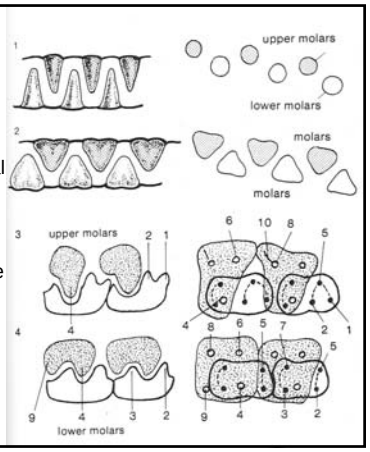
Chapter 4

"Reptile"

Early mammal

Carnivore

Herbivore




Savage and Long 1986

## Mammalian Origins

| Era | Period | Epoch | Myr BP (approx.) | Biological Events |
|---|---|---|---|---|
| Cenozoic | Quaternary | Recent | 0.01 | |
| | | Pleistocene | 1.8 | |
| | Neogene Tertiary | Pliocene | 5 | |
| | | Miocene | 24 | Most mammalian families in evidence |
| | | Oligocene | 37 | |
| | Paleogene | Eocene | 54 | Origin of most mammalian orders |
| | | Paleocene | 65 | Mammalian radiation Dinosaurs extinct |
| Mesozoic | Cretaceous | | 144 | |
| | Jurassic | | 213 | Dinosaurs abundant |
| | Triassic | | 248 | First mammals |
| Paleozoic | Permian | | | |
| | Carboniferous | Pennsylvanian | 320 | Synapsids |
| | | Mississippian | 360 | Amniota |
| | Devonian | | 408 | Devonian tetrapods |
| | Silurian | | 438 | First jawed fishes |
| | Ordovician | | 505 | First vertebrates and land plants |
| | Cambrian | | 590 | Invertebrates |

Feldhamer Table 4.1

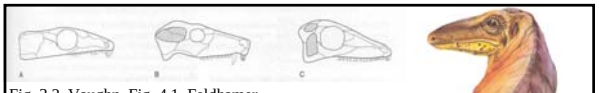


Fig. 3.2, Vaughn, Fig. 4.1, Feldhamer

## Mammalian Origins

Overview

Synapsids

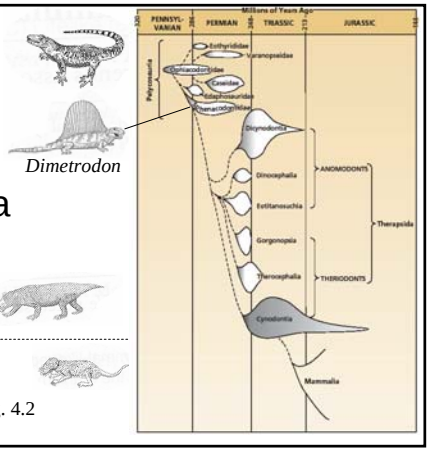
Pelycosaurs and Therapsids

First Mammals

Mesozoic Era appear
Cenozoic Era radiate

Savage and Long 1986

## Major groups of Synapsida




Feldhamer Fig. 4.2

## Skull, jaw musculature, and teeth

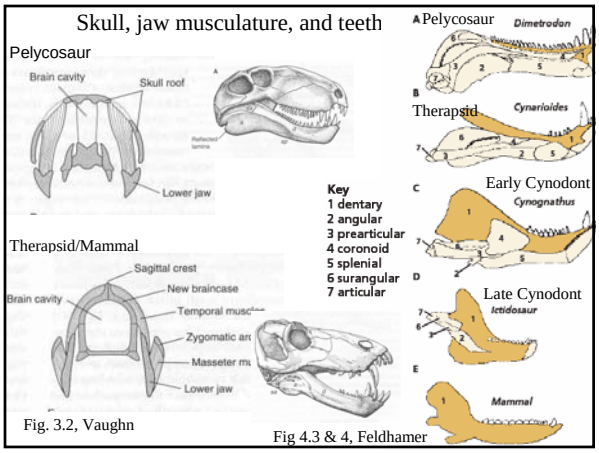
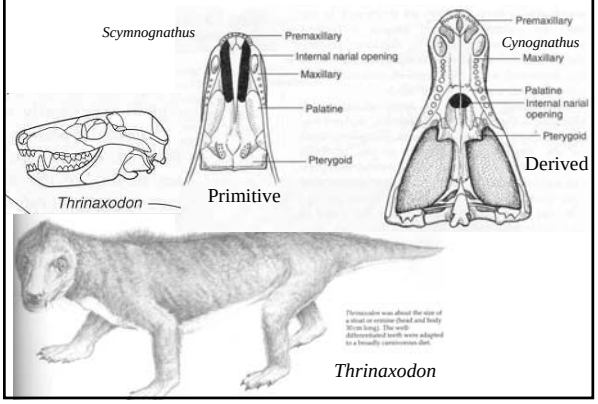


