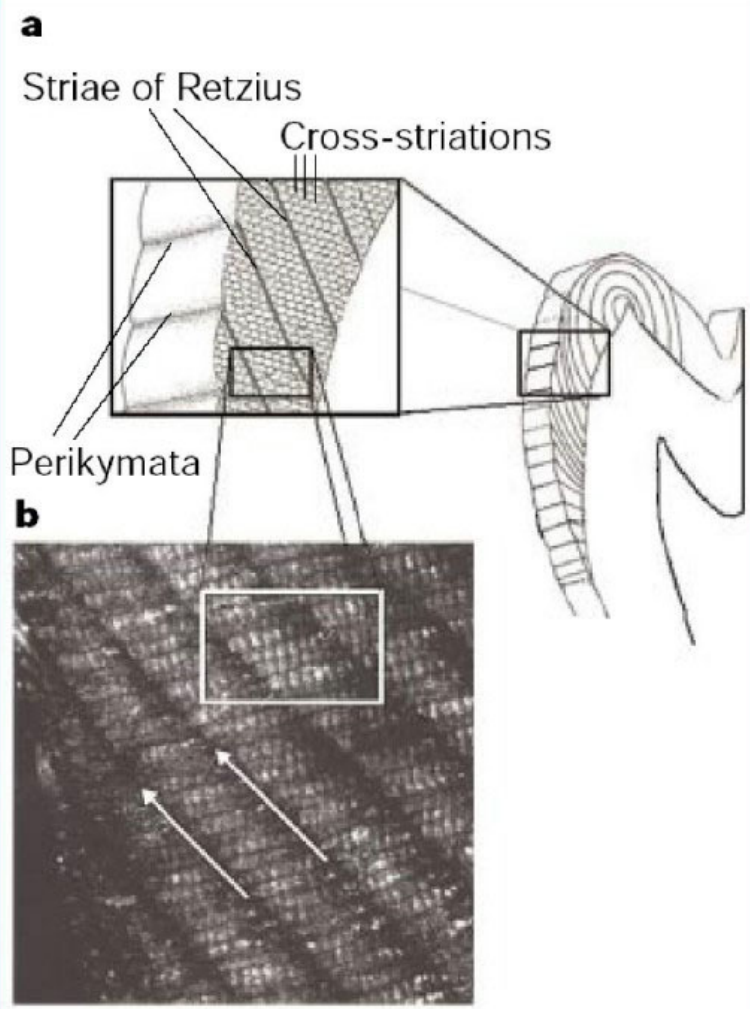
# Measurable Aspects of Dental Development

## **Making a tooth**

- Daily secretion rate of enamel and dentine (DSR)
- Periodicity of long period increments (repeat interval or RI)
- Extension rate; made up of angle of striae of Retzius or Andresen lines and DSR
- Degree of decussation; curvature of dentine tubules
- Enamel thickness
- Taken together = crown and root formation time.

## **Making a dentition**

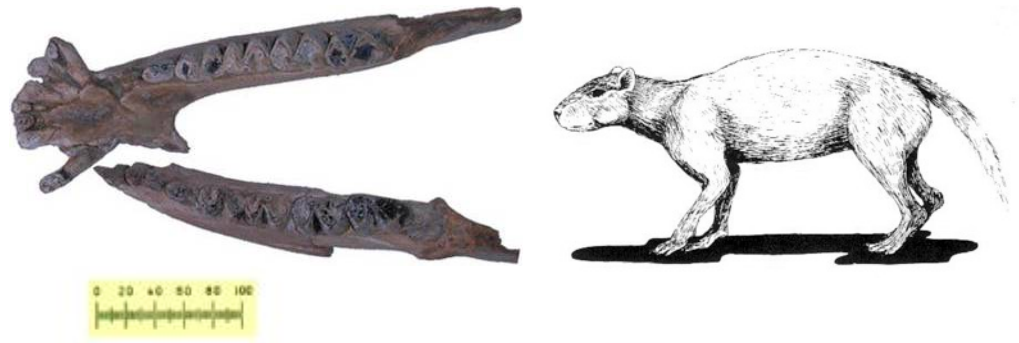
- The ages at initiation and completion of each tooth
- The age at eruption (gingival vs alveolar emergence) of each tooth
- Together create a pattern of overlap of tooth formation and eruption



