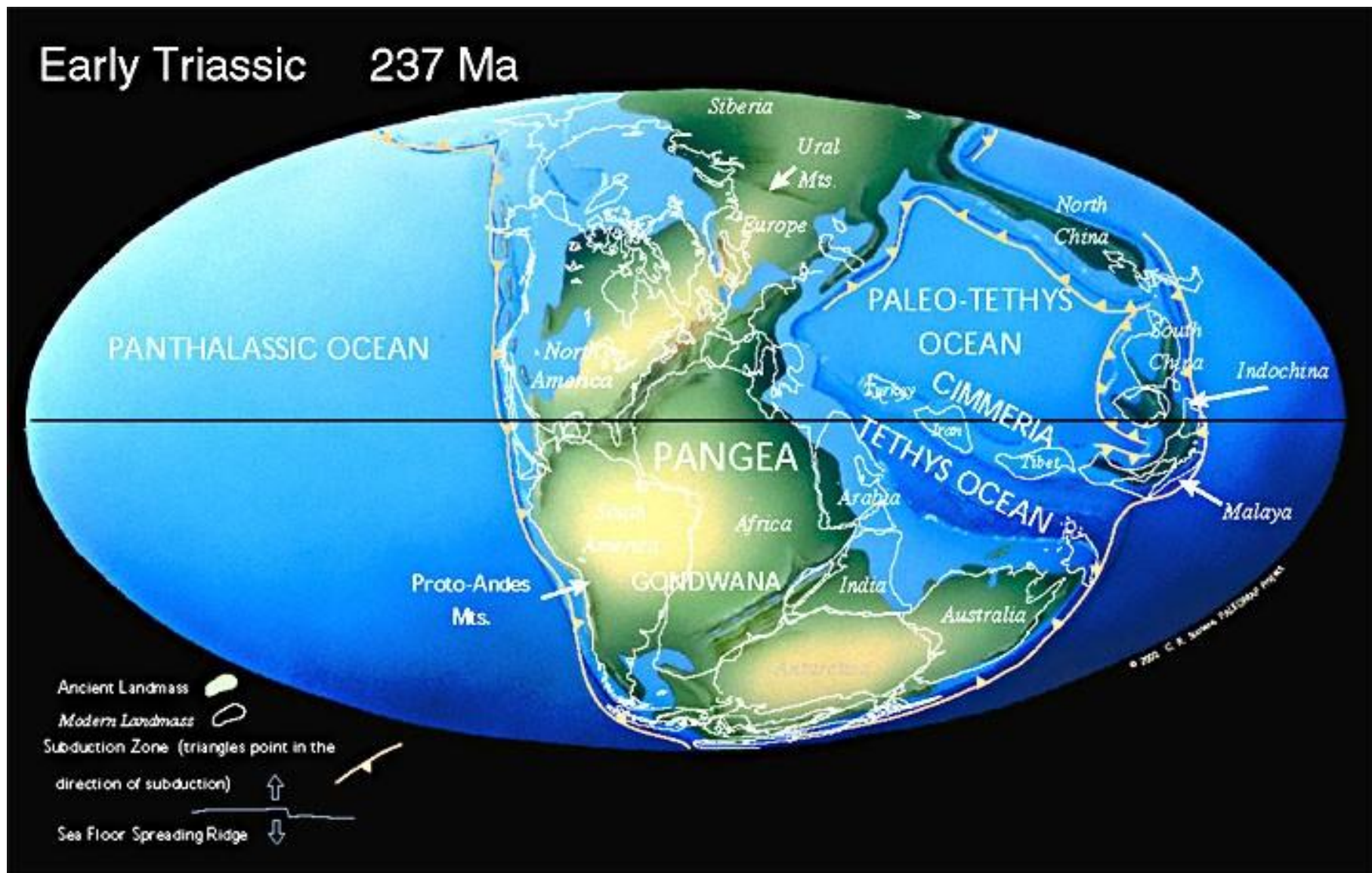


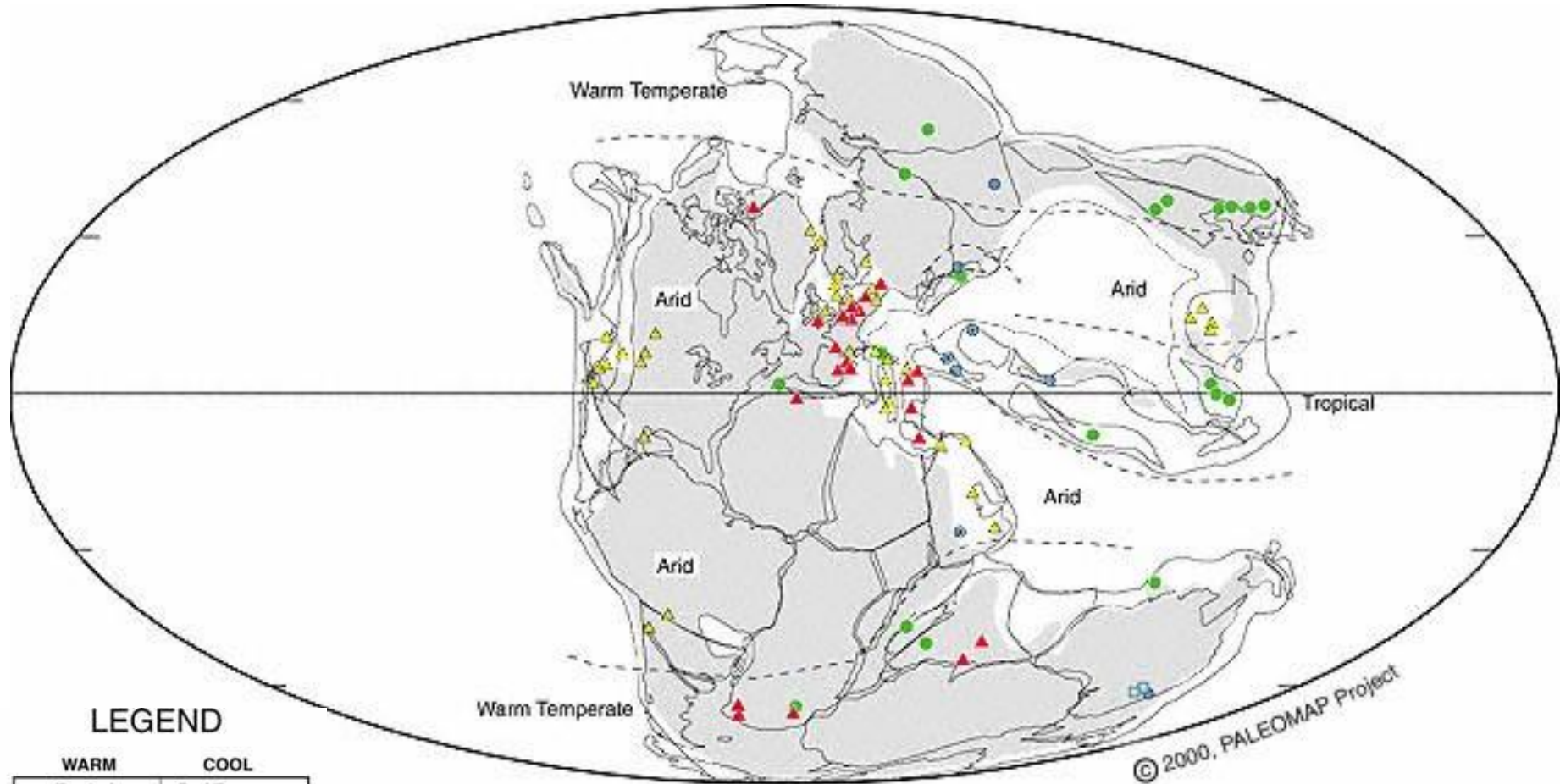
# **ИСТОРИЧЕСКАЯ ГЕОЛОГИЯ**

# Триасовый период



Палеотектоническая реконструкция Земли

# Климат



© 2000, PALEOMAP Project

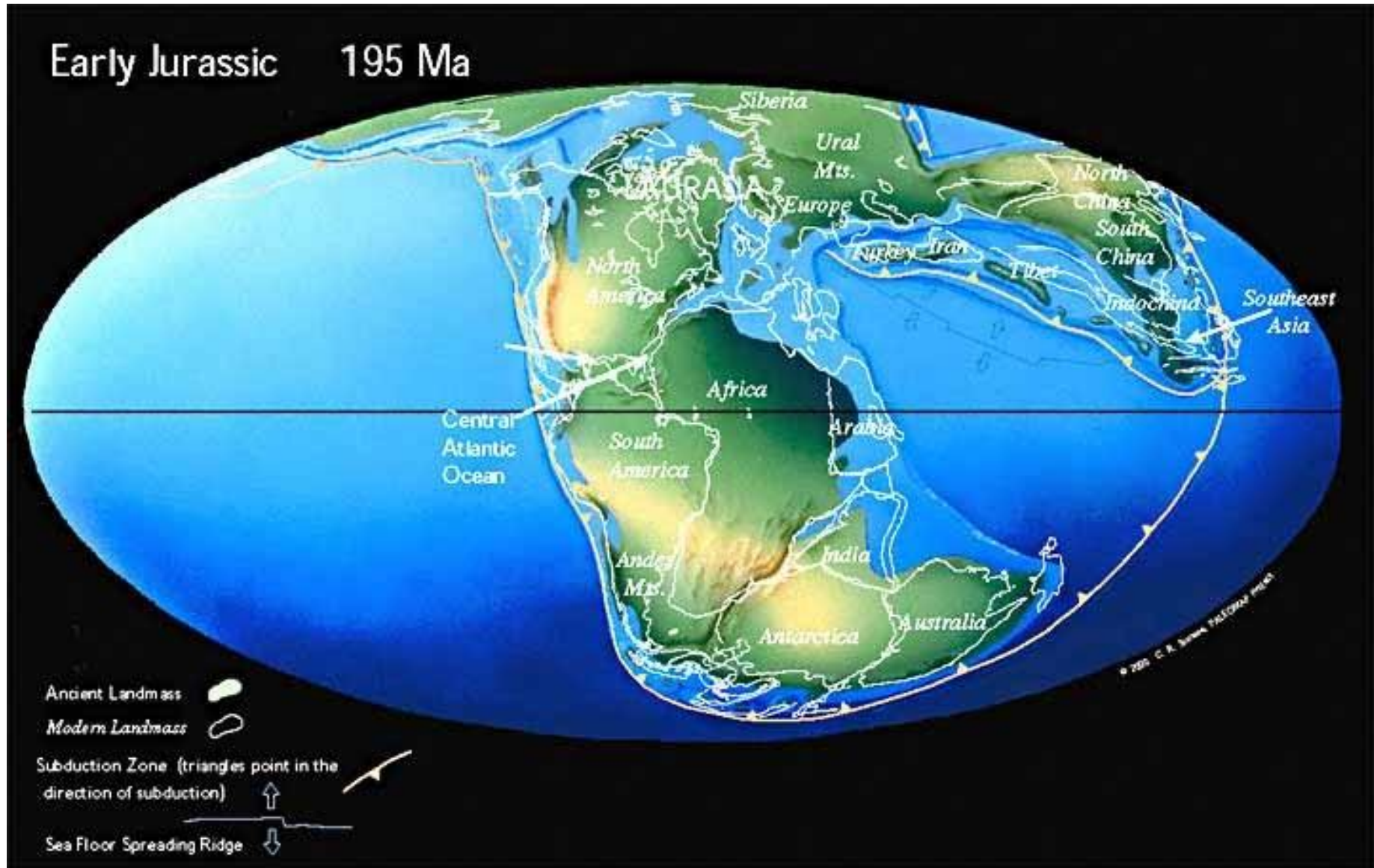
## LEGEND

WARM		COOL	
<i>Tropical</i>		<i>Cool Temperate</i>	
● Coal	● Coal & Tillites		
● Bauxite			
● Laterite			
<i>Warm Temperate</i>			
■ Kaolinite (& coal & evaporite)	← Crocodiles	→ Palms & Mangroves	
<i>Arid</i>		<i>Cold</i>	
▲ Evaporite	⊕ Tillite		
▲ Calcrete	⊕ Dropstone		
	● Glendonite		