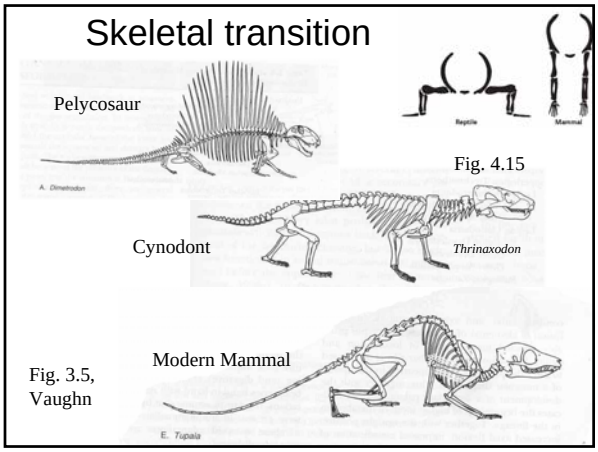

Fig. 3.2, Vaughn

Fig 4.3 & 4, Feldhamer

## Cynodontia -- Advanced, predaceous therapsids



## Skeletal transition




## Extinction of Cynodonts

Possibly competition from dinosaurs

Early Cynodonts were dog-size, last surviving were squirrel sized

Mammals that survived while Cynodonts went extinct (contemporary) were mouse-sized.

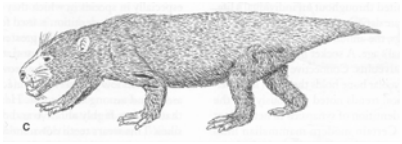
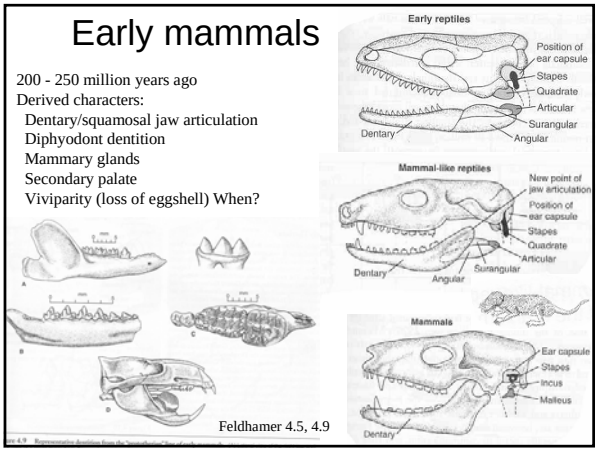


Fig. 4.16c, Early Cynodont

## Early mammals

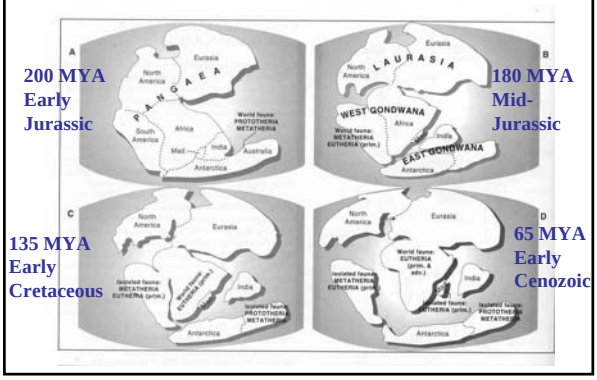
200 - 250 million years ago
Derived characters:
- Dentary/squamosal jaw articulation
- Diphyodont dentition
- Mammary glands
- Secondary palate
- Viviparity (loss of eggshell) When?