*Meniscotherium chamense*

Eocene

Determination of DSR, RP  
& crown formation times



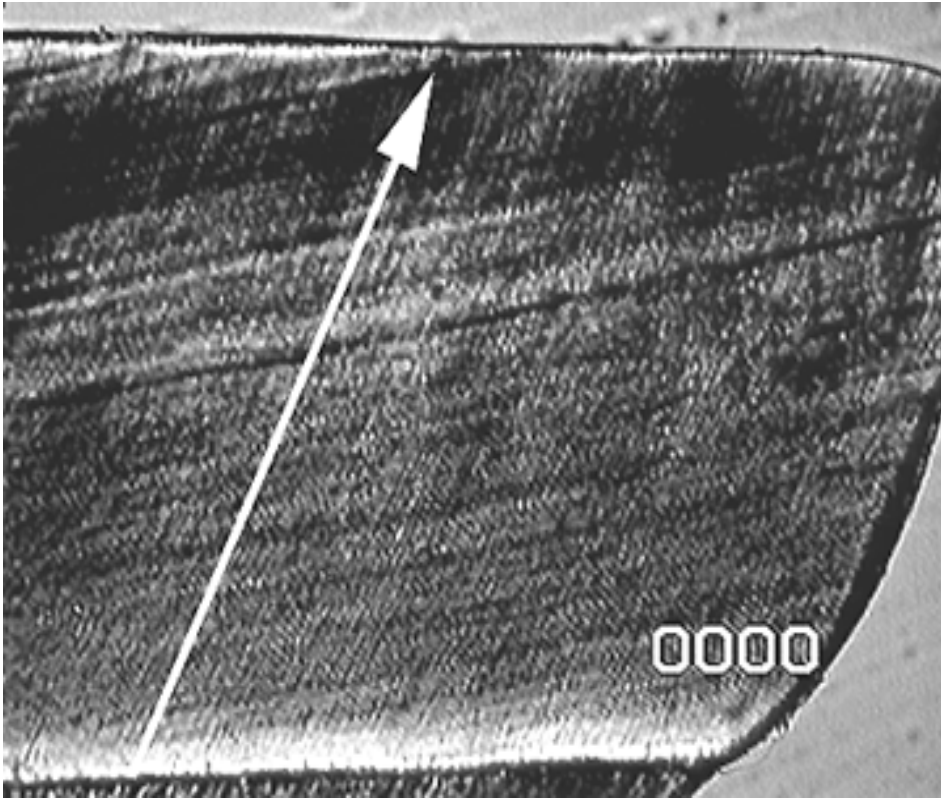
Determination of  
crown extension rate



Distance  $y/x$  days = extension rate





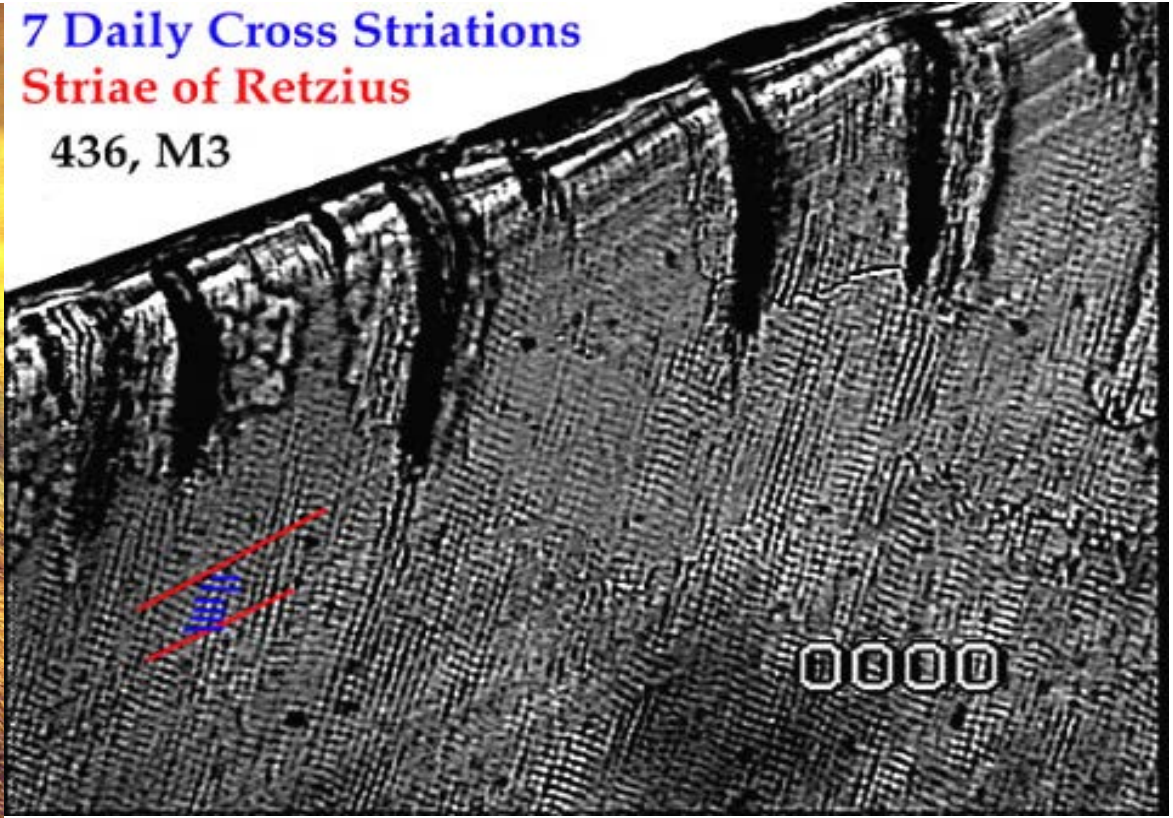


Striae periodicity determined by measurement  
(5 days in langur 845/70)

Striae periodicity determined by count  
(7 days in baboon A436)