Lower Triassic

"Paratropical" = High Latitude Bauxites

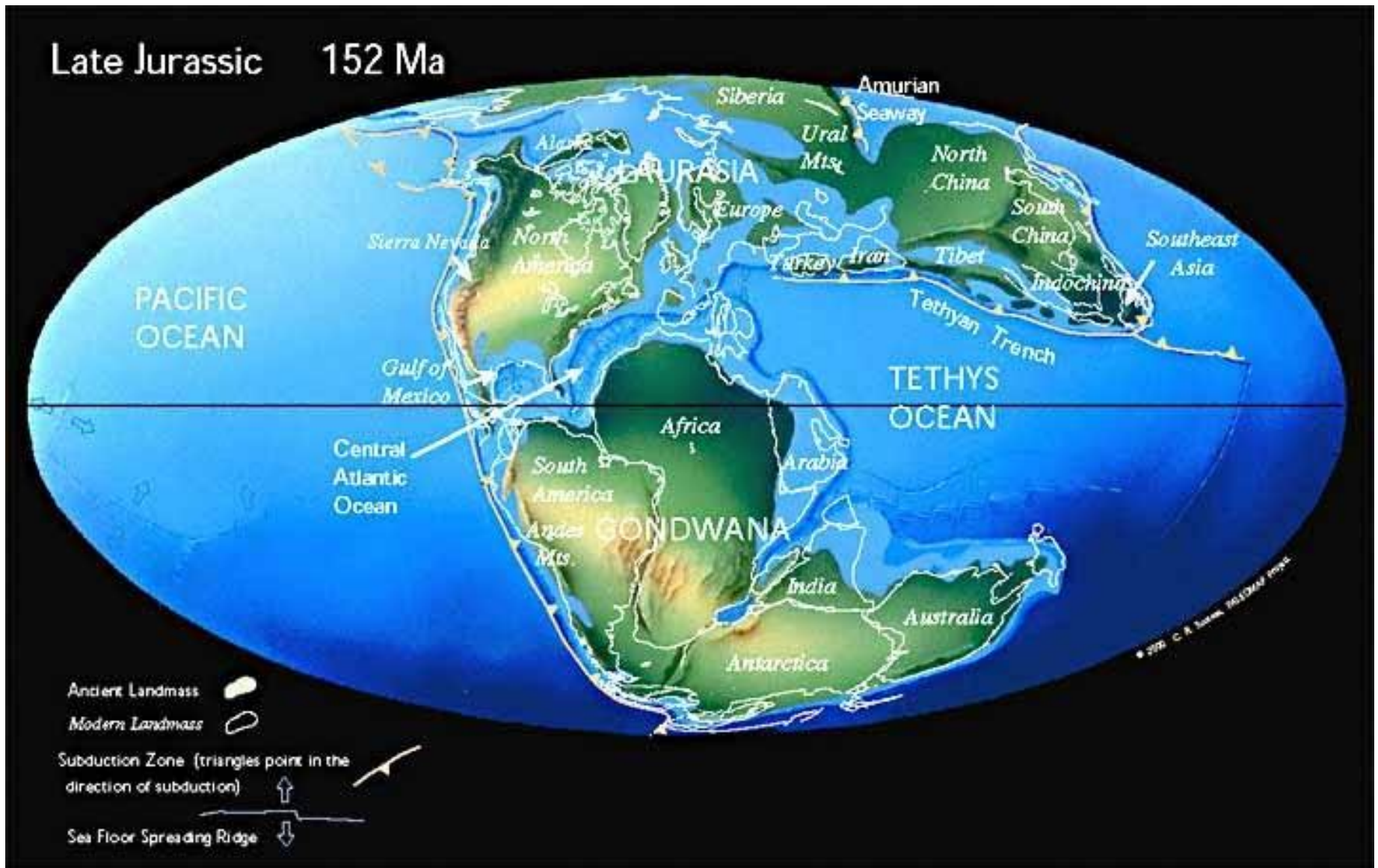
# Юрский период



Палеотектоническая реконструкция Земли

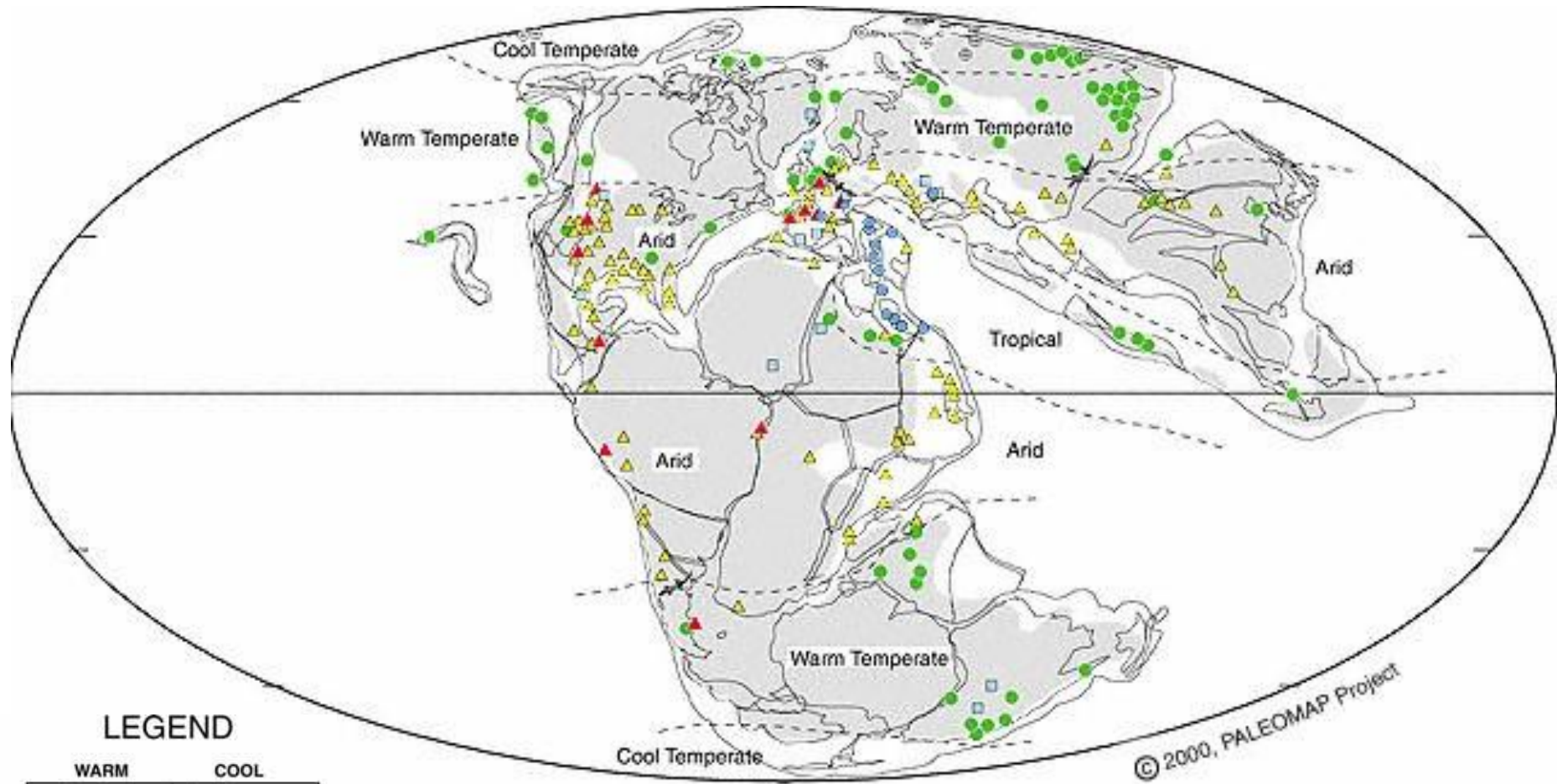
# Юрский период

Late Jurassic 152 Ma



Палеотектоническая реконструкция Земли

# Климат



© 2000, PALEOMAP Project

## LEGEND

WARM		COOL	
<i>Tropical</i>		<i>Cool Temperate</i>	
● Coal	● Coal	● Coal & Tillites	
● Bauxite			
● Laterite			
<i>Warm Temperate</i>			
■ Kaolinite (& coal & evaporite)			
🐊 Crocodiles	🌴 Palms & Mangroves		
<i>Arid</i>		<i>Cold</i>	
▲ Evaporite	⊕ Tillite	⊕ Dropstone	
▲ Calcrete	● Glendonite		

Upper Jurassic

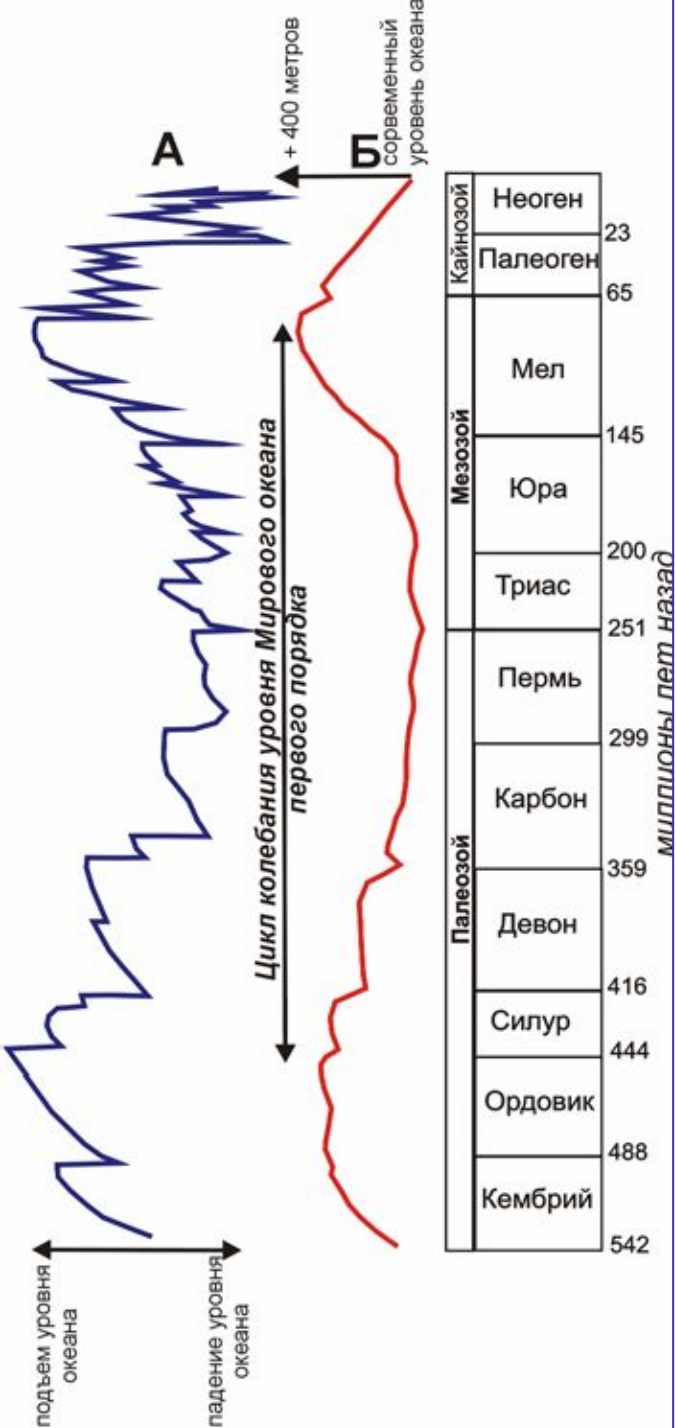
"Paratropical" = High Latitude Bauxites

# Меловой период.

## Палеогеографические события

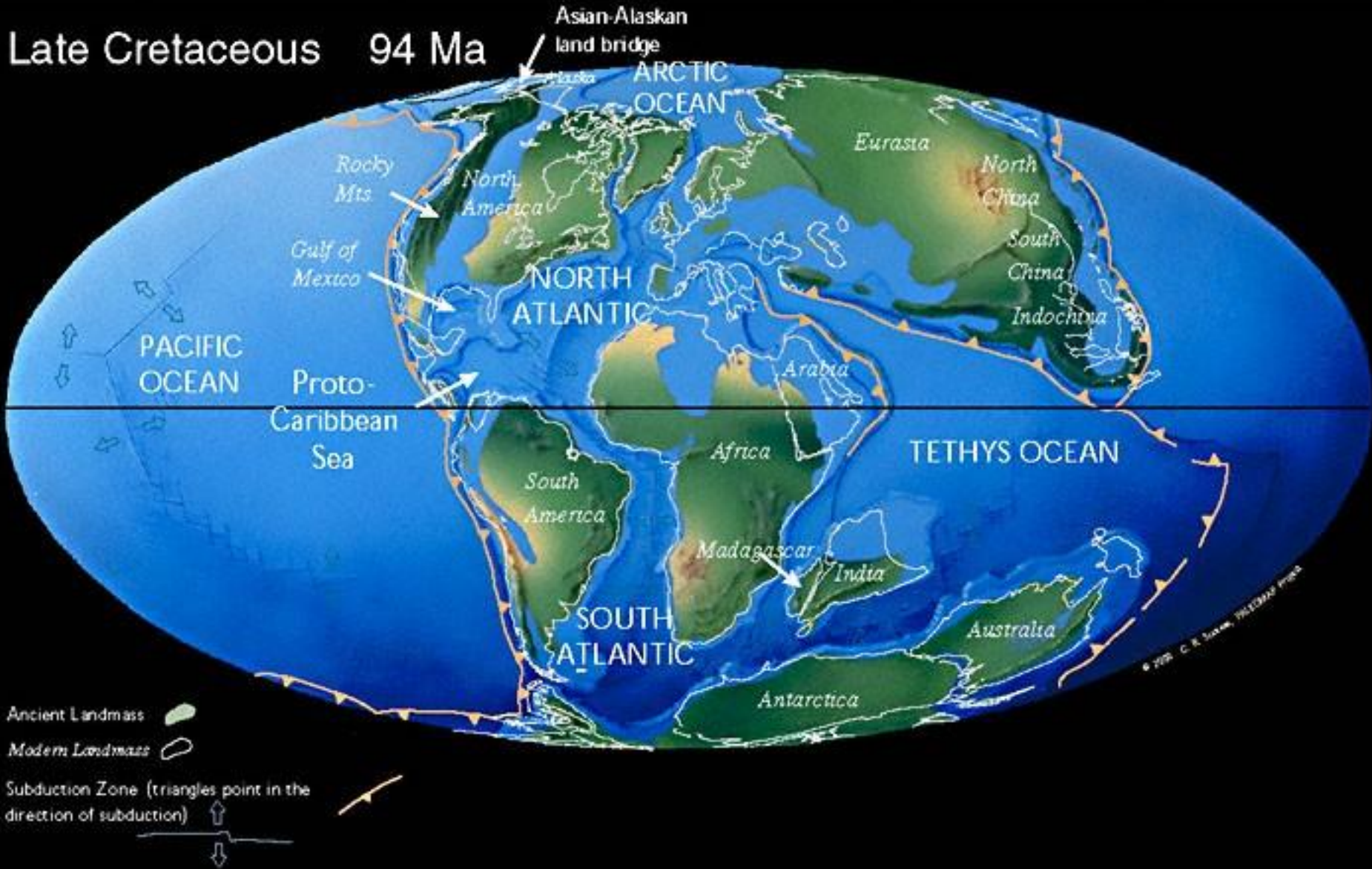
- Талассократия, огромные эпиконтинентальные бассейны
- Накопление пясчег мела
- Аридный климат – в начале, смена на гумидный теплый - в конце
- Резкое уменьшение эрозии в связи с появлением травы
- Развитие карбонатных шельфов