Feldhamer 4.5, 4.9

## Changes in land masses

Feldhamer 4.11

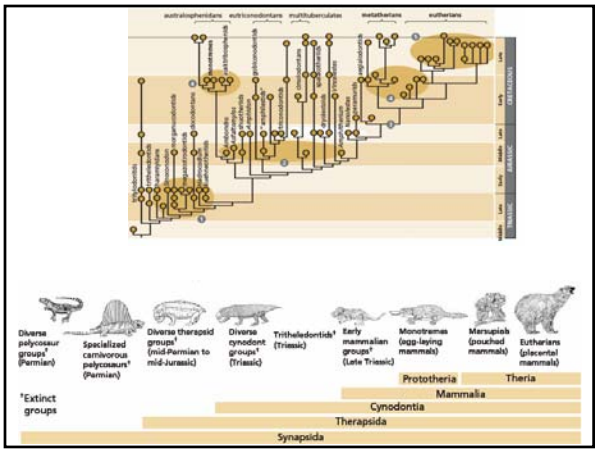


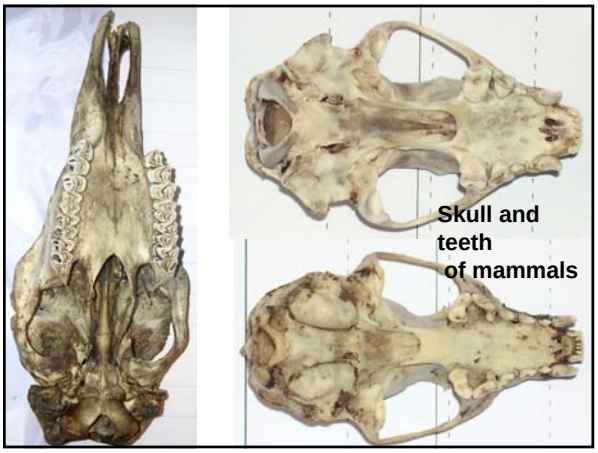

**200 MYA Early Jurassic**

**180 MYA Mid-Jurassic**

**135 MYA Early Cretaceous**

**65 MYA Early Cenozoic**



## Teeth

One of the major keys to success of mammals

*Teeth of mammals are extremely variable with different diets -- more than other taxa*

Feldhamer et al.

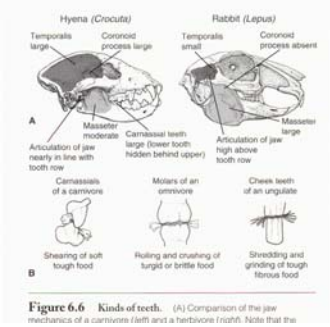


Figure 6.6 Kinds of teeth. (A) Comparison of the jaw mechanics of a carnivore (left) and a herbivore (right). Note that the

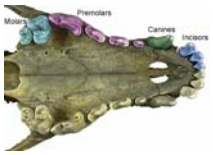
## Teeth and Dentition of Mammals

Heterodont teeth with different functions

*Differentiated on the basis of function, resulting in increased efficiency acquiring and digesting food.*

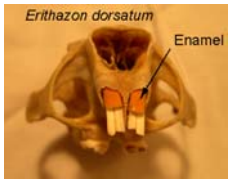
Teeth occur in 3 bones of skull: premaxilla, maxilla, dentary






## Additional Notes on Tooth Structure

**Not all teeth have enamel over entire surface of tooth, results in differential wear**

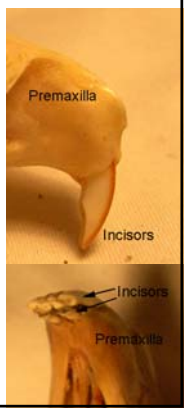



**Open-rooted teeth grow continuously (e.g., rodent incisors)**

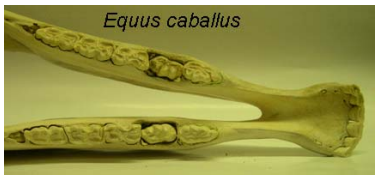

## Incisors: rooted in premaxilla (upper) and dentary (lower)

**Often reduced in number with a "diastema" in herbivores**






**Usually canines are lost**




**Canines: posterior to incisors, rooted in maxilla, dentary**

Function: piercing/tearing prey, holding, display, fighting

Structure: moderately to very long (compared to other teeth), usually simple form (unicuspid), single rooted