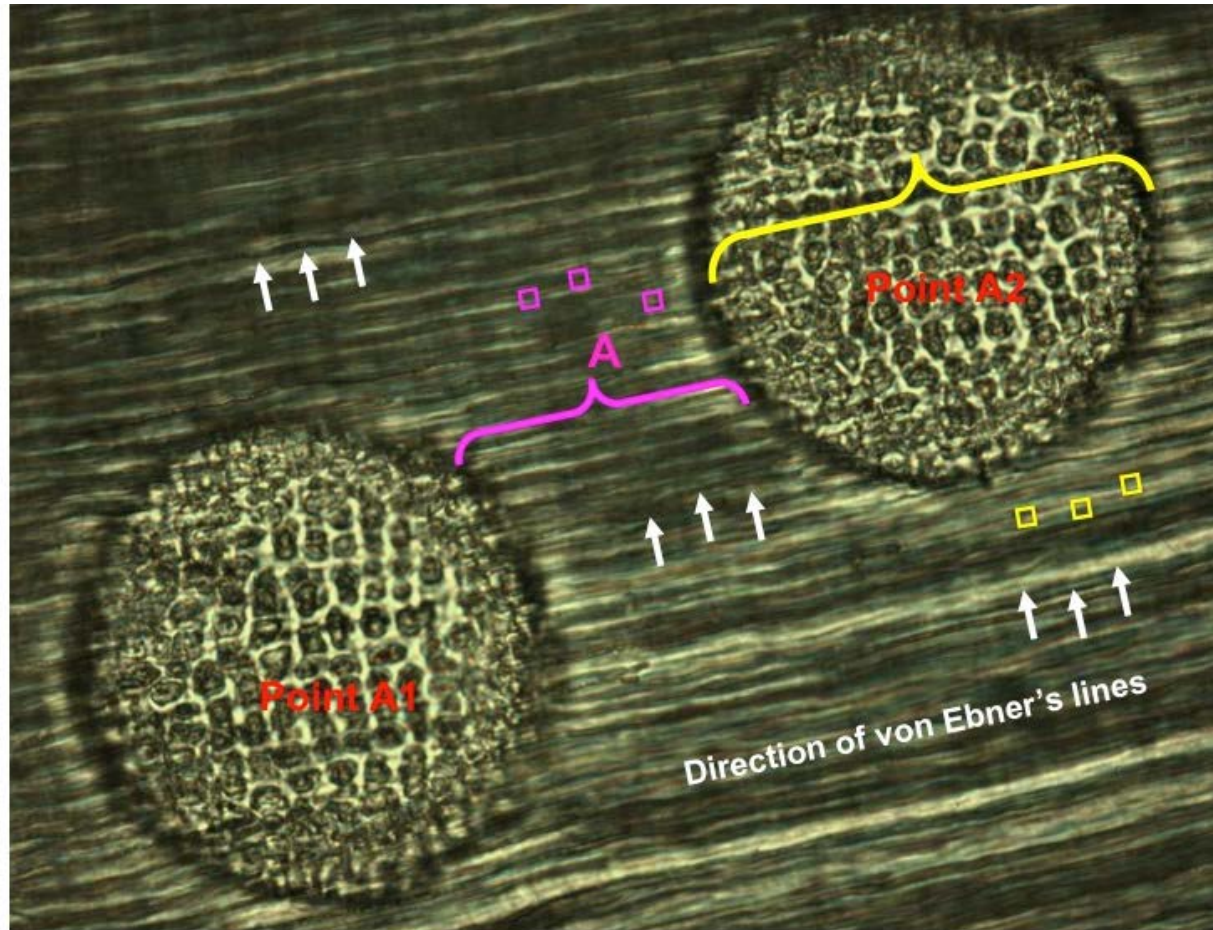


7 Daily Cross Striations  
Striae of Retzius  
436, M3





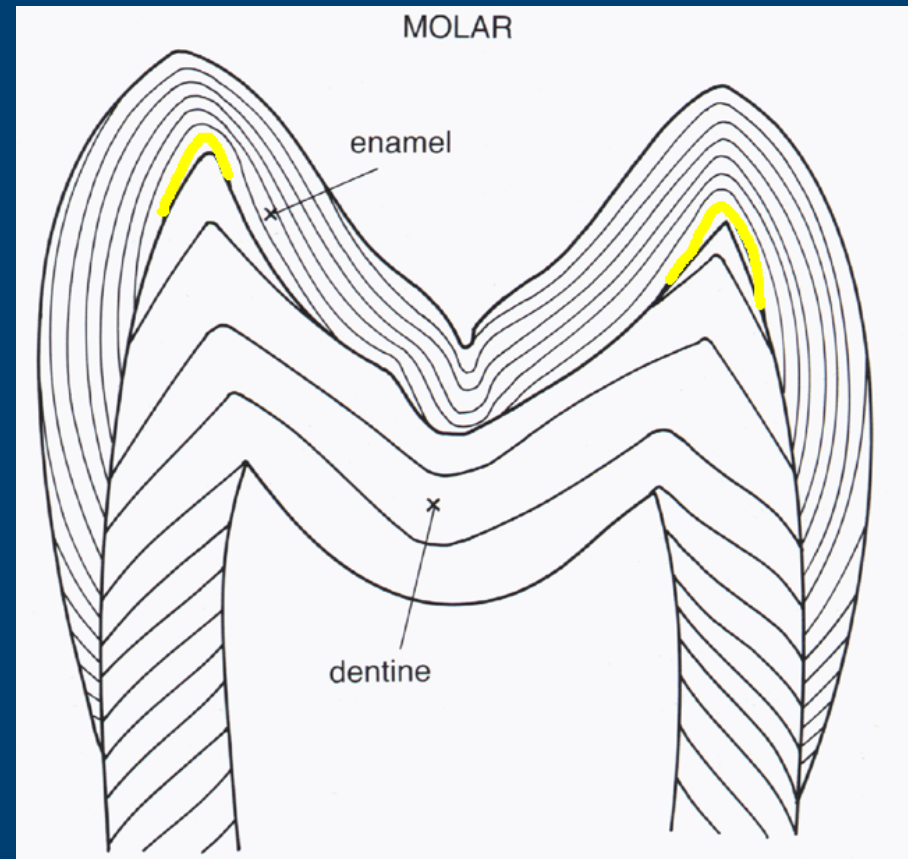
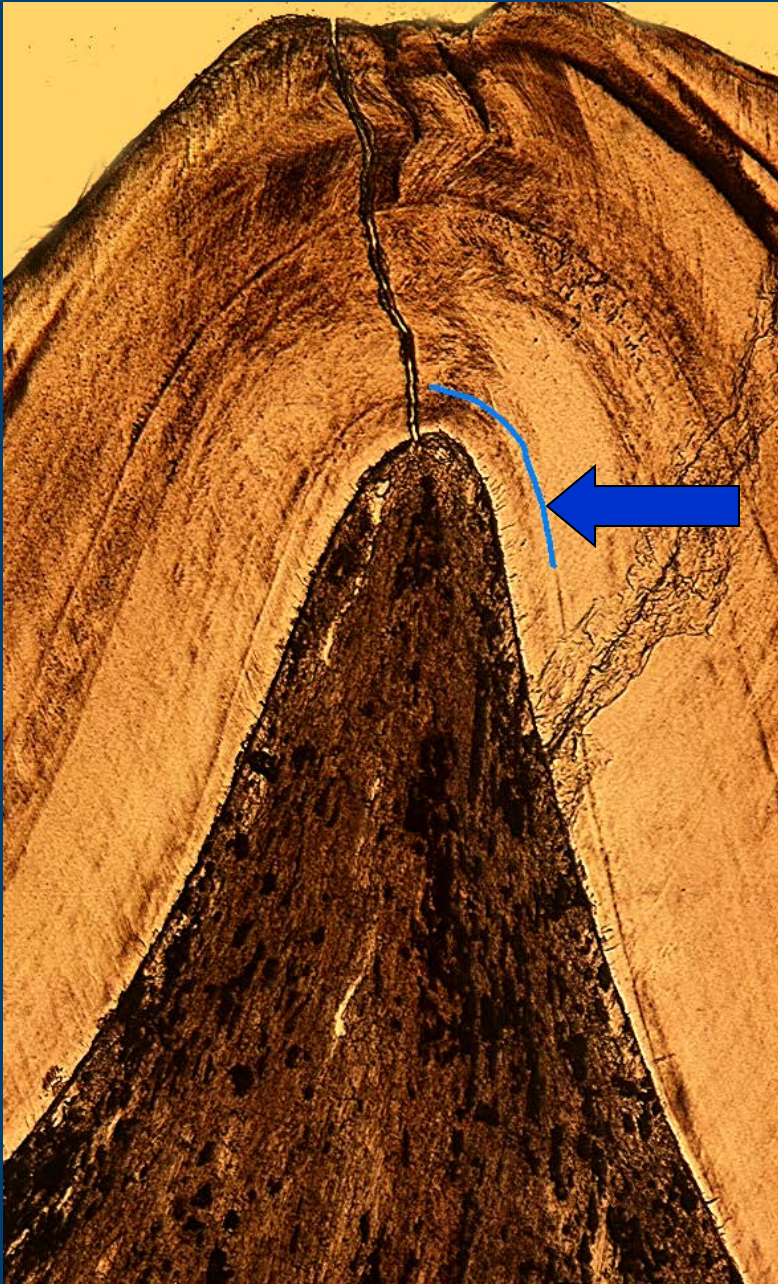
The age of each ablation pit was determined using growth increments in dentine and the neonatal line.