«Событие» на рубеже мела и палеогена: ? метеоритная бомбардировка или вулканизм



# Меловой период

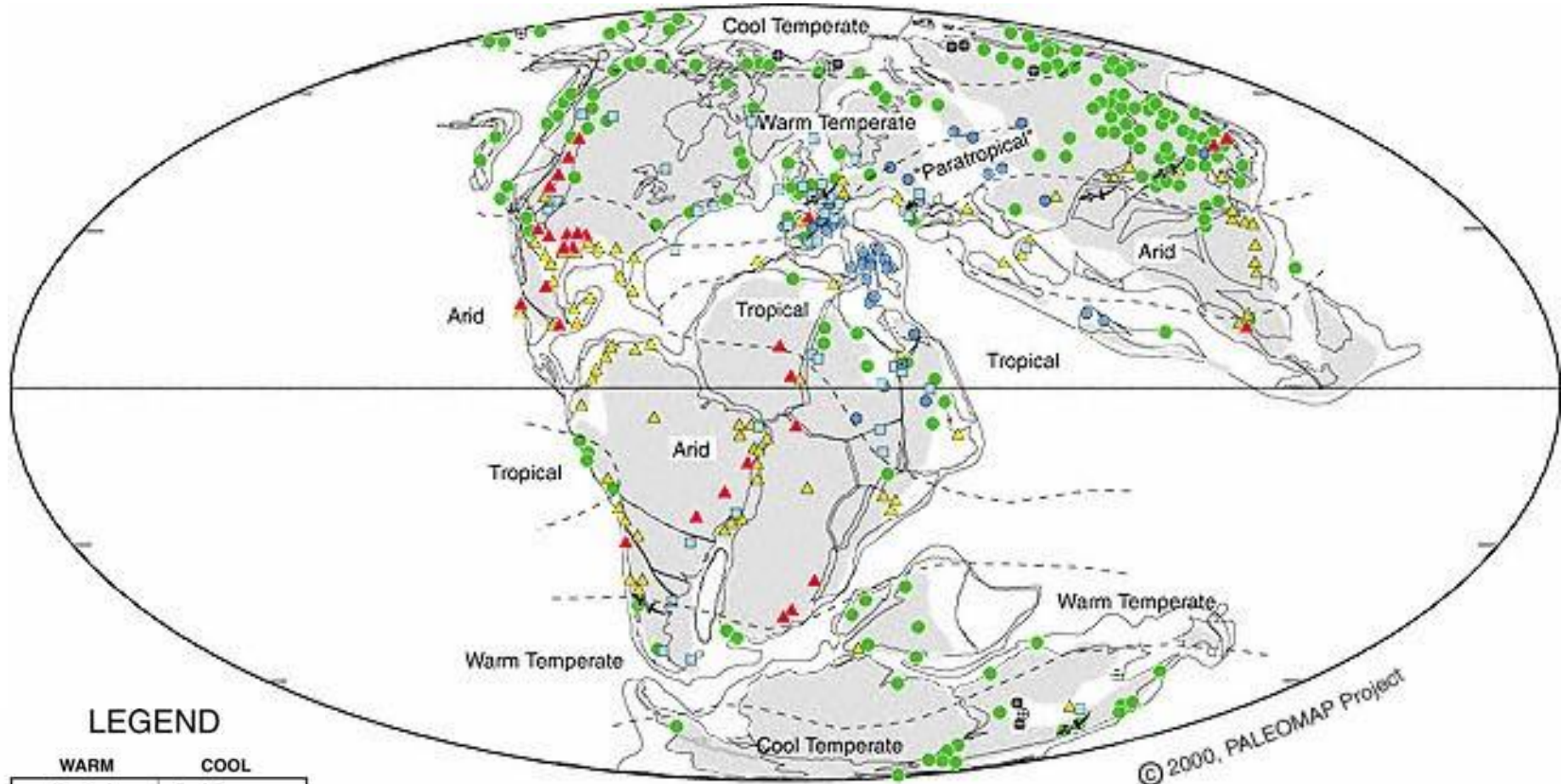
Late Cretaceous 94 Ma



Палеотектоническая реконструкция Земли



# Климат



## LEGEND

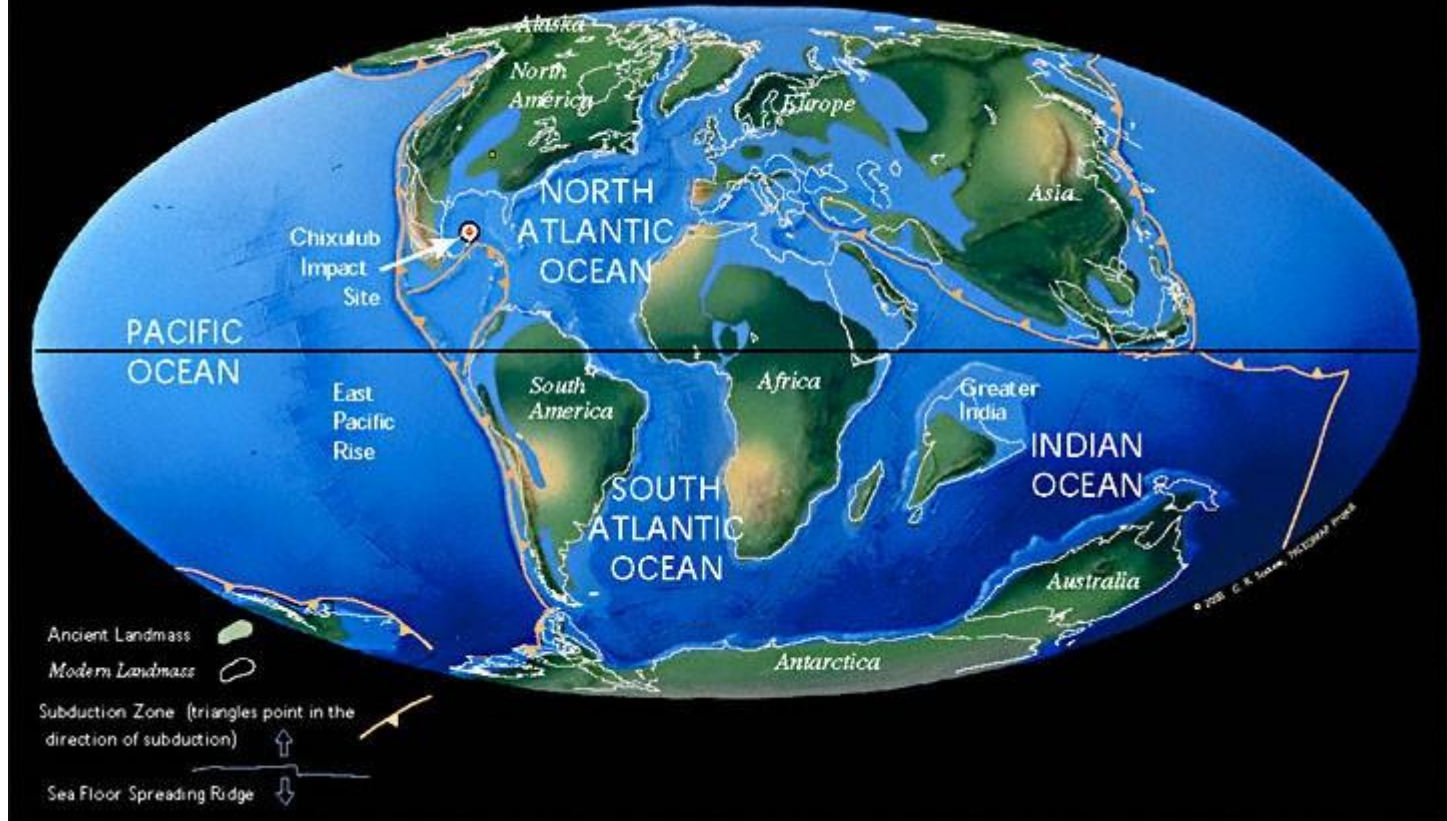
WARM		COOL	
<i>Tropical</i>		<i>Cool Temperate</i>	
● Coal	● Coal	● Coal & Tillites	
● Bauxite			
● Laterite			
<i>Warm Temperate</i>			
■ Kaolinite (& coal & evaporite)			
🐊 Crocodiles	🌴 Palms & Mangroves		
<i>Arid</i>		<i>Cold</i>	
▲ Evaporite	⊕ Tillite	⊕ Dropstone	
▲ Calcrete	● Glendonite		

Lower Cretaceous

© 2000, PALEOMAP Project

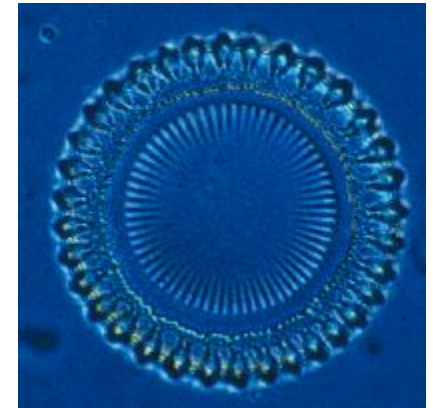
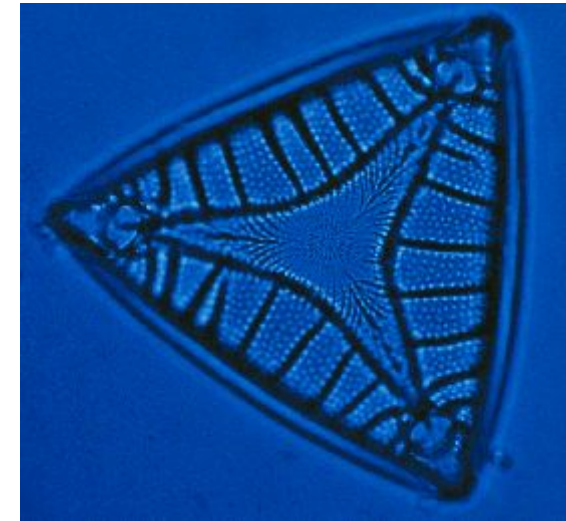
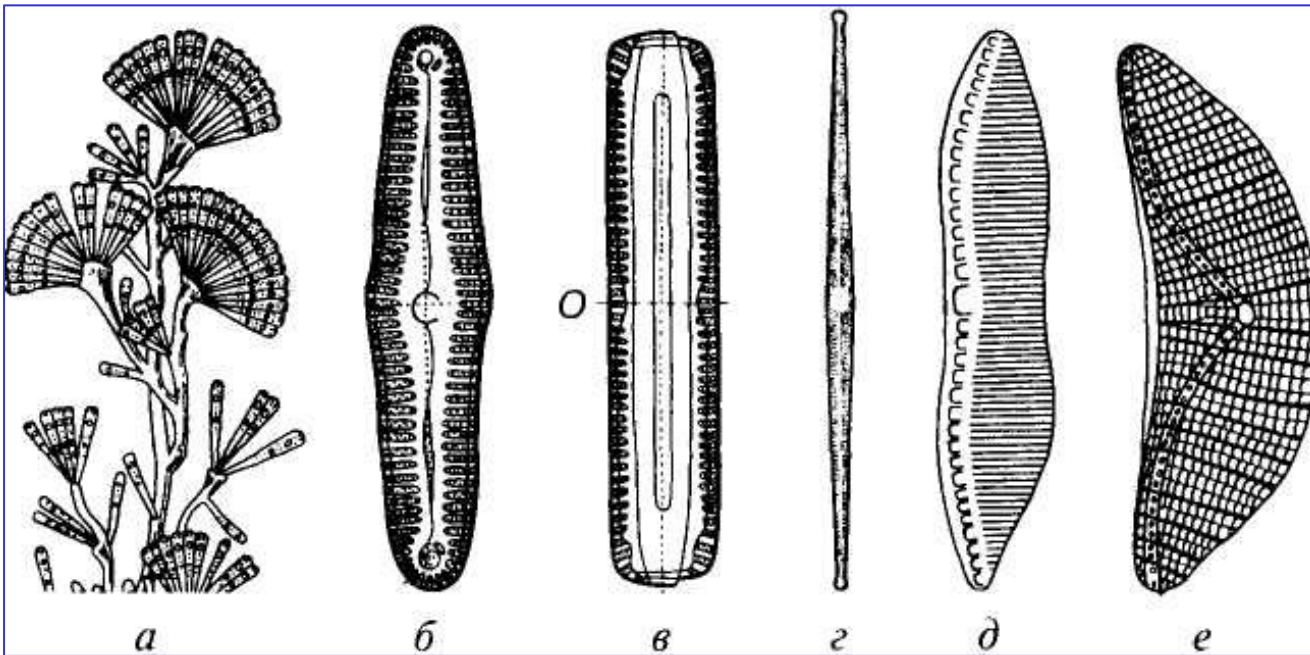
"Paratropical" = High Latitude Bauxites

## K/T Boundary 66 Ma



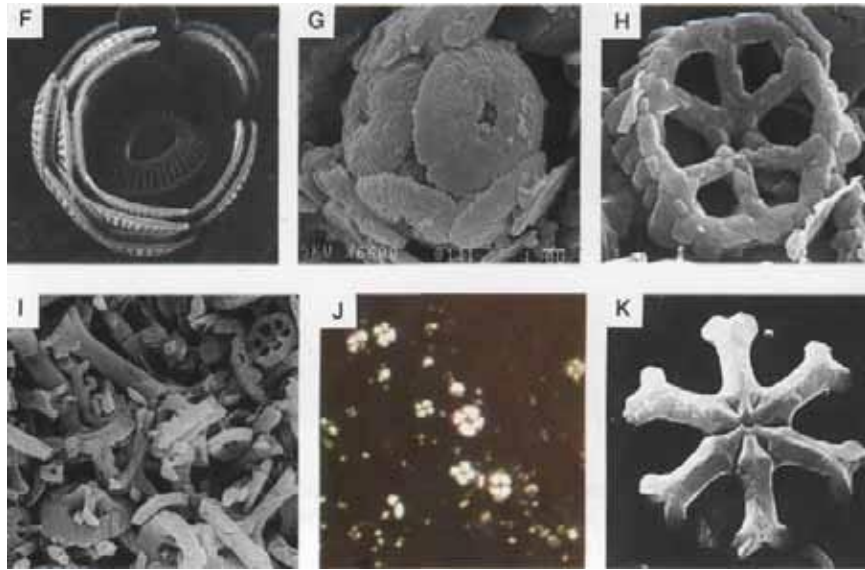
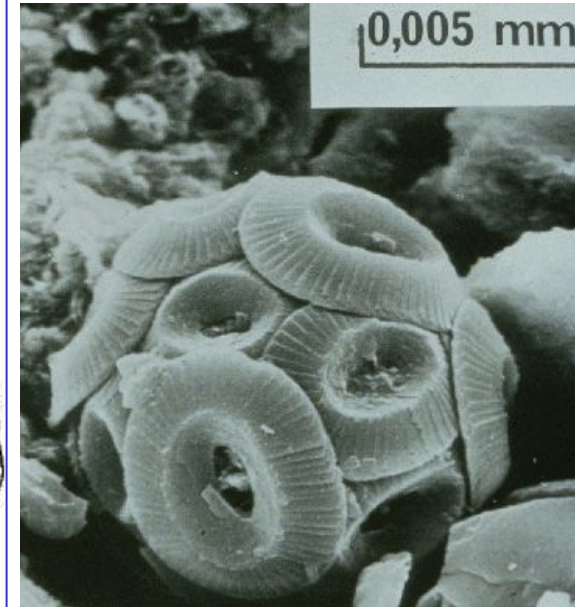
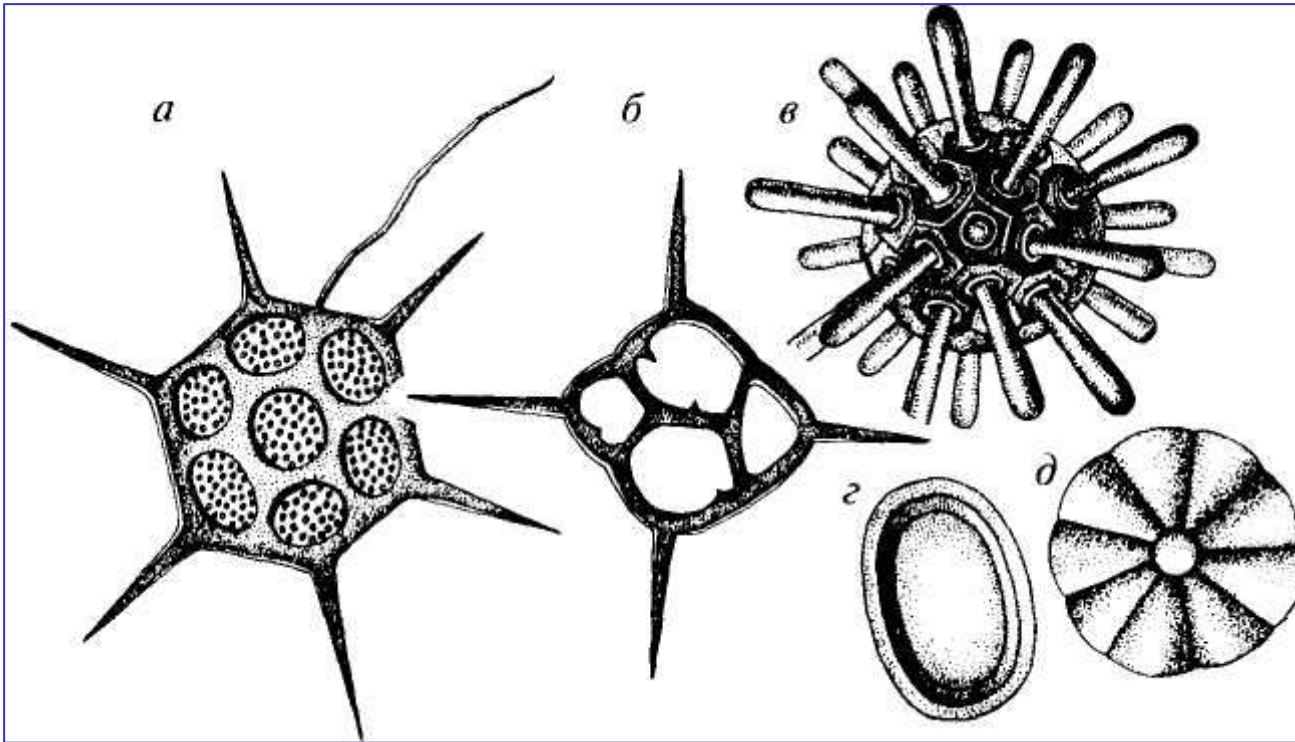
## Палеотектоническая реконструкция Земли