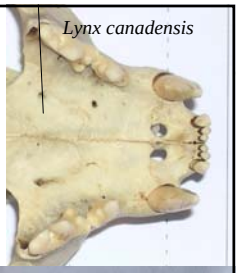
Mammals have single canine in each quadrant of jaw if present. Never present in modern rodents, often absent in herbivores

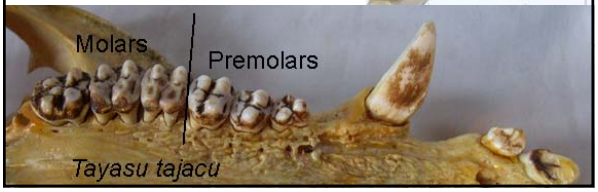
Often used in social displays or fighting.


## Molars and Premolars

Carnivores vs. Herbivores

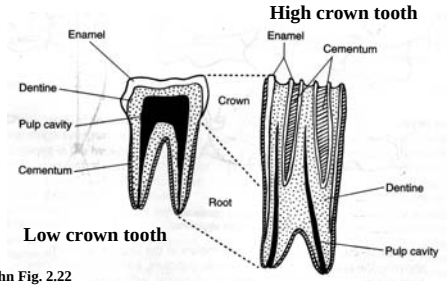
Generalizations and exceptions



## TOOTH CROWN HEIGHTS

**Brachydont: Low crowned teeth, typical of omnivores**
**Hypsodont: high crowned teeth, typical of many herbivores**




**Vaughn Fig. 2.22**

## Tooth Replacement

Most mammals are diphyodont which means they produce 2 sets of teeth during lifetime (milk teeth, permanent dentition)

Milk teeth consist of incisors, canines, and premolars. Molars only grow in as permanent teeth

Pattern of tooth replacement/eruption is well-ordered and species-specific; tooth eruption schedules can be used for aging mammals

Tooth replacement is vertical except in a few species in which it is horizontal (elephants, manatees, dugongs)

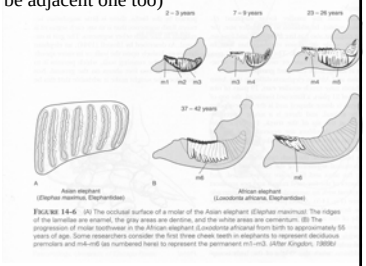

## Proboscidea

Functional teeth -- consequences of long life --
Single tooth active (may be adjacent one too)

Tusks -- 2nd upper incisor

*Deinotherium*

40 million years ago



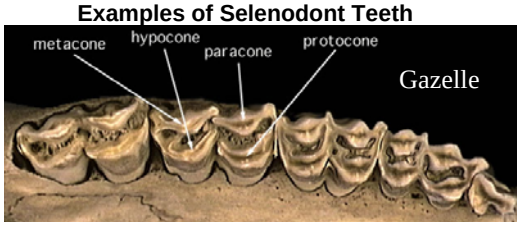
## Cheekteeth Cusp Patterns

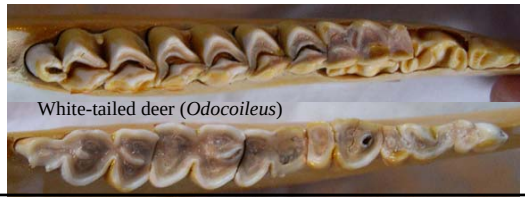
BUNODONT: Separate, rounded cusps for crushing, grinding, typical of omnivores

LOPHODONT: Cusps forming continuous ridges, or lophs, seen in herbivores

SELENODONT: Cusps as lophs which are crescent- shaped and longitudinal, also in


## Examples of Selenodont Teeth




## DENTAL FORMULAS

1. **Dental formulae are always given in the order: incisors (I), canines (C), premolars (P), molars (M)**
2. **Humans have 2 incisors, 1 canine, 2 premolars, and 3 molars = I2 C1 P2 M3, in each quadrant of their upper jaws**
3. **The numbers for each quadrant of the lower jaw are the same; general formula for humans is written I2/2 C1/1 P2/2 M3/3.**
4. **To calculate total number of teeth from dental formula, sum these numbers (2+2+1+1+2+2+3+3 = 16) then multiply by 2**

**16 X 2 = 32 total teeth in adult human**