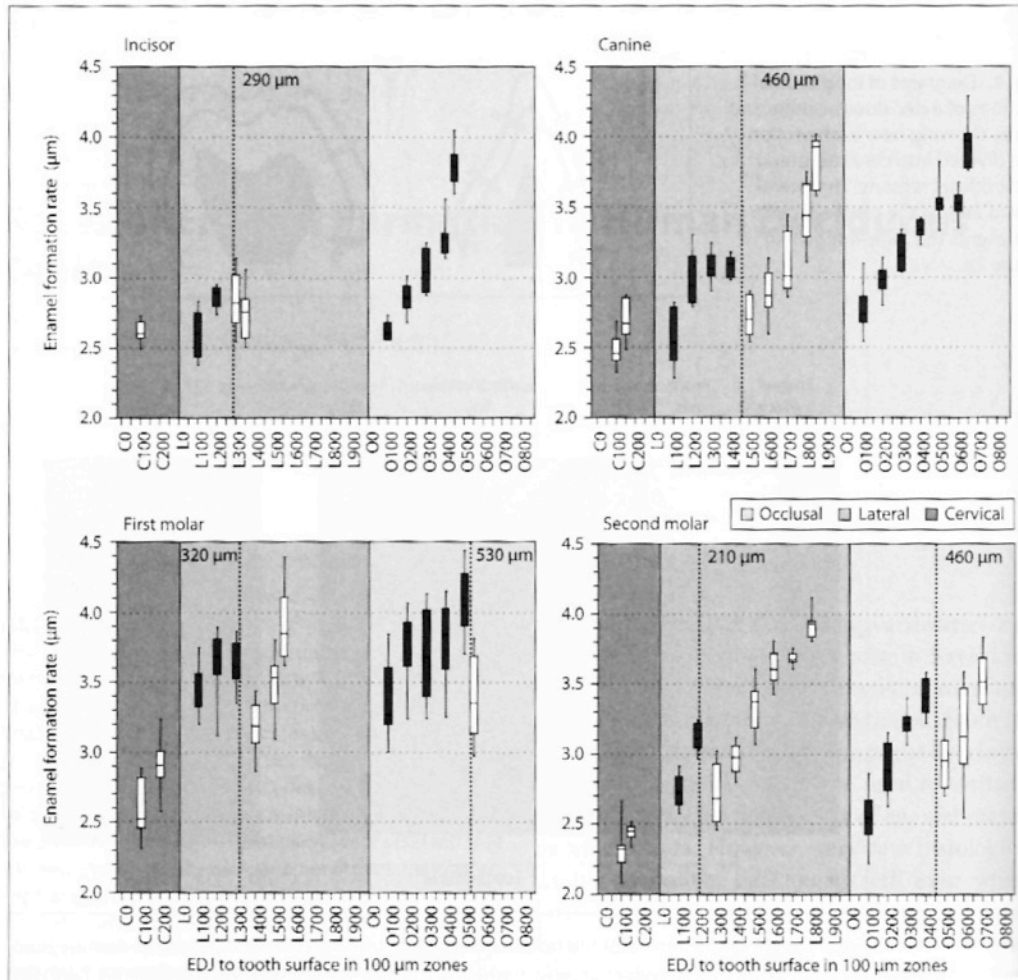




# Neonatal line

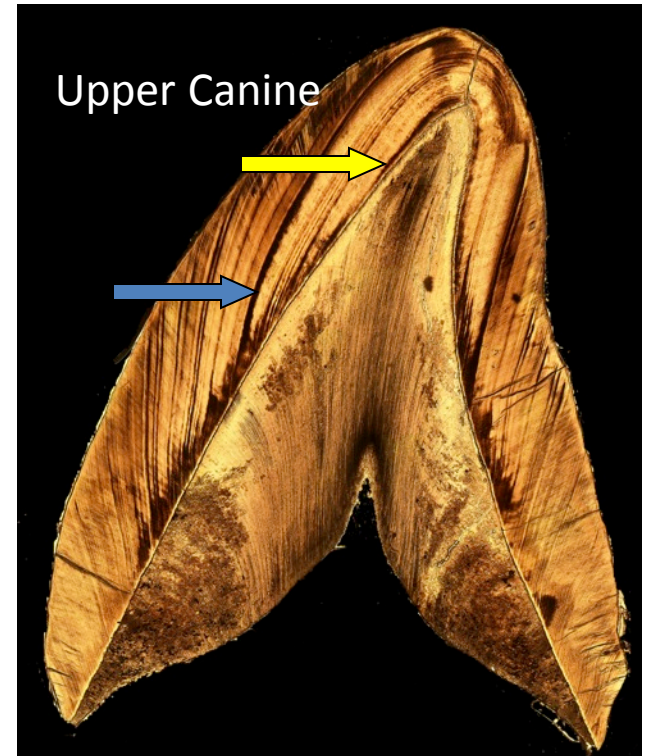
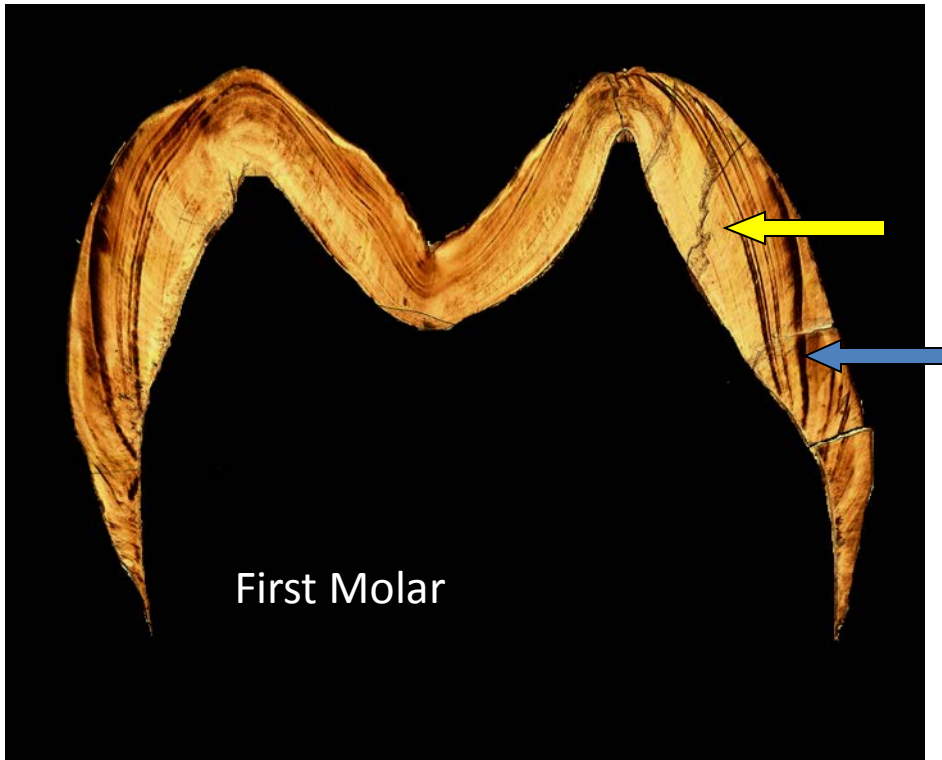
in  $M_1$





Birch W & Dean MC (2009). Rates of enamel formation in human deciduous teeth. In *Comparative Dental Morphology*, Koppe T, Meyer G & Alt KW, eds. Basel, Karger: pp 116-120.