# Развитие флоры в мезозое



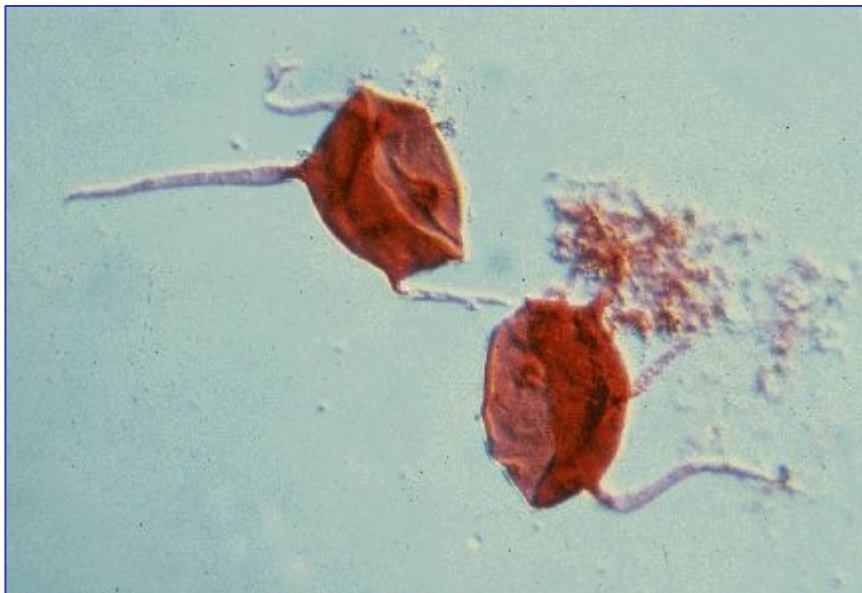
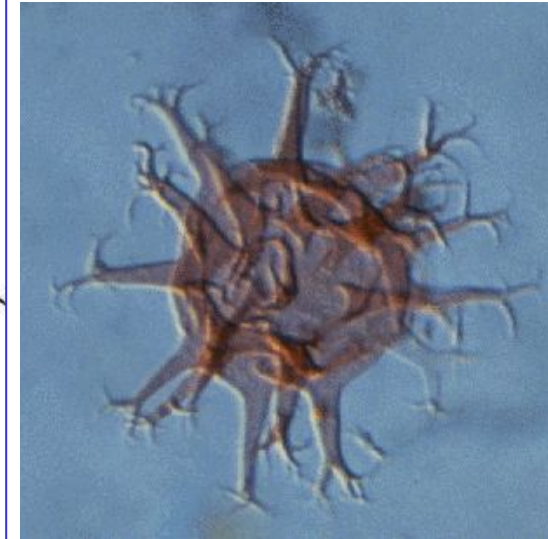
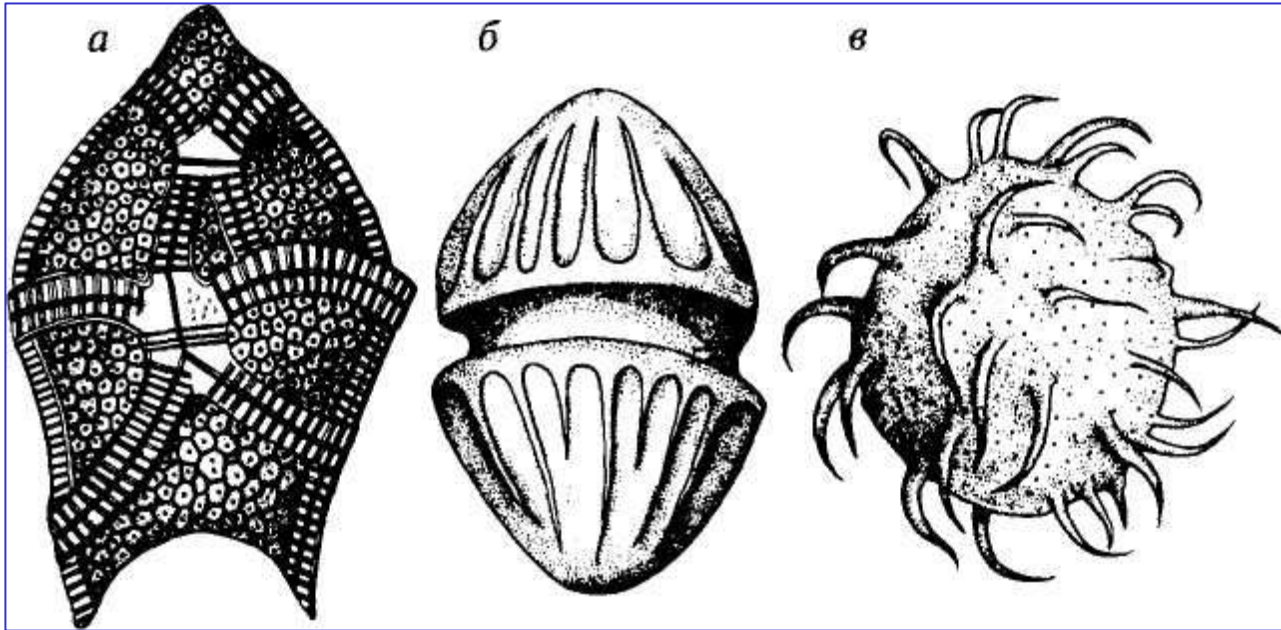
**Диатомовые Водоросли,  
Diatomeae (P-Q)**

# Развитие флоры в мезозое



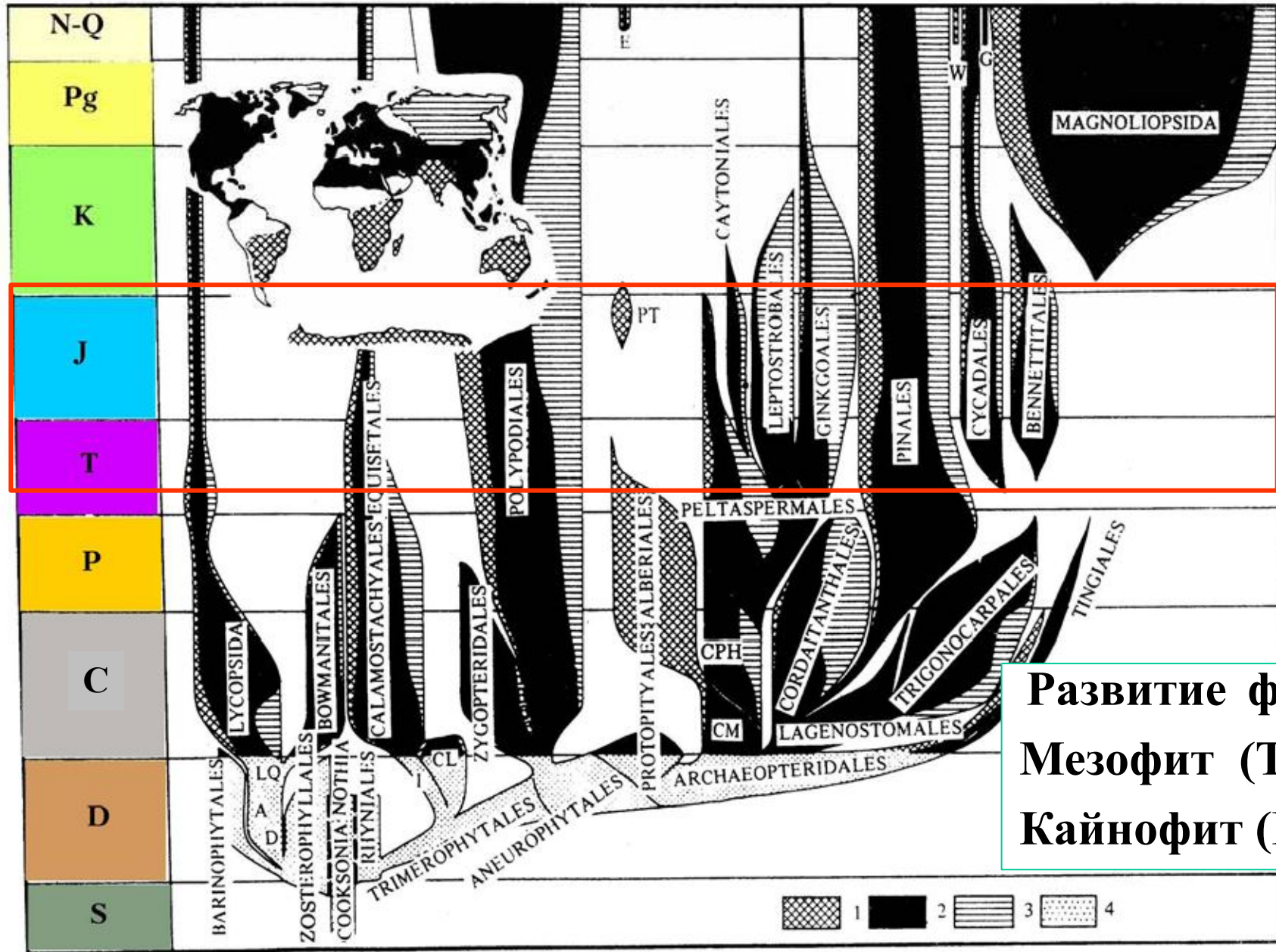
**Золотистые Водоросли,  
Chrysophyta (T-Q)**

# Развитие флоры в мезозое



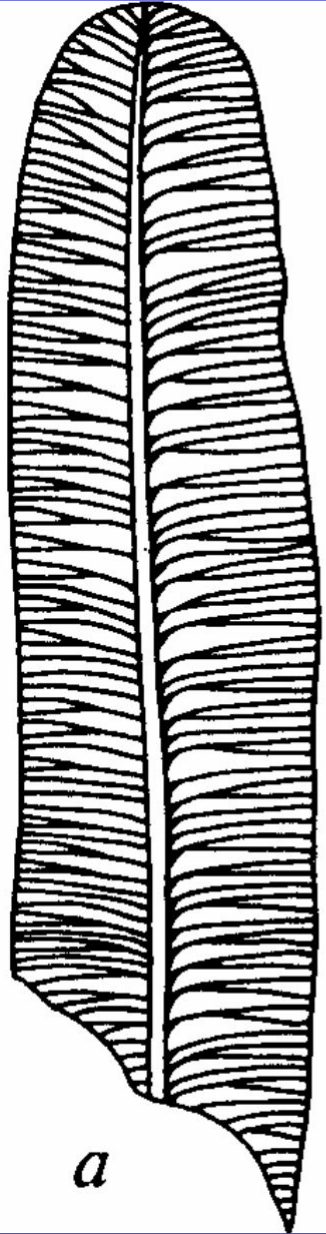
**Динофитовые  
Водоросли, Dinophyta  
(P-Q)**

# Развитие флоры в мезозое

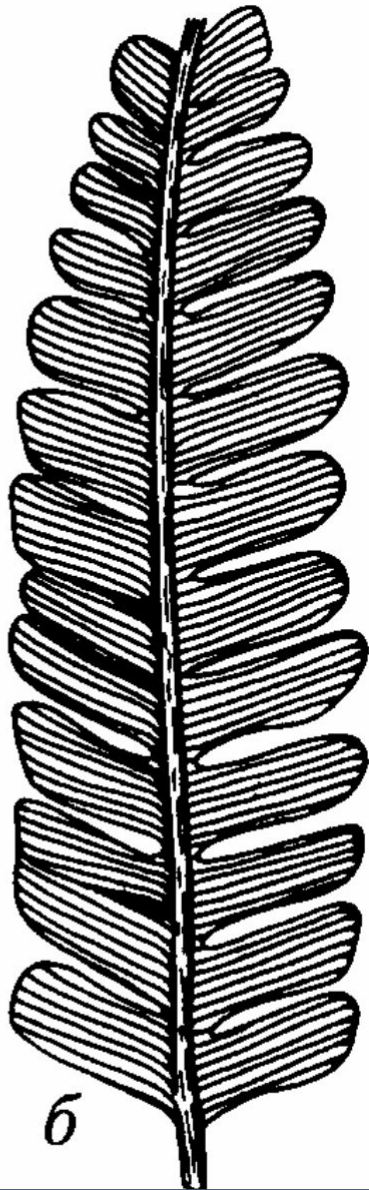


Развитие флоры  
 Мезофит (Т<sub>2</sub>-К<sub>1</sub>)  
 Кайнофит (К<sub>1</sub>-Q)

# Развитие флоры в мезозое



*a*



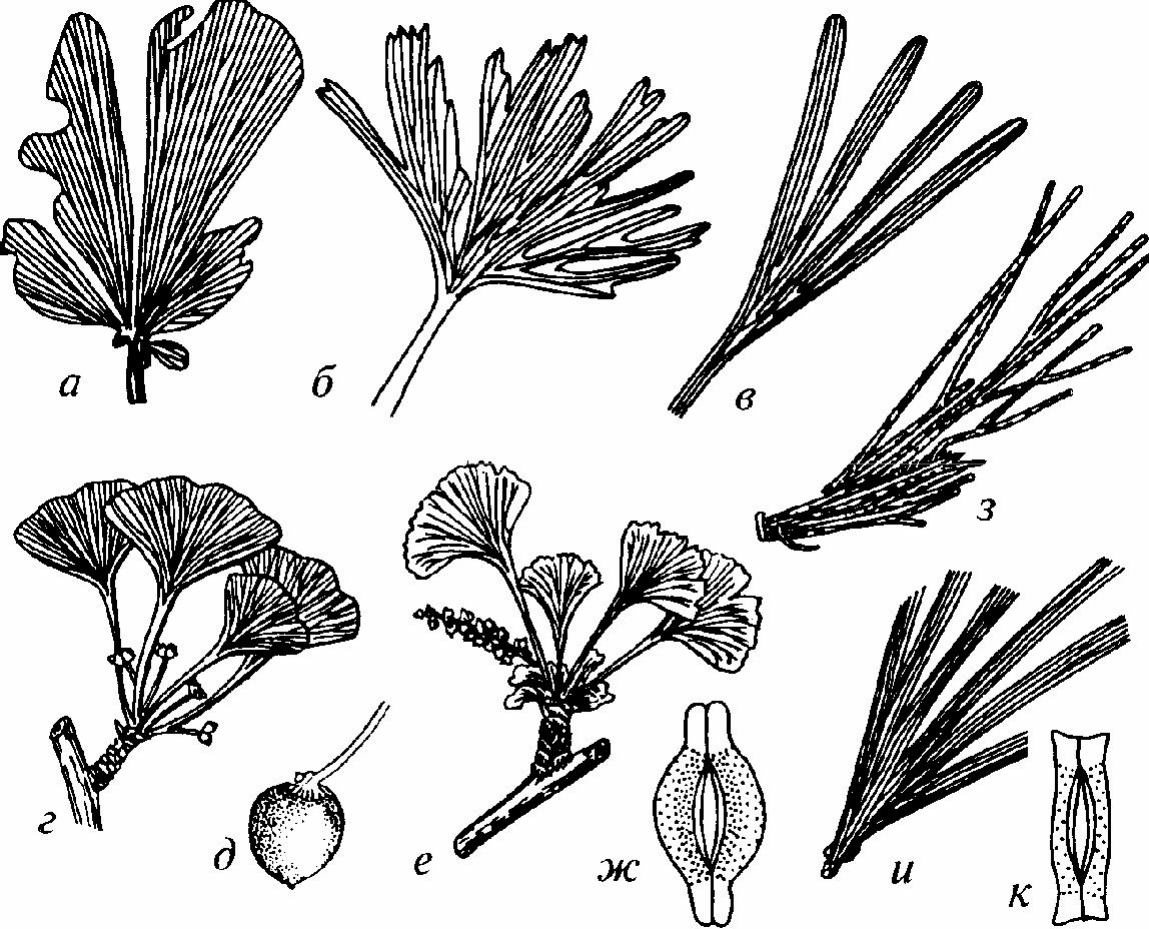
*б*



Порядок *Sycadales* (P<sub>2</sub>-Q)

*a* — лист типа *Taeniopteris* (Cз-K<sub>1</sub>); *б* — *Nilssonia* (T-K)

# Развитие флоры в мезозое



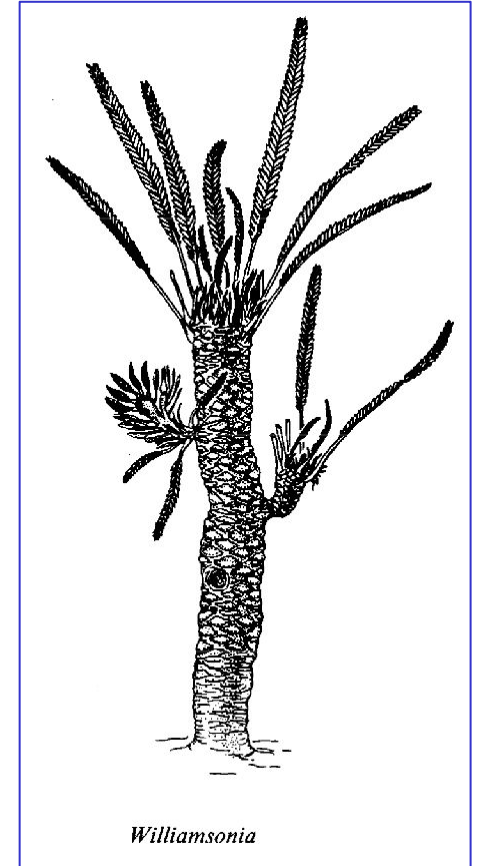
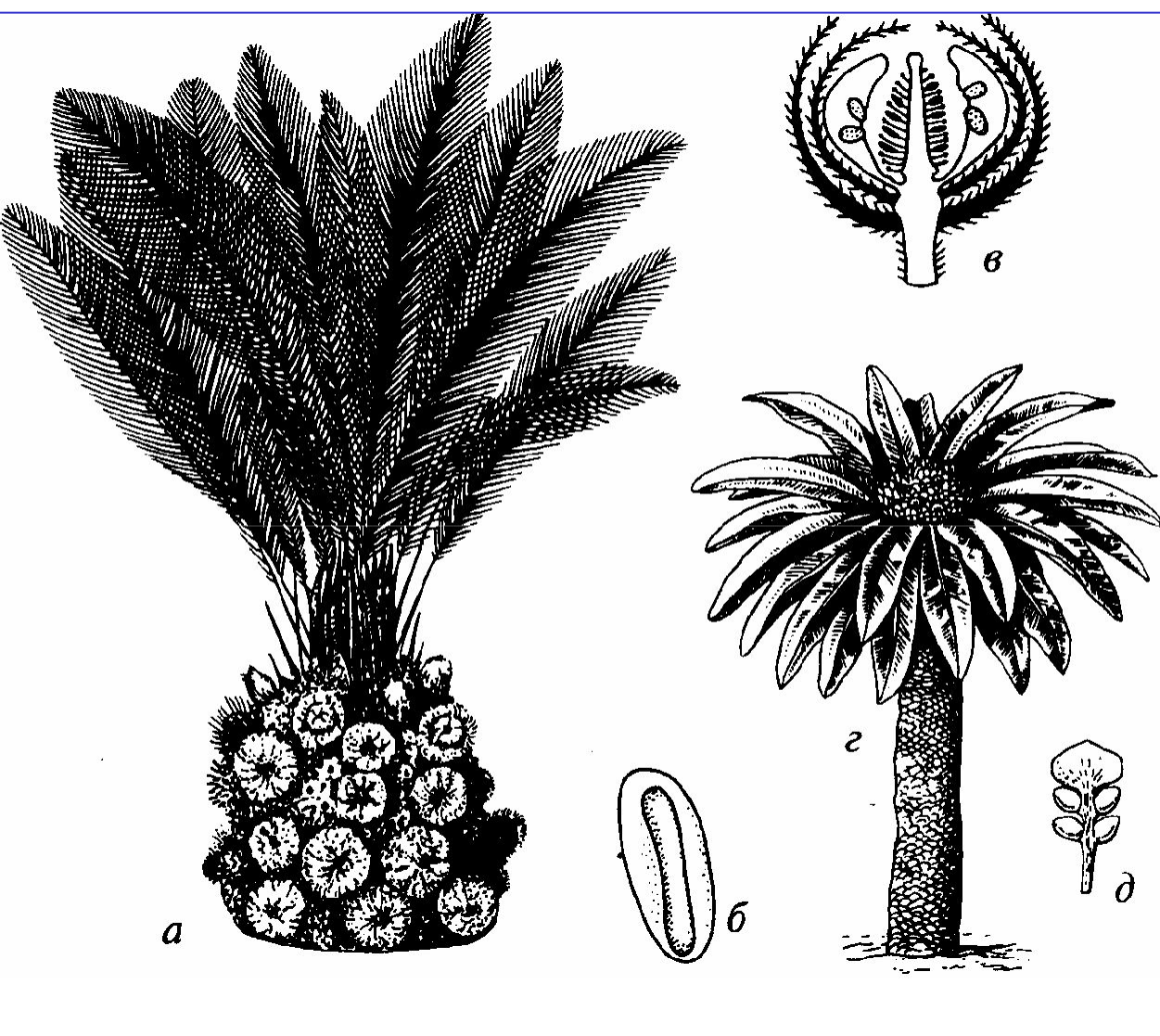
Порядки  
Ginkgoales (P-Q),  
Czekanowskiales (T<sub>3</sub>-K)



emc14



# Развитие флоры в мезозое



## Порядок Bennettitales ( $T_2$ -К)

а, б — Cycadoidea (J-K): а — реконструкция, б — пыльцевое зерно; в —

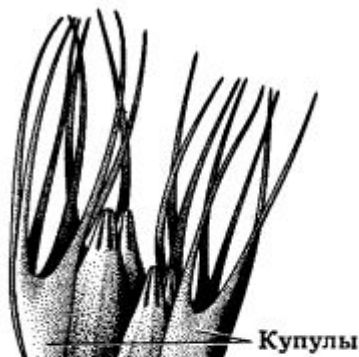
*Williamsoniella* (J), реконструкция обоеполого стробила; г — реконструкция дерева с листьями типа ( $T_3$ ); д — мегаспорофилл с вмятинчатками (*Palaeocycas*,  $T_3$ )

четырьмя

# Развитие флоры в мезозое

## Происхождение покрытосеменных (Magnoliophyta, Angiospermae)

- “Проклятая тайна” (Ч.Дарвин)
- Первое появление - средние широты Северного и Южного полушарий 120–115 млн лет назад (готеривский век раннего мела)
- Несколько крупных центров параллельного развития
- ? связь с рифтами и насекомыми
- Проангиоспермы – вымершие гнетовые (*Eoantha*) ?
- ? произошли от беннеттитовых



Купулы

Реконструкция ветви растения с семяподобными структурами: в каждой купуле два колбовидных семени с разделенными на лопасти верхушками



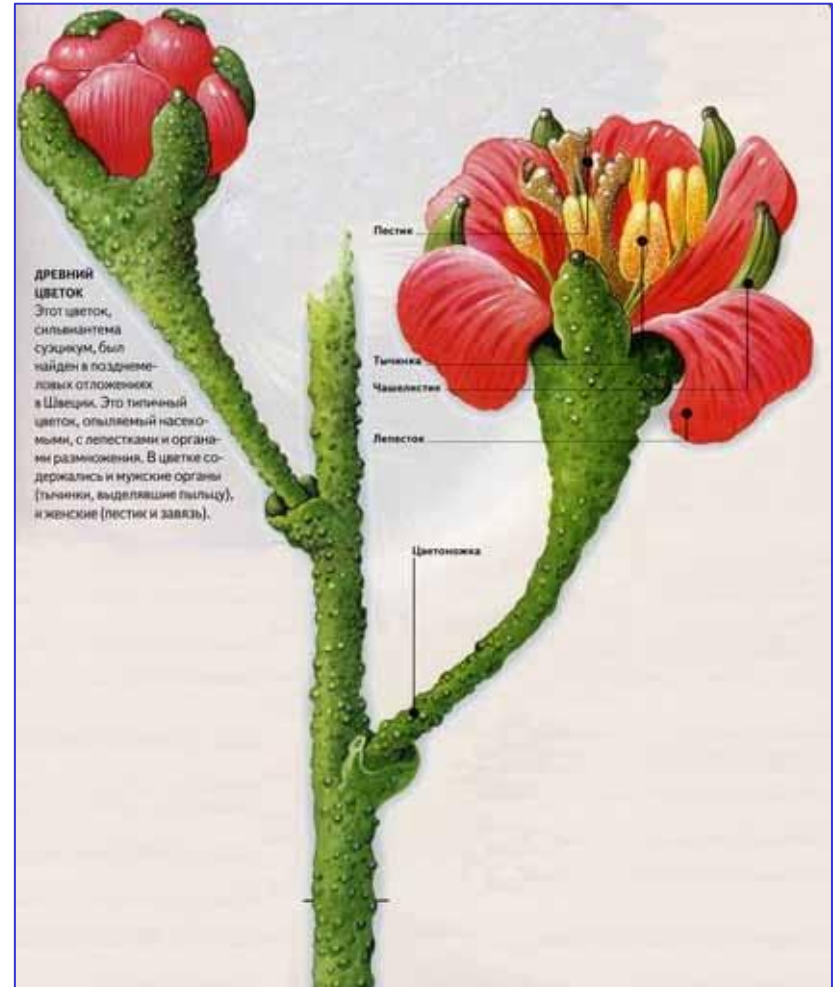
Эфедра хвощевая – современная форма предполагаемого предка цветковых растений

# Развитие флоры в мезозое.

## Покрытосеменные

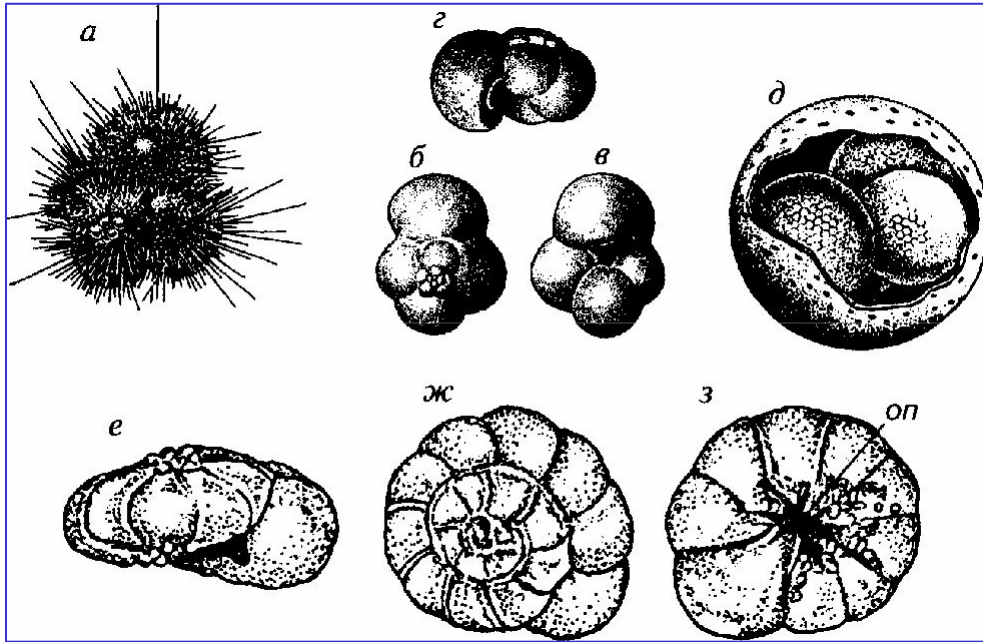


- *Archeofructus*, К<sub>1</sub>,  
Китай



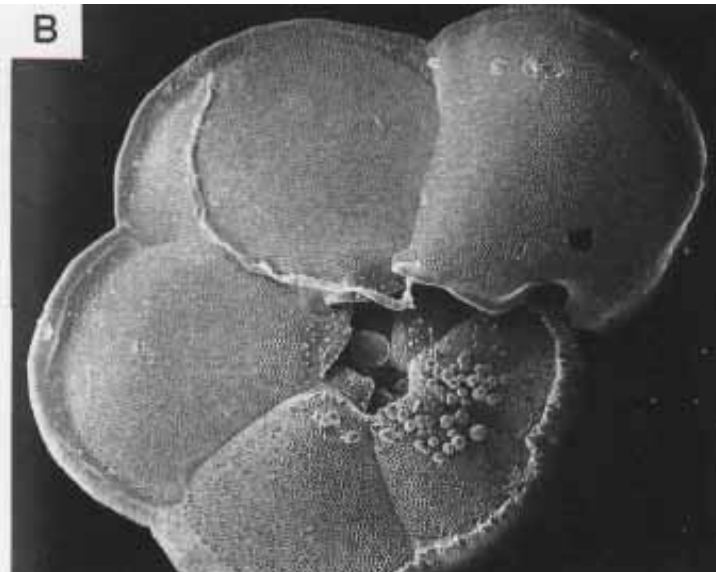
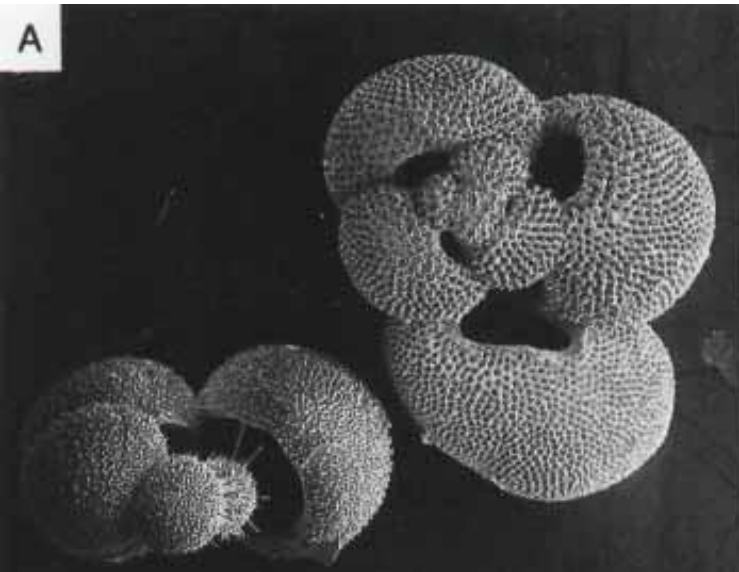
- *Sylviantema*, К<sub>2</sub>,  
Швеция

# Развитие жизни в мезозое

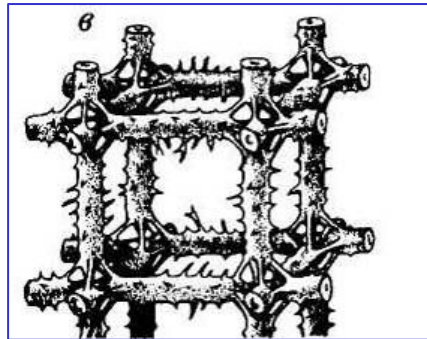
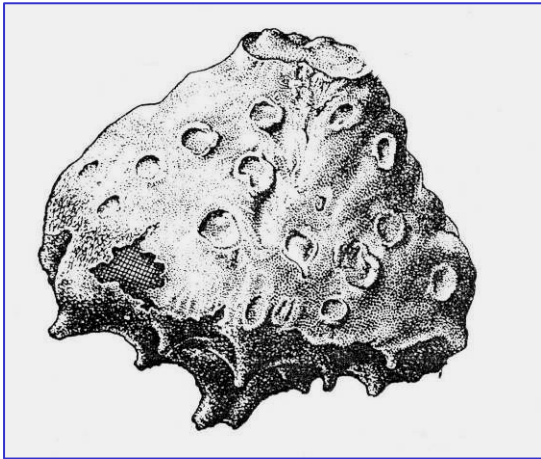
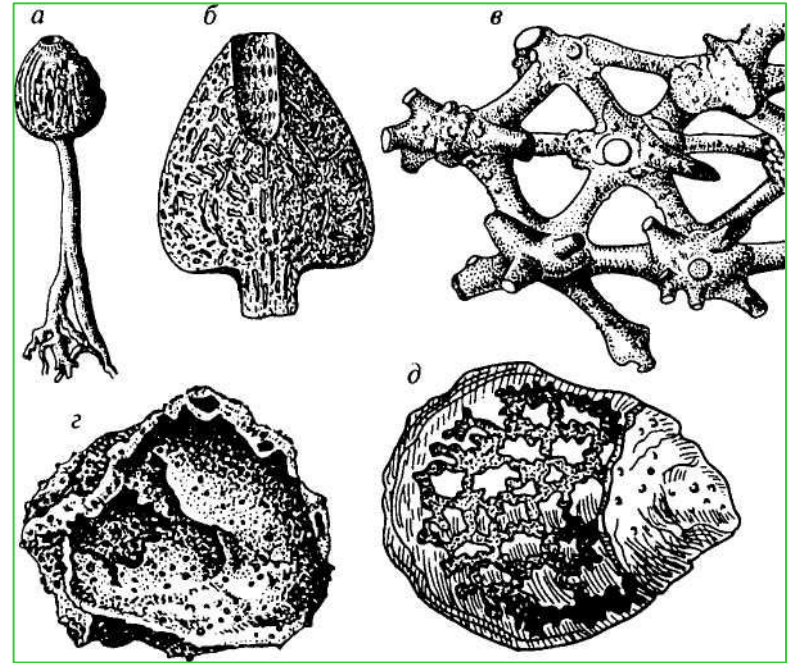
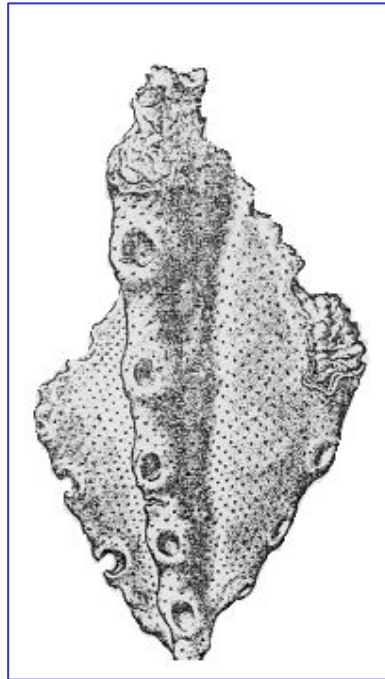
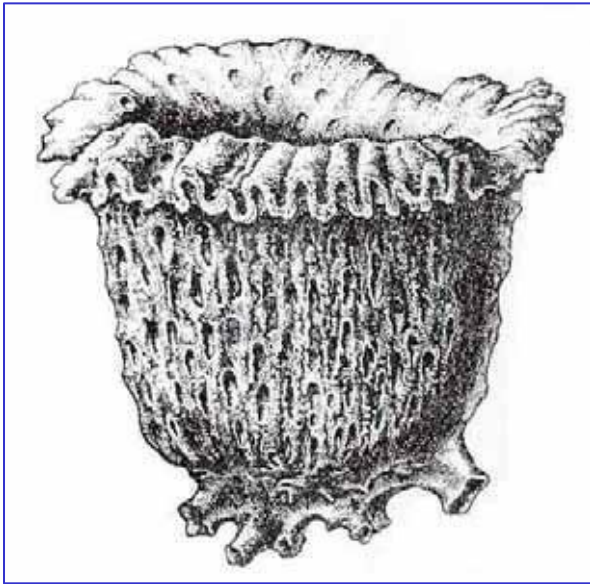