# Matching Accentuated Lines Across Tooth Types







Right third upper molar

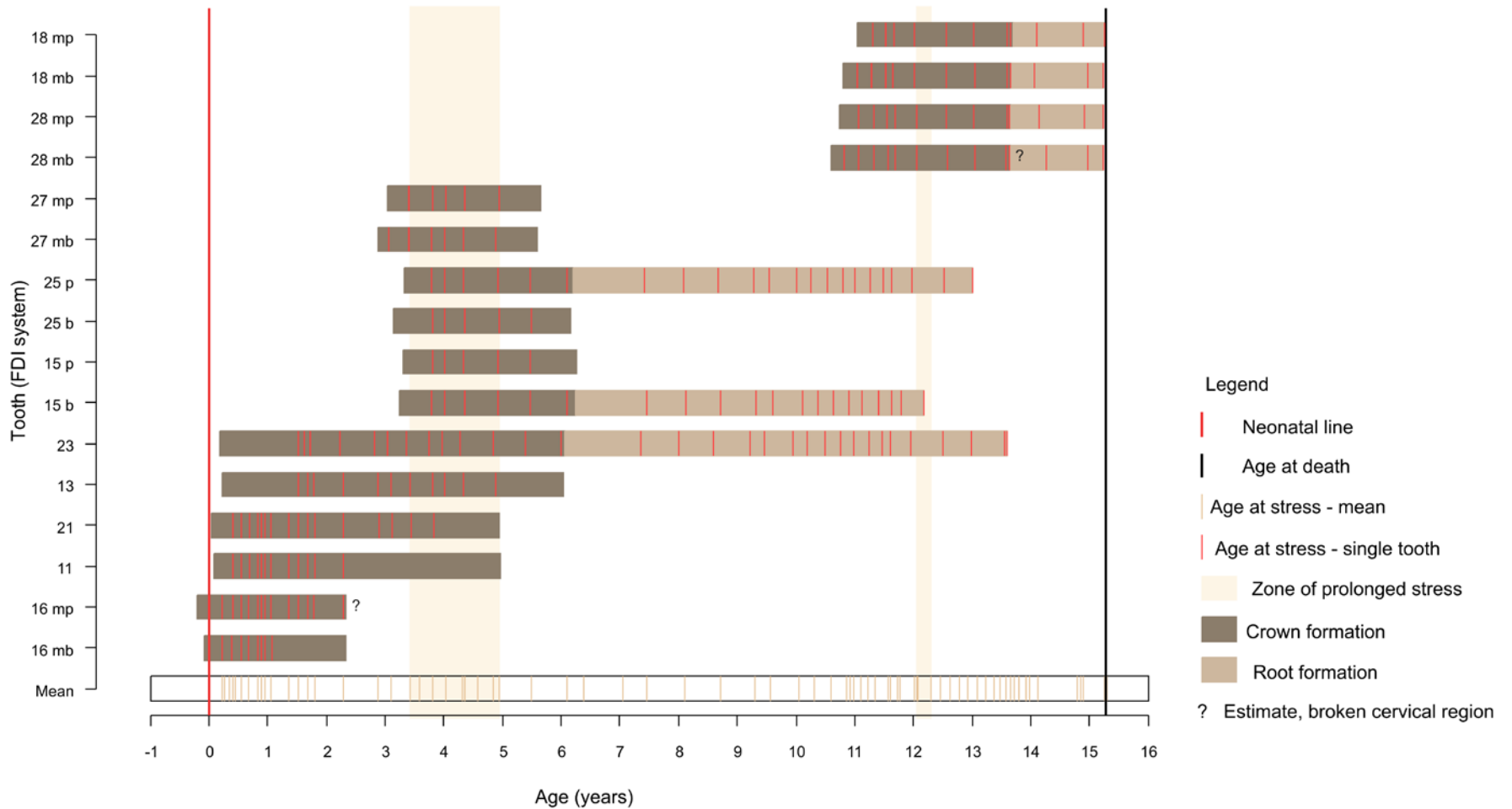


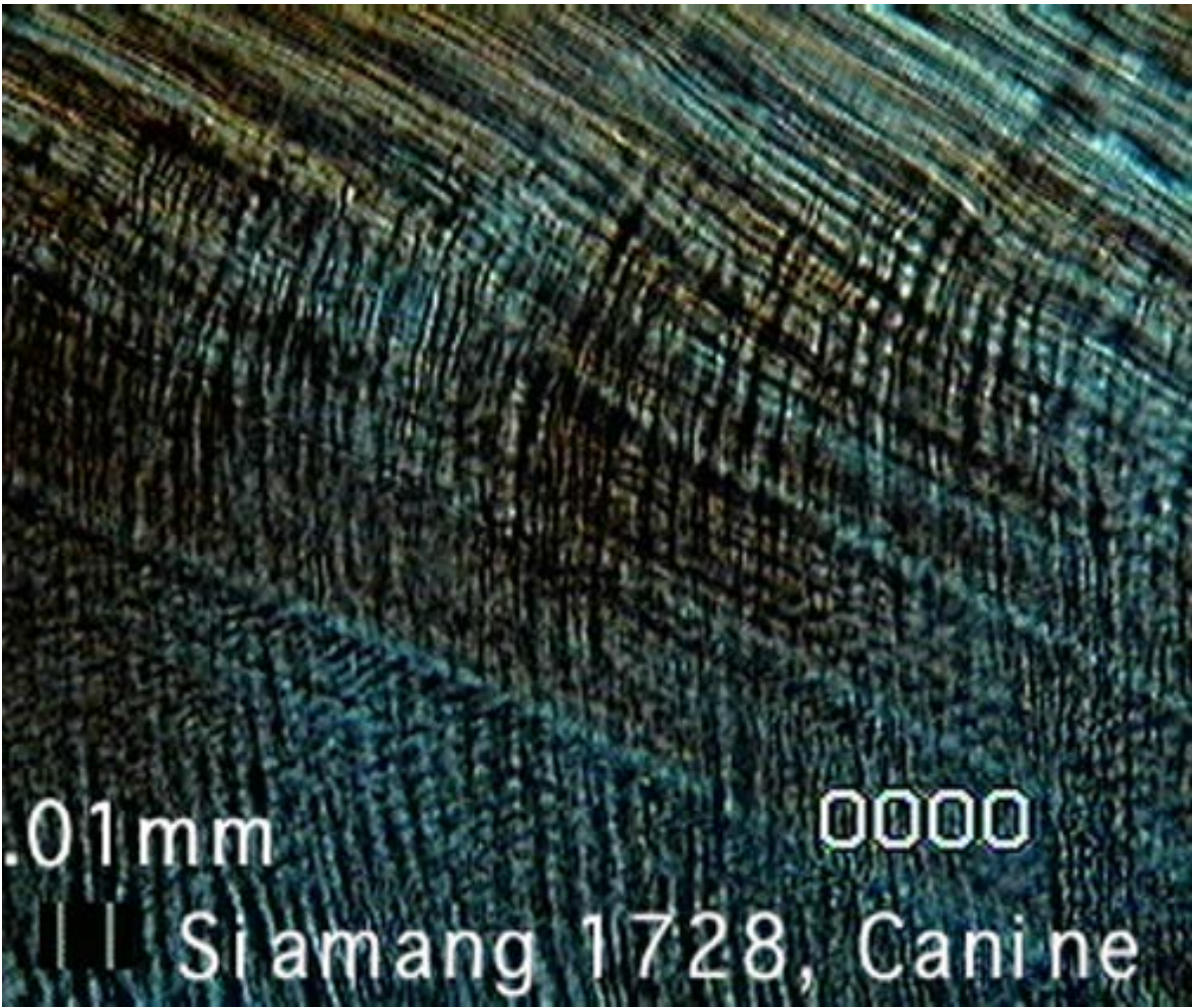
Right first upper molar



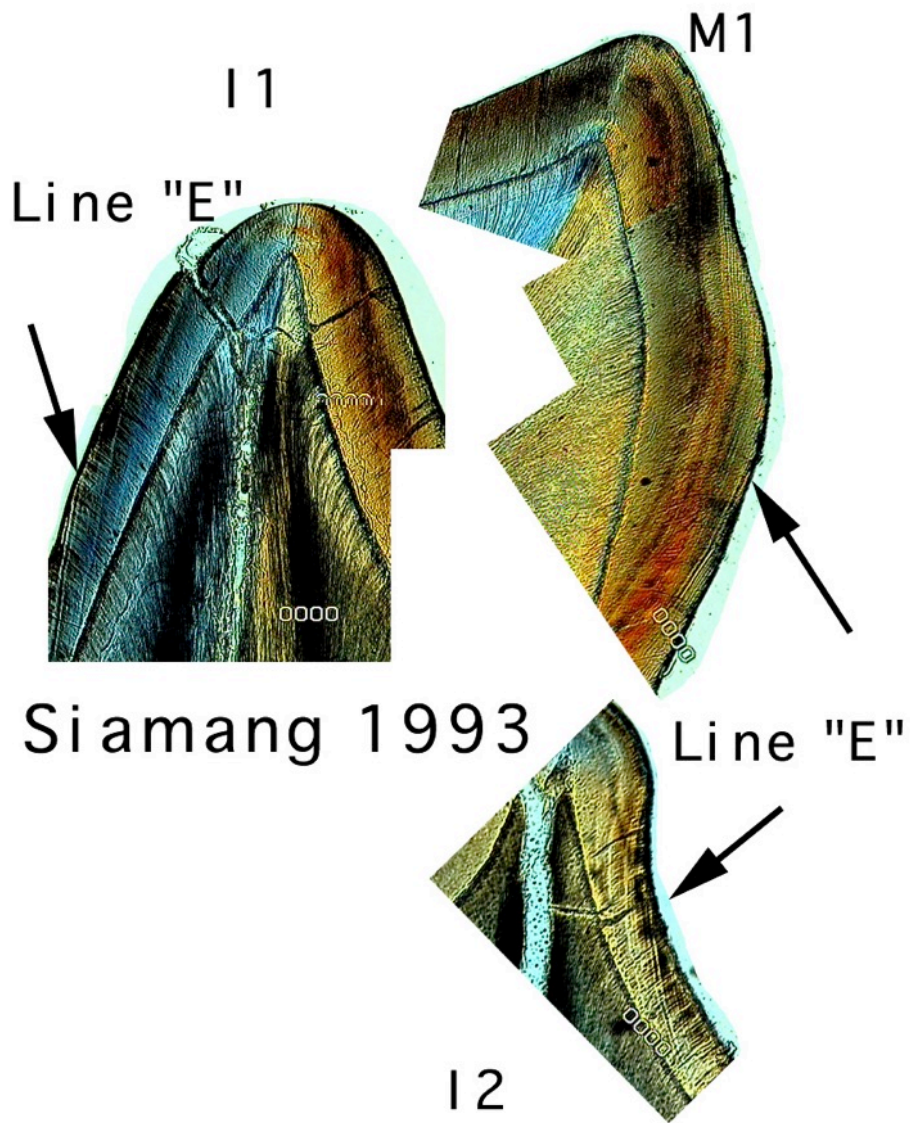
Left upper canine

### Chronology of dental development and timing of stressful events









M1 Mesial



M2 mesial



M2 distal

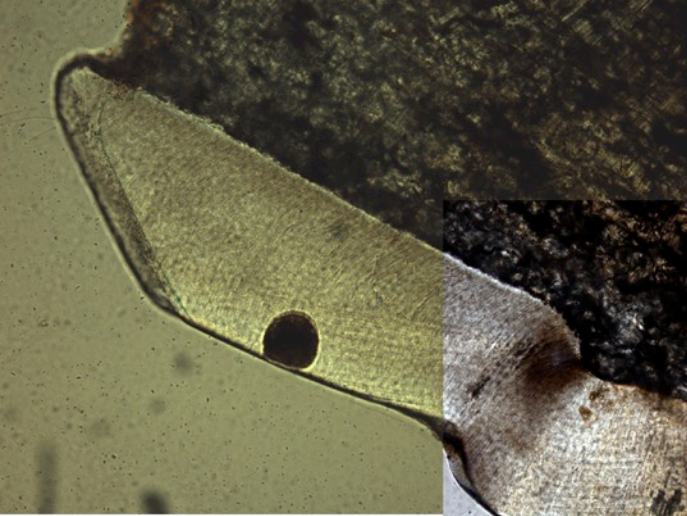


M1 Distal

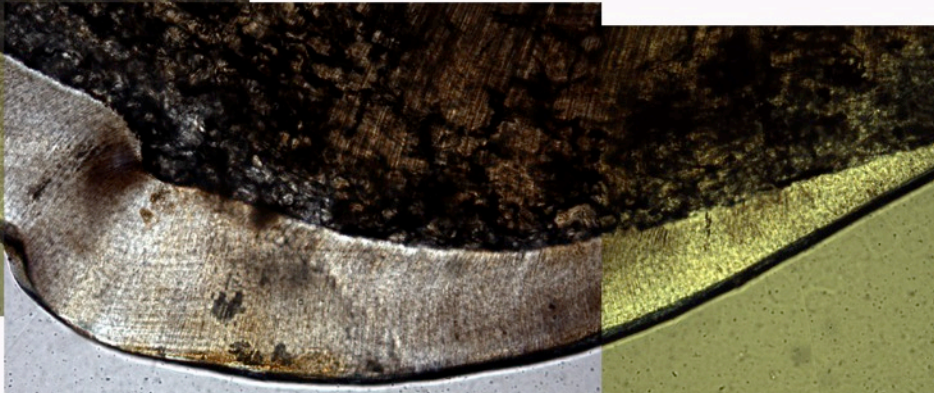


*Leptadapis magnus*

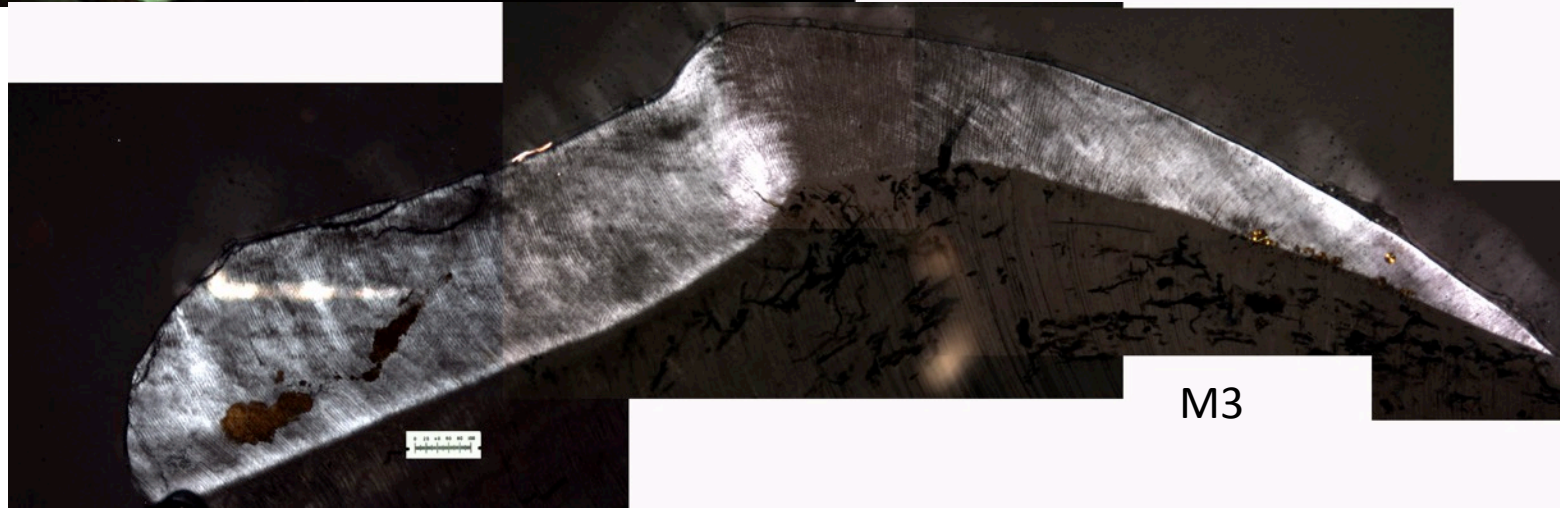
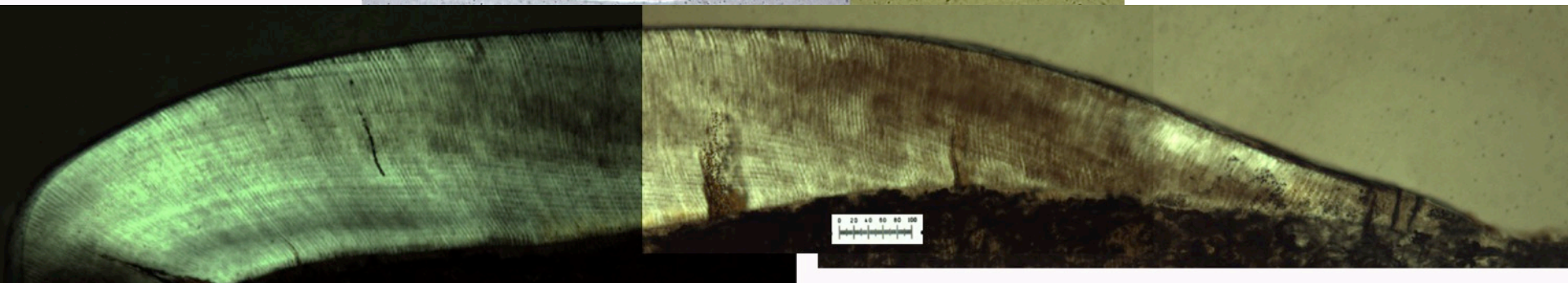