- Появление планктонных фораминифер в  $J_1$

- Кризис на рубеже мезозоя и кайнозоя

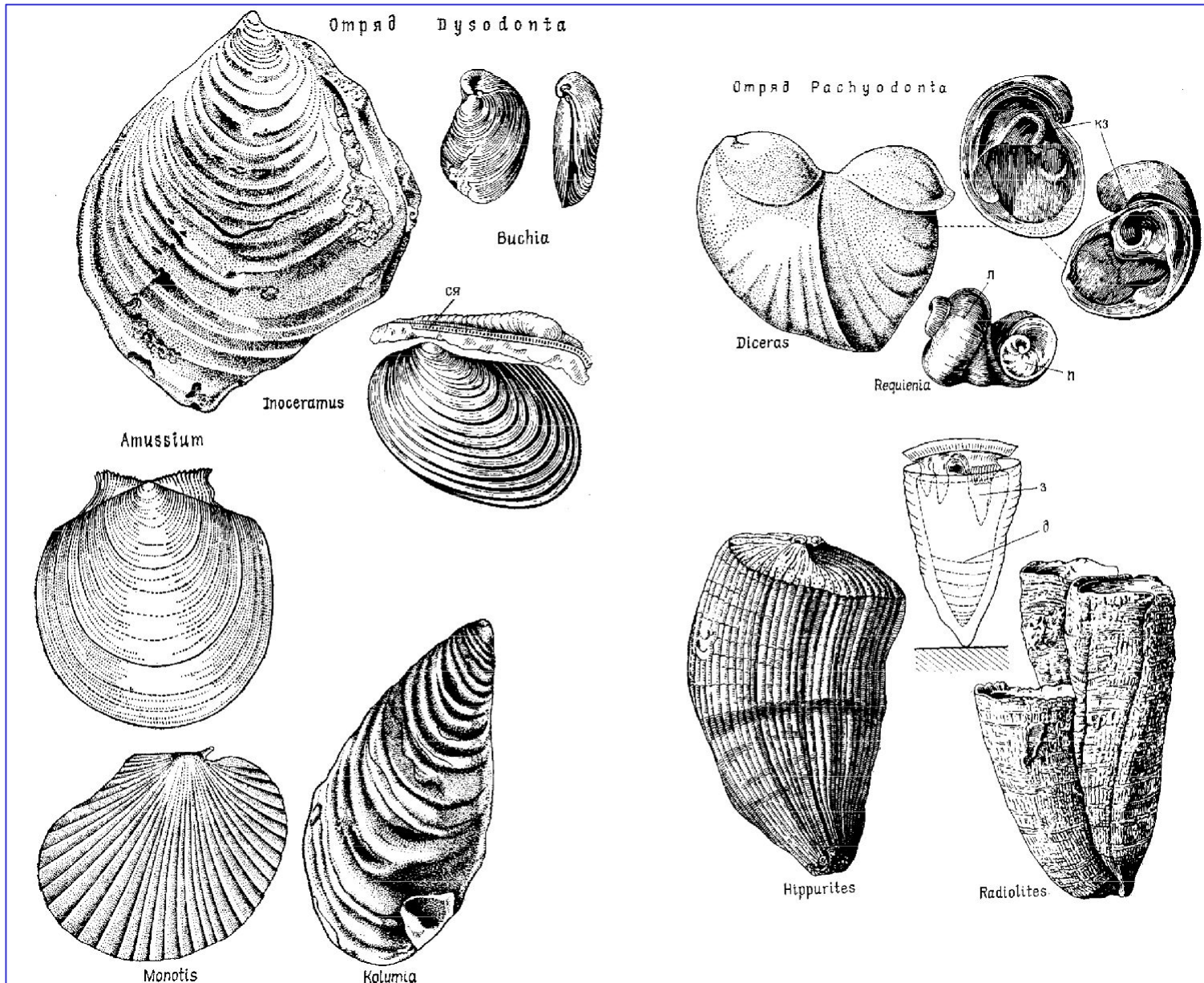


# Развитие жизни в мезозое



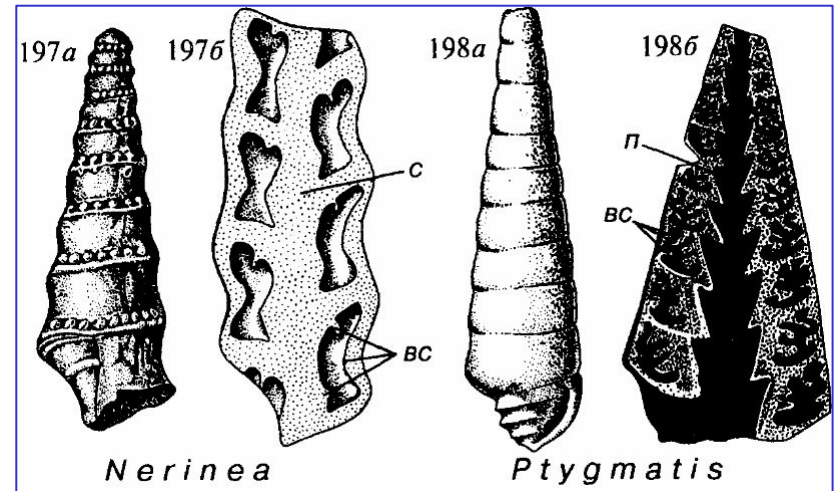
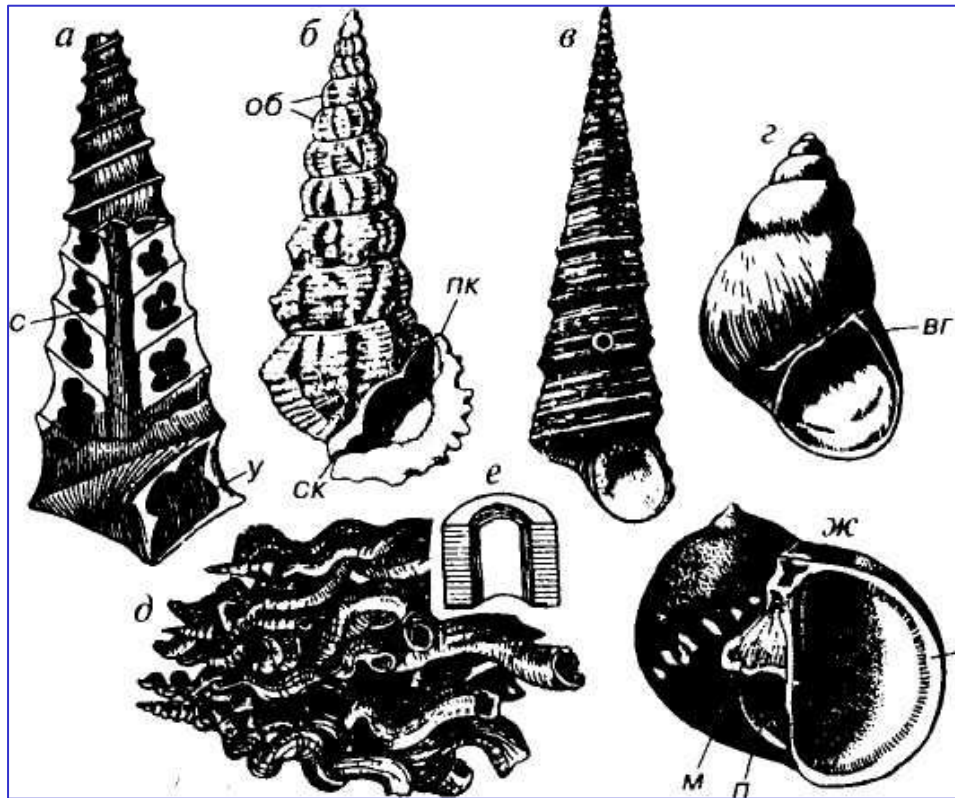
- Кремневые губки
- Образование «губковых полей»

# Развитие жизни в мезозое



## Двустворки

# Развитие жизни в мезозое. Гастроподы

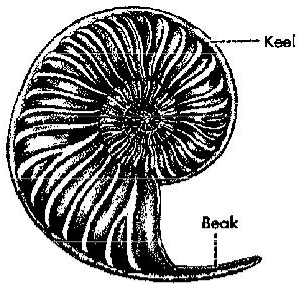


Отряд Mesogastropoda (O-Q)

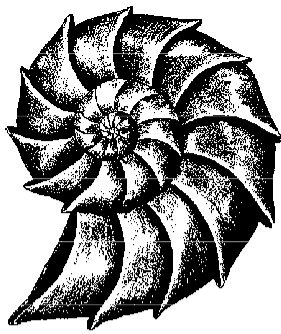


*Nerinea* (J-K)

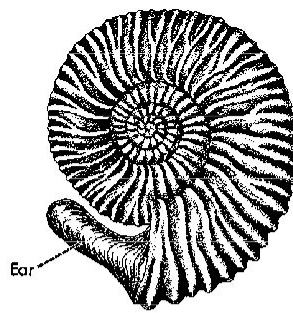
# Развитие жизни в мезозое



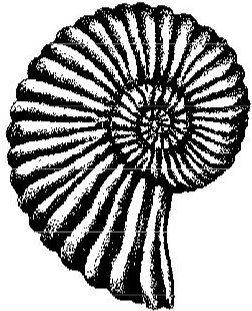
*Schloenbachia*, about  $\times 1$ , with keel and beak. Cretaceous, Europe, Greenland



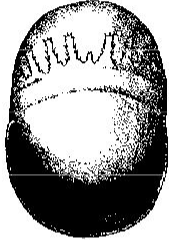
*Lytoceras*, slightly less than  $\times 1$ , showing ornamentation. Jurassic-Cretaceous, Europe



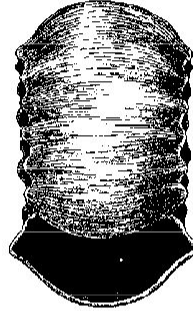
*Normannites*, showing the prominent ear. Middle Jurassic, Europe



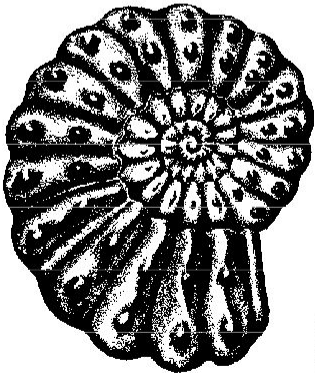
*Dufrenoyia*, about  $\times 1$ , a narrow ammonoid with coarse ribs. Early Cretaceous, Europe, North and South America, Africa



*Arcestes*, about  $\times 2$ , a rounded crawler. Shows ceratitic suture pattern. Worldwide range in the Middle to Late Triassic



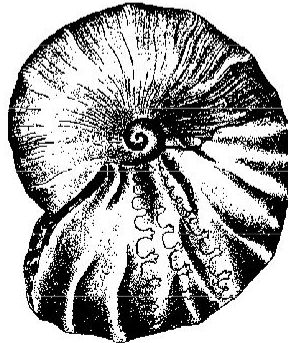
*Zemistephanus*, a crawler that resembled some snails. Jurassic, British Columbia



*Mortonoceras*,  $\times 1$ . Genus was restricted to the Early Cretaceous of Africa, Eurasia, and North and South America



*Diploceras*, a narrow ammonoid with a keel, about  $\times 1$ . Cretaceous



*Engonoceras*, about  $\times 1$ . Cretaceous, Europe, North Africa, and North and South America

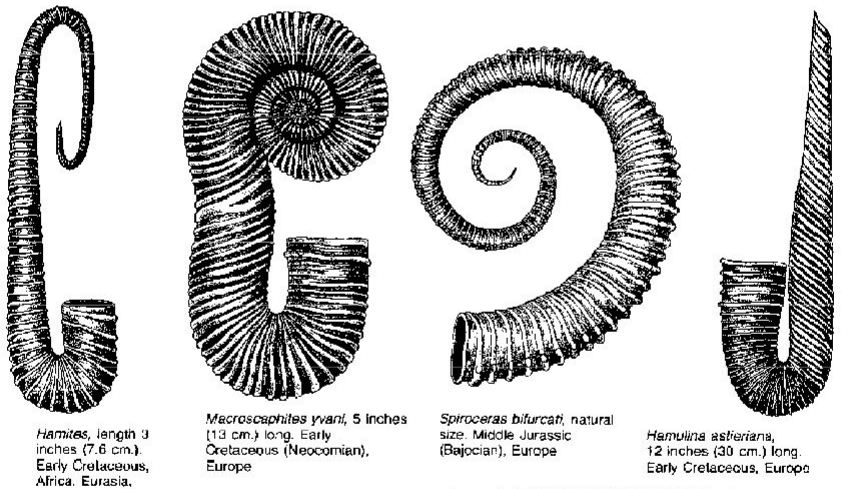
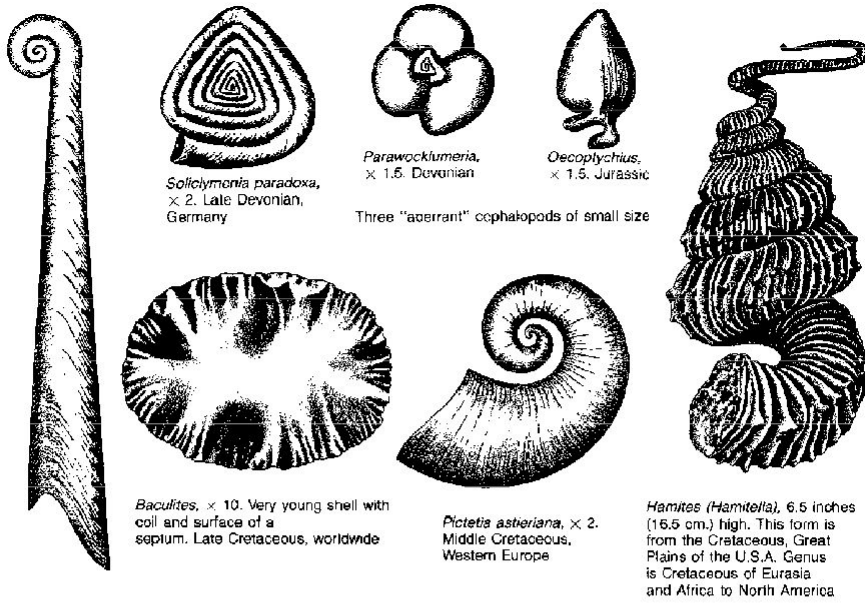
*Ammonoids of varied shapes*