M1



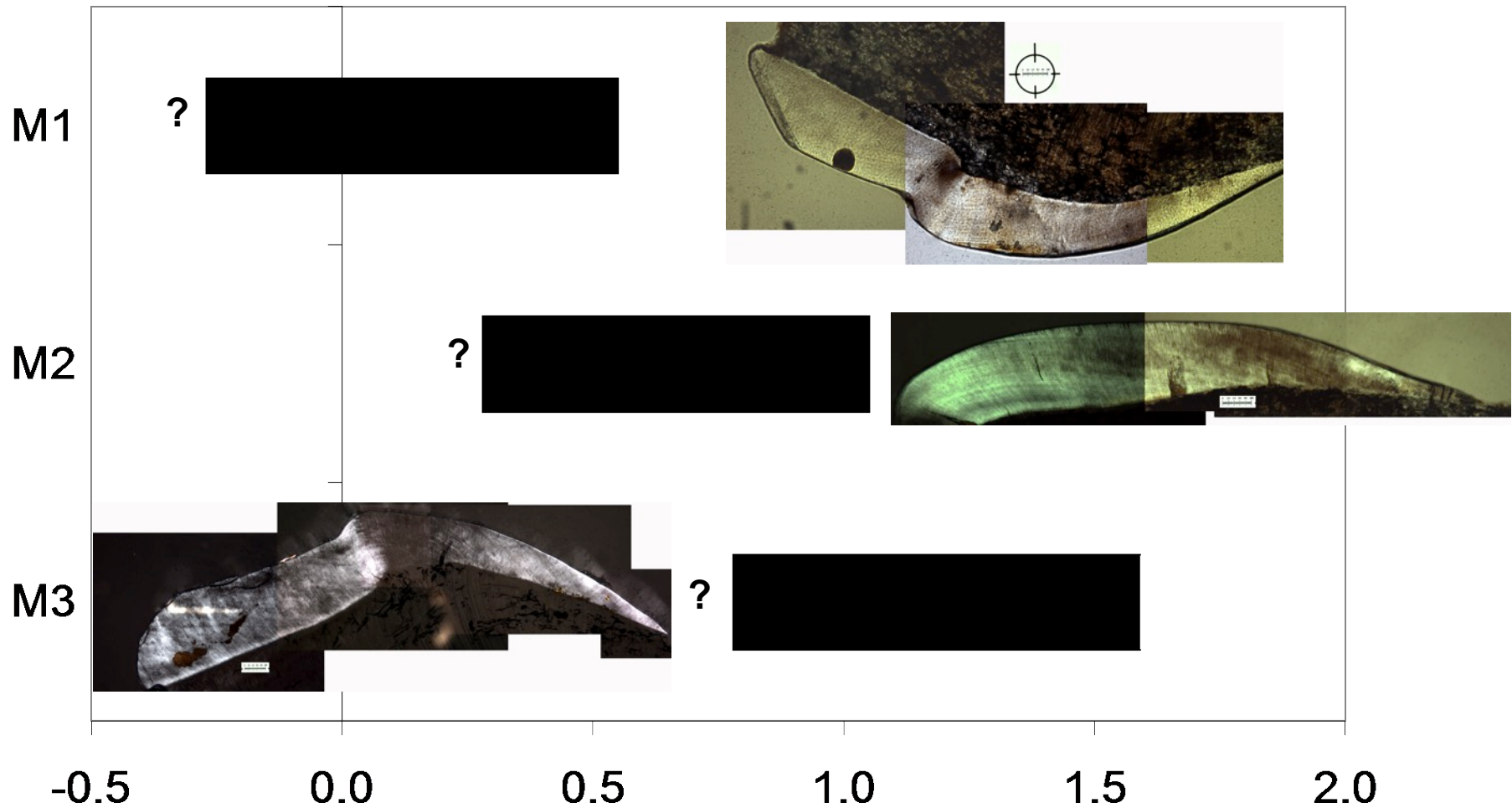
M2



M3

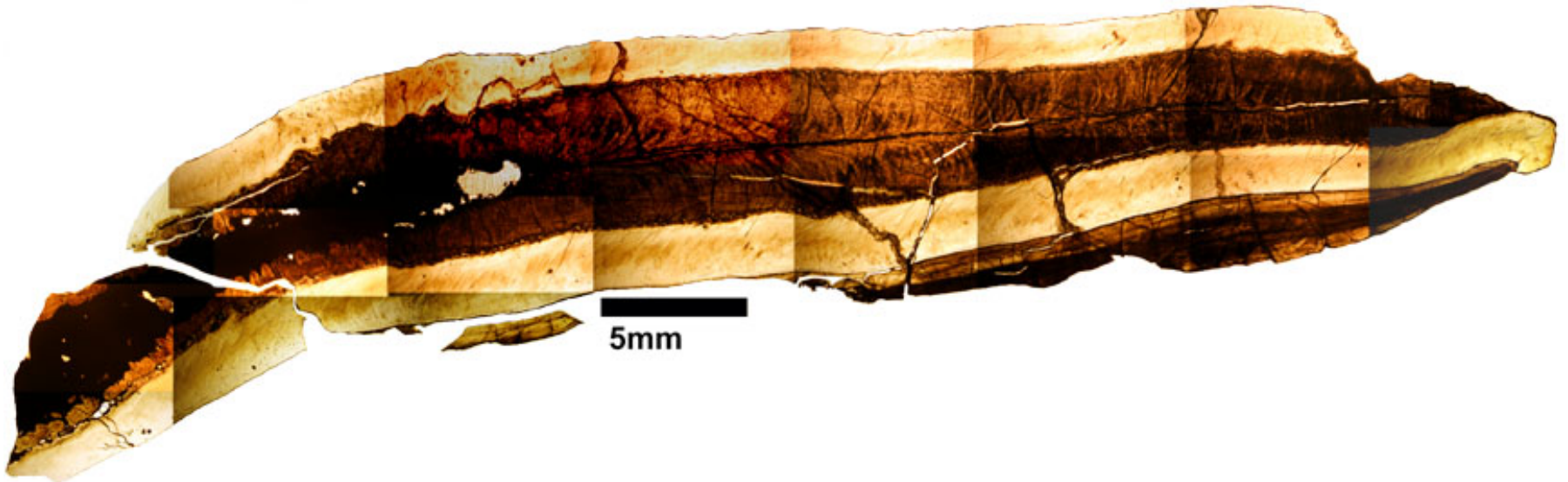
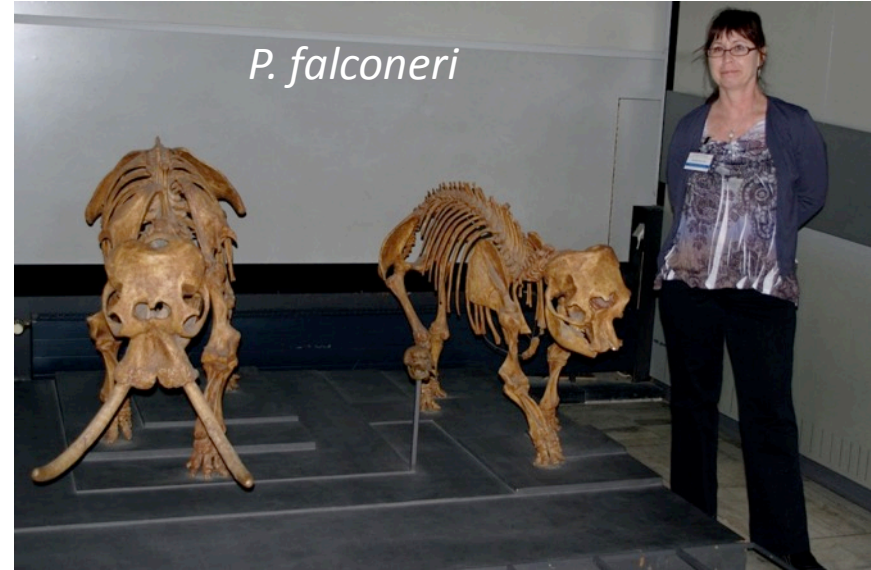


# Lower Molar Crown Development in *Leptadapis magnus*



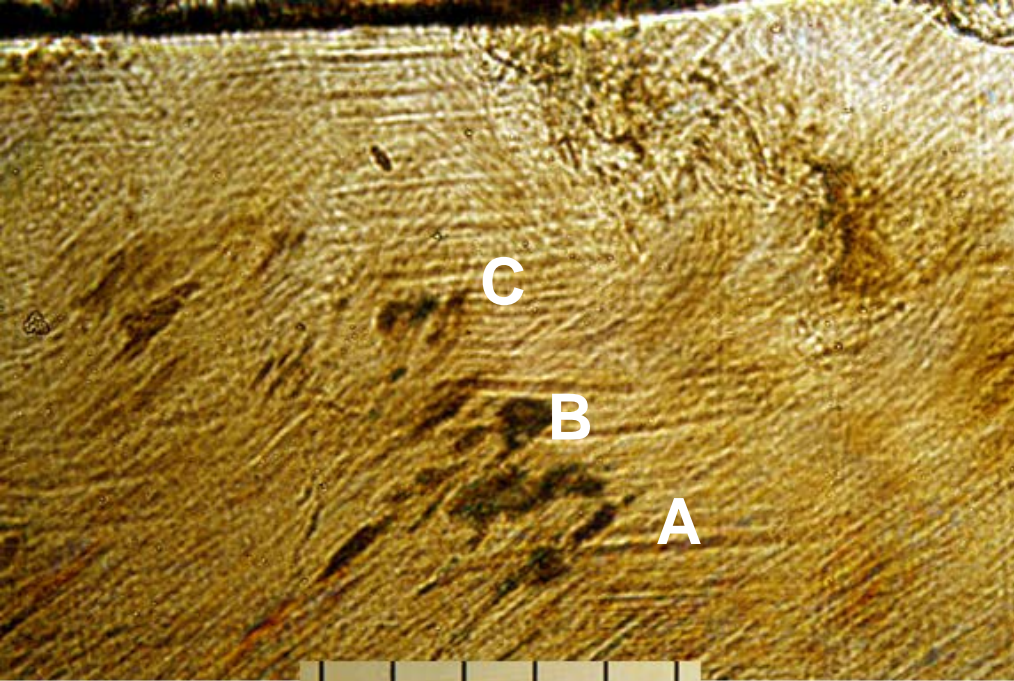
Age in Years

*Palaeoloxodon*  
*cypriotes*: 200 kg  
Late Pleistocene

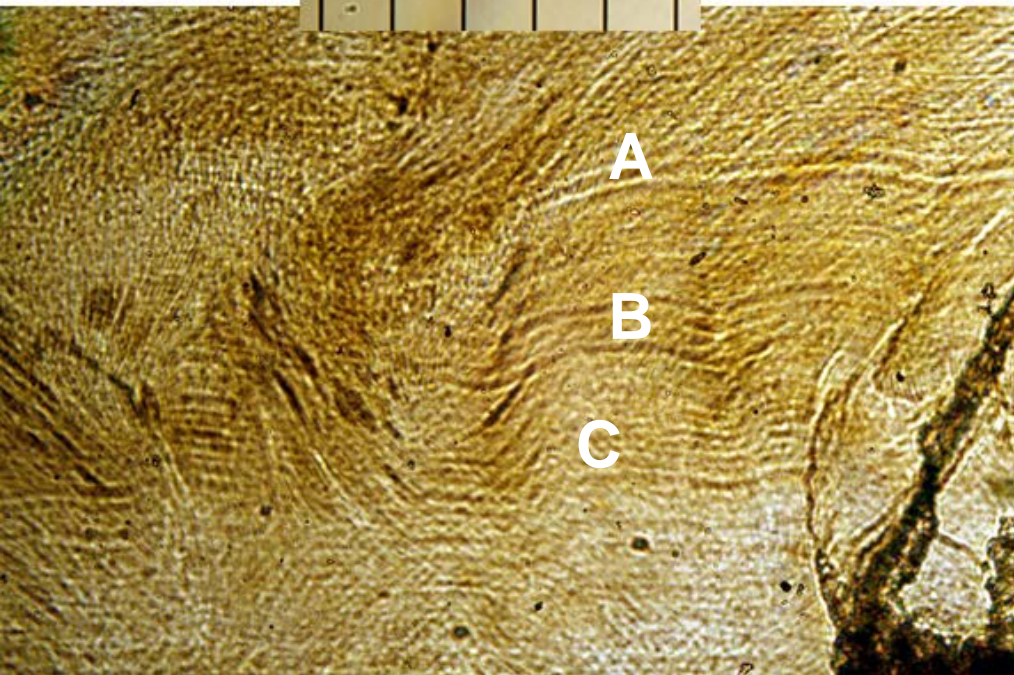


**Plate height externally = 60.5 mm, probably M<sup>2</sup> or M<sup>3</sup>,  
Internal height along enamel dentine junction (edj) = 53 mm  
Estimated plate formation time = 6 yrs**





500µm



# Matching Lamellae in *P.* *cyprites*

**Estimated offset:  
7 days**

**12 plates; 3 months extra**

**Estimated total formation  
time 6.25 years,  
excluding root formation**





<http://researchnews.osu.edu/archive/neanderpics.htm>

# Wilson Bands & Linear Enamel Hypoplasias





# Variation between individuals from 'stress' lines; accentuated lines in dental tissues

- Mandrills and other primates-