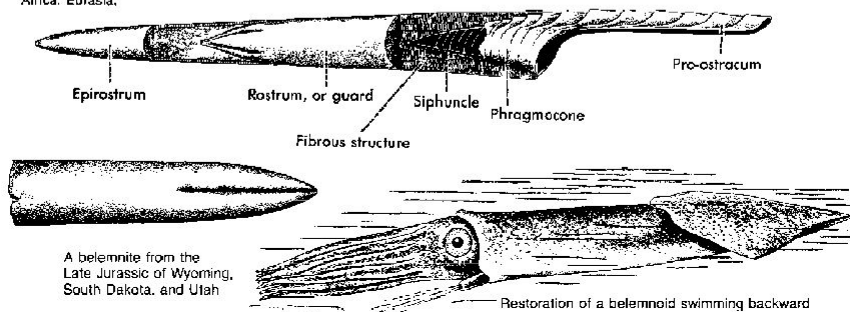
## АММОНИТЫ



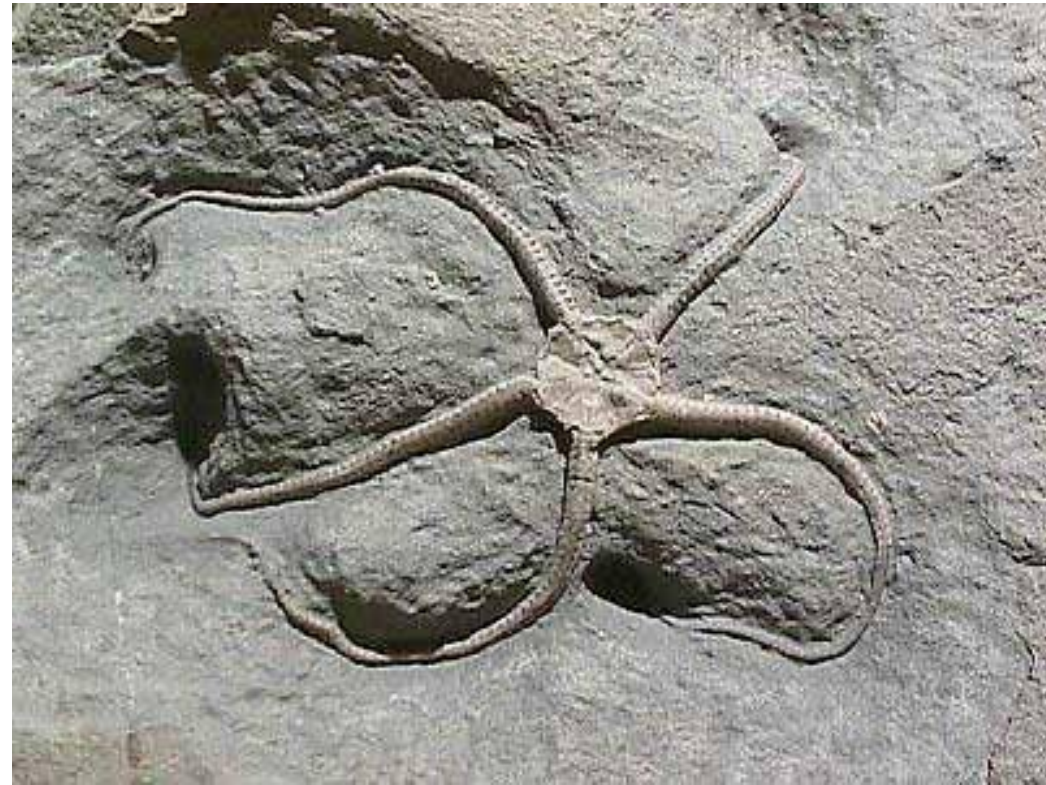
# Развитие жизни в мезозое



# Аммониты, белемниты



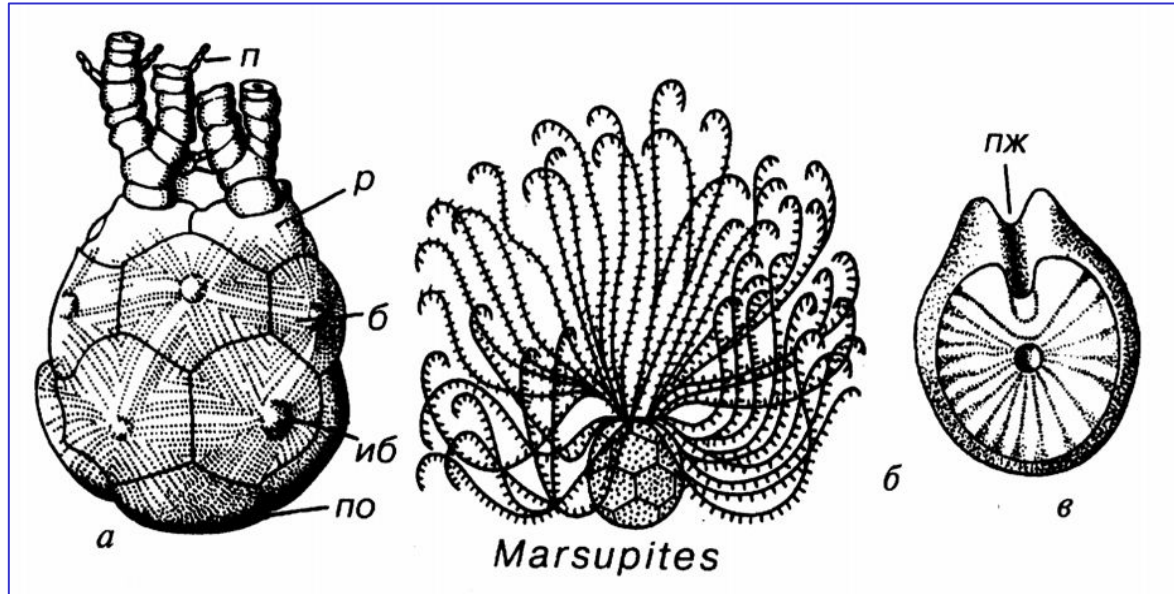
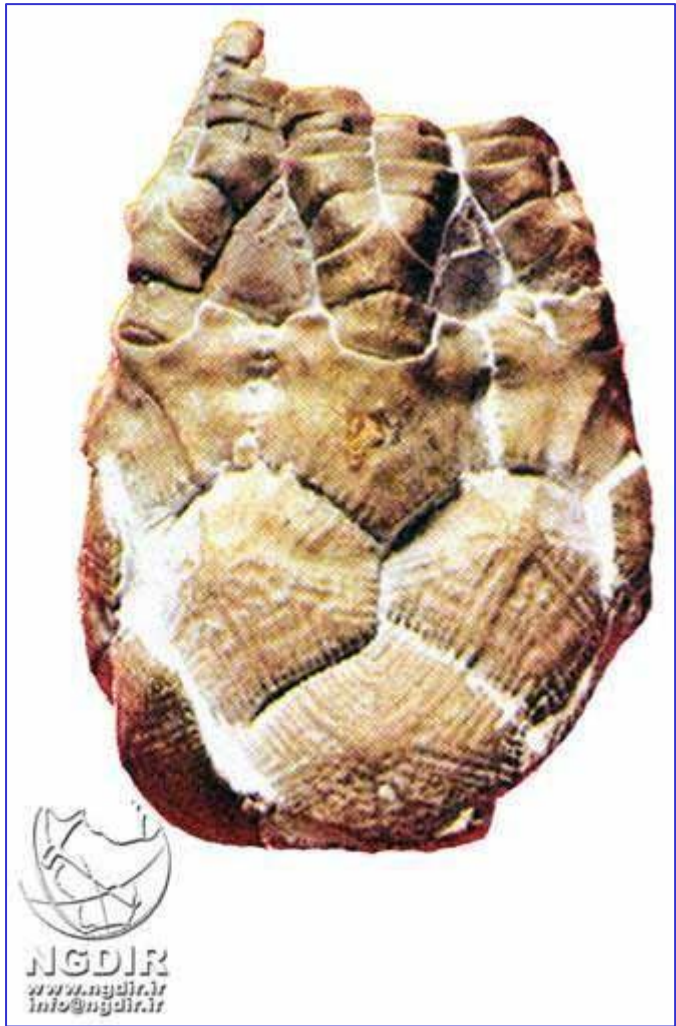
# Развитие жизни в мезозое



**Иглокожие**

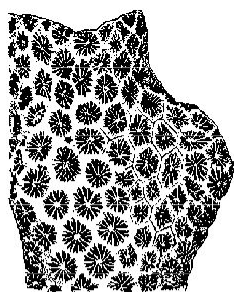


# Развитие жизни в мезозое

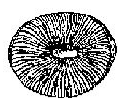


Бесстебельчатые морские лилии: *Marsupites*

# Развитие жизни в мезозое



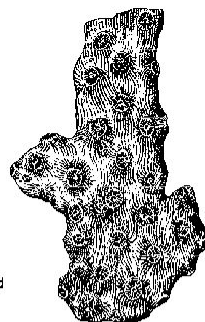
*Septastrea crassa*,  
× 1. Pliocene,  
North Carolina



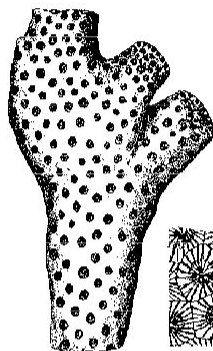
*Montivalia natthoimensis*, × 0.3.  
Jurassic, Germany



*Parasmilia*, × 2.  
Early Cretaceous, England



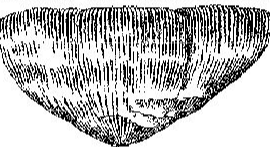
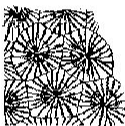
*Archahelia vicksburgensis*, × 1.  
Oligocene, Mississippi



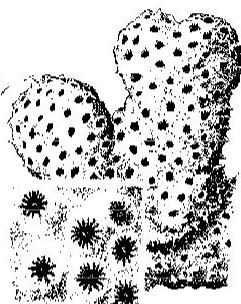
*Haimeastrea conferta*, × 1,  
section × 5. Early Eocene, Alabama



*Meandrina alveolus*, × 1, top view Miocene, Jamaica



*Meandrina barreti*, × 1.  
Side view Miocene, Jamaica

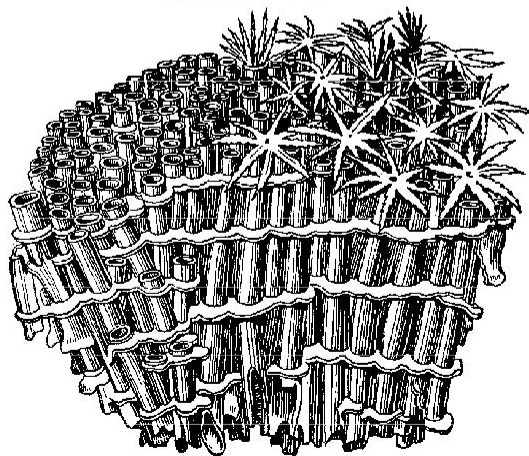


*Stylocoeniella armata*, × 5 and × 1.  
Recent, Bikini. Other species of  
Tertiary age in North America

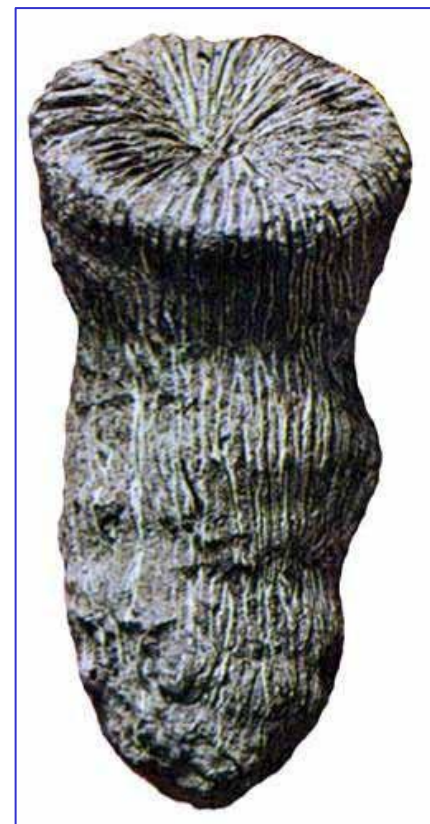
Подкласс Scleractinia

Some typical scleractinian corals

Подкласс Octocoralla



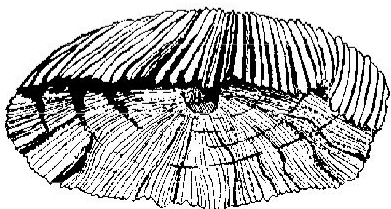
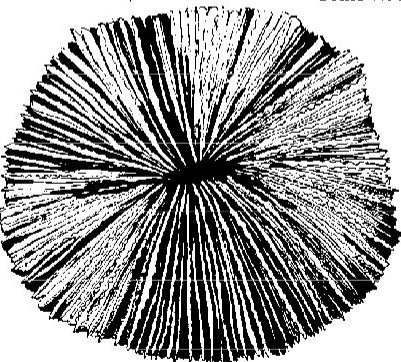
Tubipora



Кораллы:

Hexacoralla (T-Q)

Octocoralla (V?, O-S, K-Q)

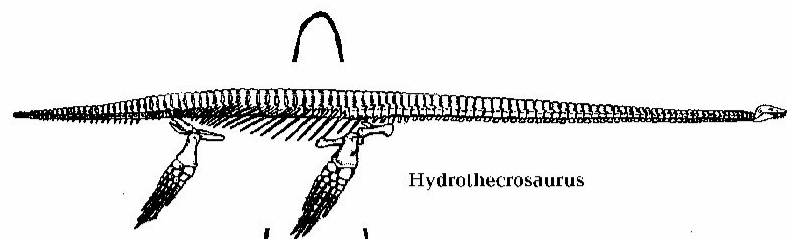


Fungia

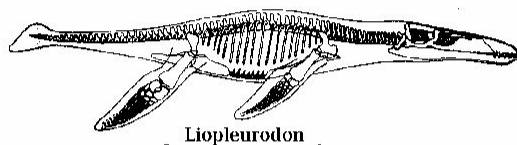
# Развитие рептилий

Морские рептилии:  
Sauropterygia,  
Placodontia,  
Ichthyosauria

М Е Л

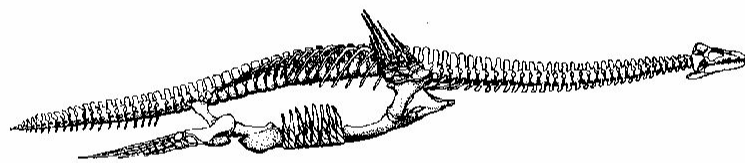


Plesiosauria

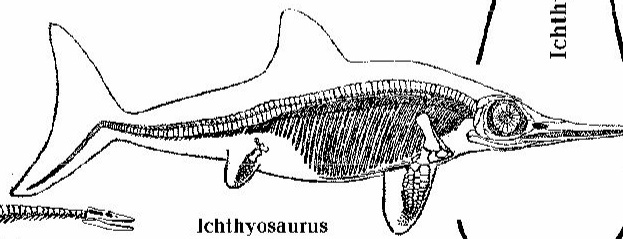


Liopleurodon

Ю Р А



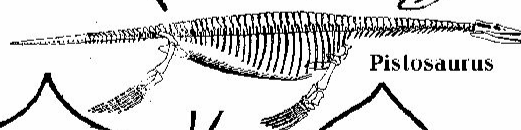
Cryptocleidus



Ichthyosaurus

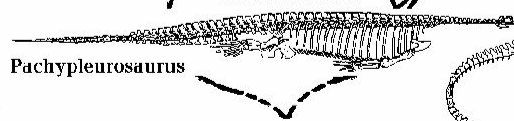
Ichthyosauria

Т Р И А С



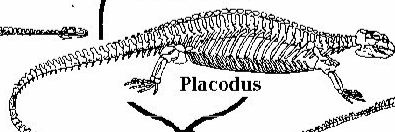
Plesiosaurus

Nothosauria



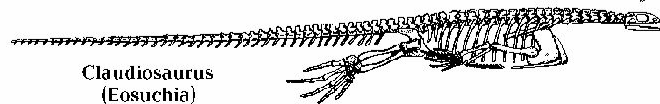
Pachypleurosaurus

Placodontia

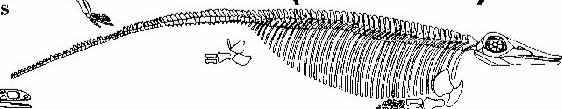


Placodus

ПЕРМЬ

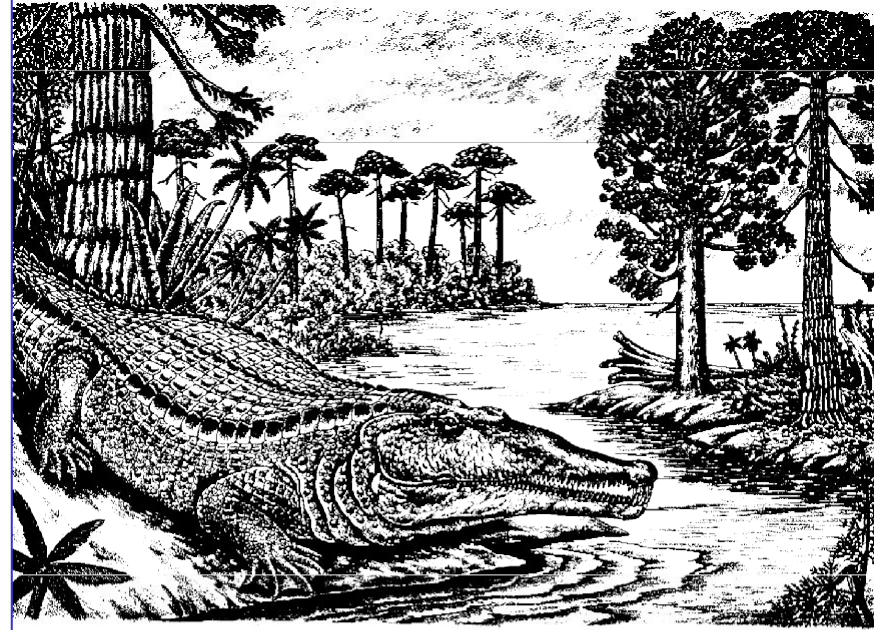


Claudiosaurus (Eosuchia)



Utatusaurus

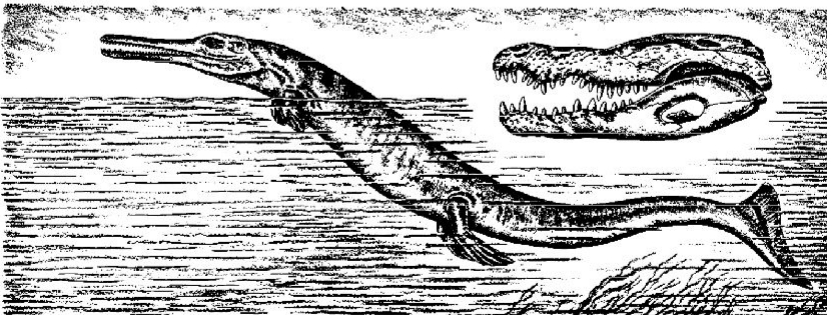
# Развитие рептилий



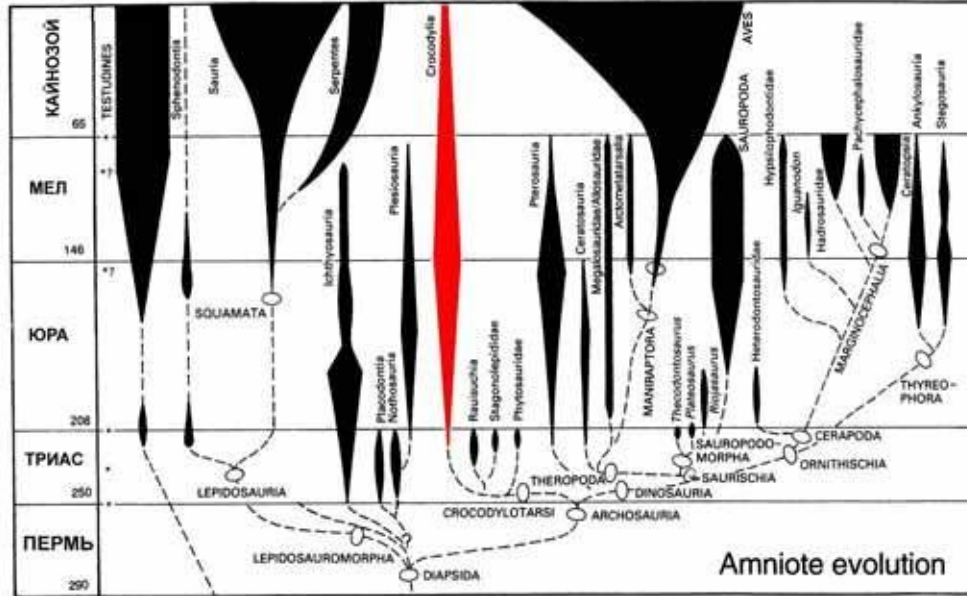
Rutiodon, a Late Triassic phytosaur from the Painted Desert, of northern Arizona; skull 42 inches (107 cm.) long. The plants include cycads, calamites, ferns, and araucarians. The tree at the extreme right is Araucarioxylon; to the left of it is Woodwardia



Protosuchus, an ancestral crocodile from the Early Jurassic of Arizona, about 30 inches (76 cm.) long

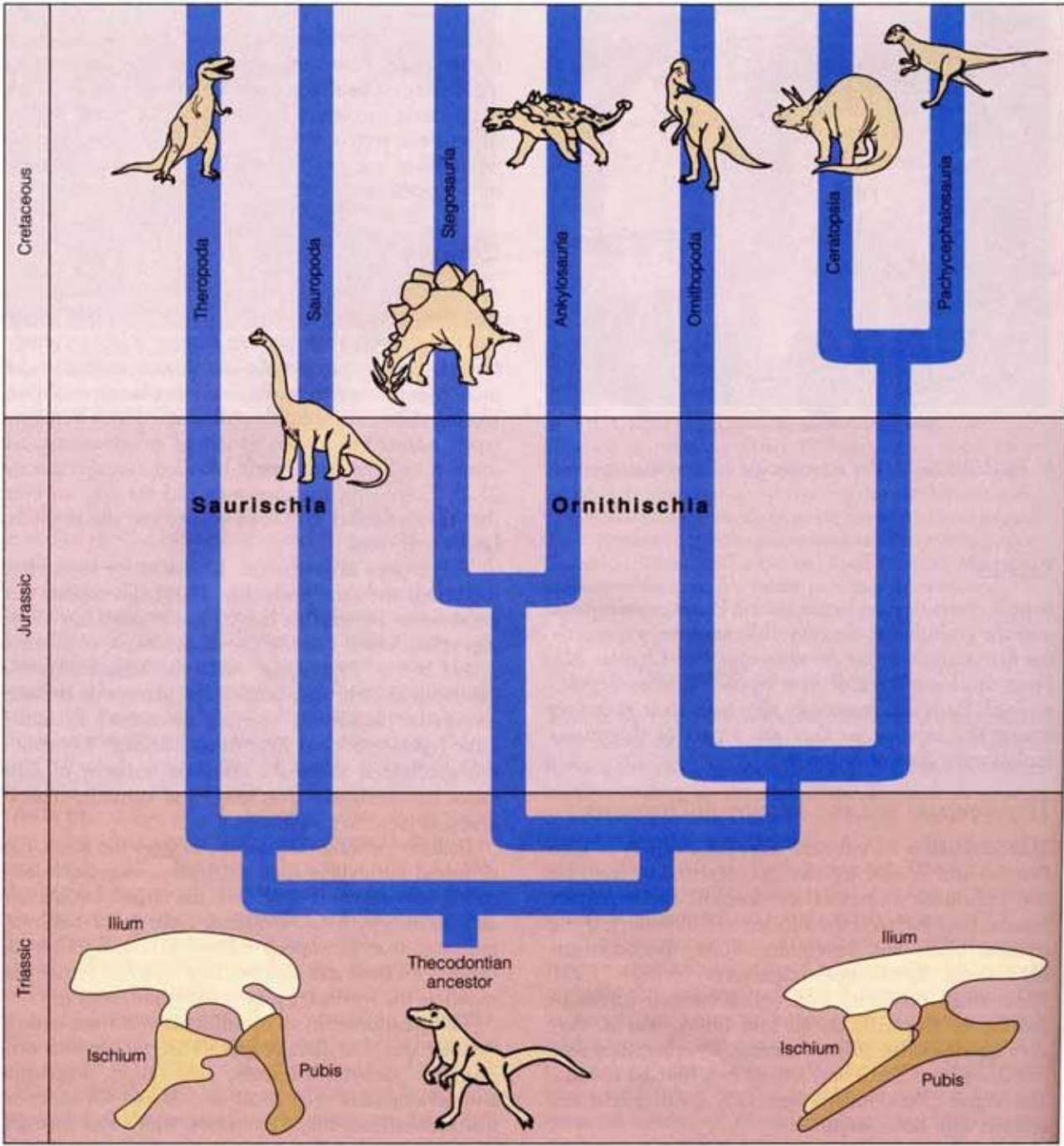


Geosaurus, a Late Jurassic marine mesosuchian crocodile (metriorhynchid) from Central Europe and Argentina with paddles and shark-like tail. Length 5 feet 8 inches (1.7 m.). At the right, skull of Alligator thomsoni, a freshwater reptile from the Late Miocene of western Nebraska. Length 14 inches (36 cm.)

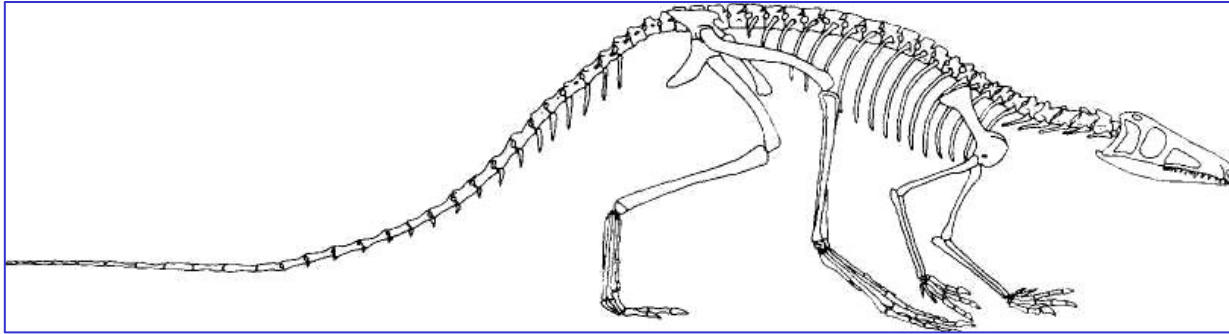


## Примитивные архозавры: Crocodylia

# ЭВОЛЮЦИЯ ДИНОЗАВРОВ



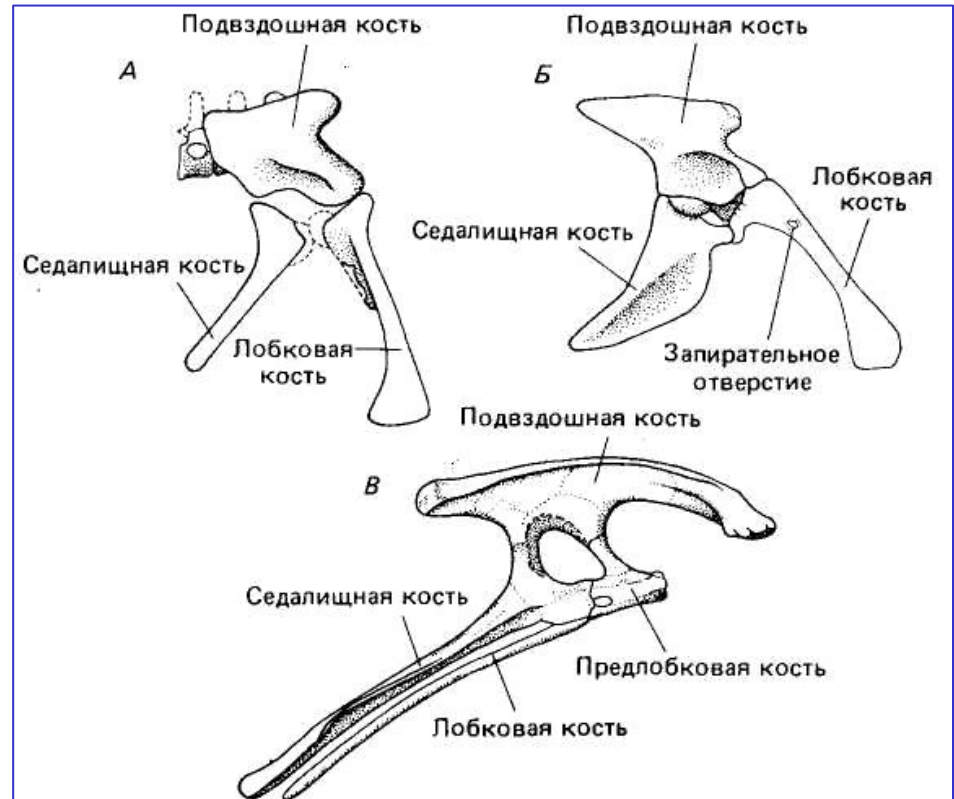
# Динозавры



Текодонт *Lagosuchus*,  
Т<sub>2</sub> Ю. Америки

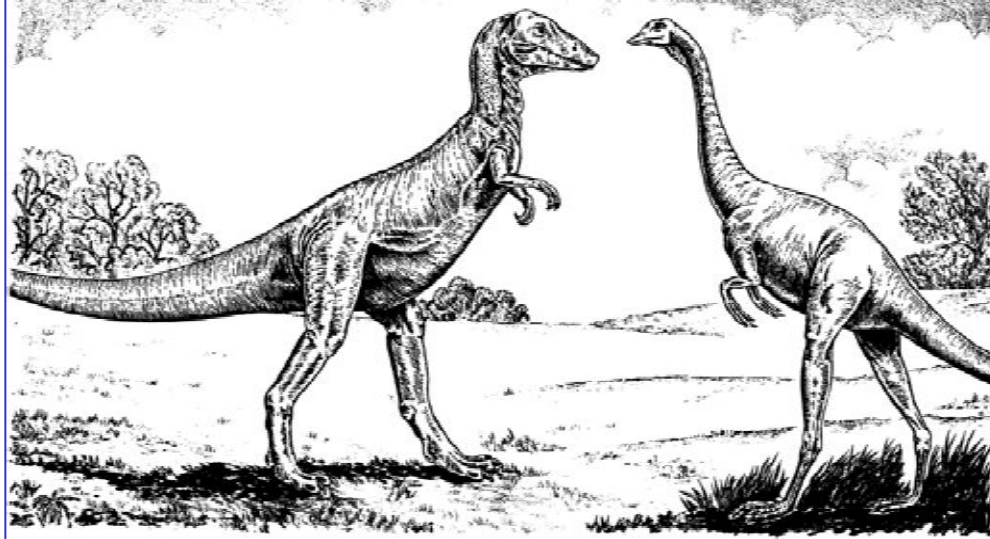
**Saurischia – ящеротазовые  
динозавры - род  
*Staurikosaurus* (А), таз похож  
на таз текодонтов типа  
*Lagosuchus* (Б)**

**Ornithischia – птицетазовые  
динозавры - род  
*Heterodontosaurus* (В)**

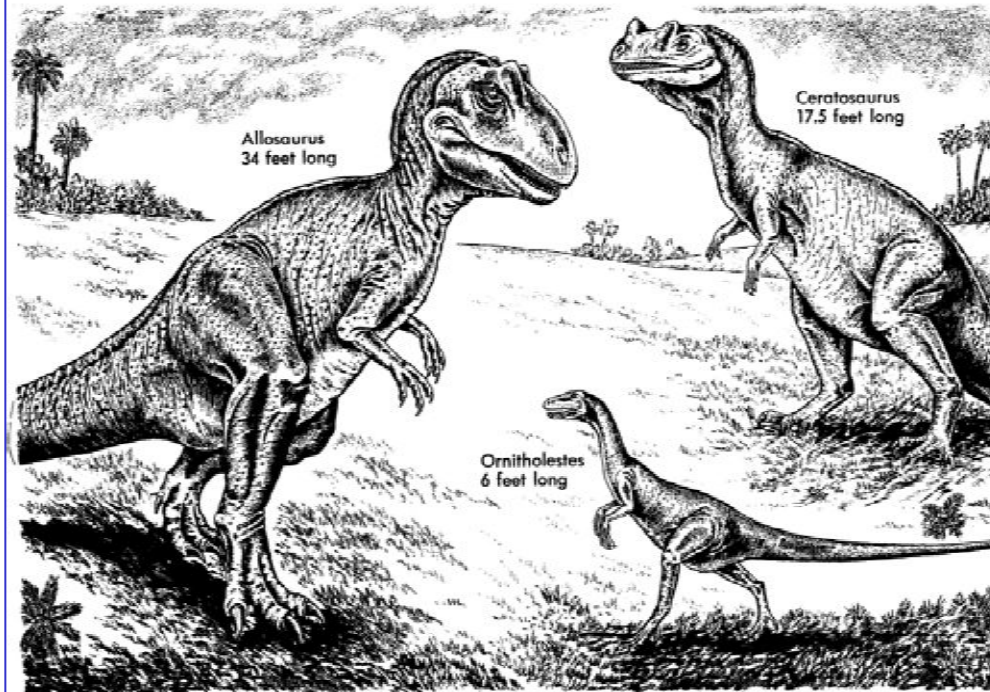




# Saurischia



(Right) *Struthiomimus*, the "ostrich mimic," of Cretaceous Alberta, Canada. Height 8 to 9 feet (2.4–2.7 m.). (Left) an early species of *Gorgosaurus*, 7 feet (2.1 m.) high at the hips. Cretaceous of Alberta

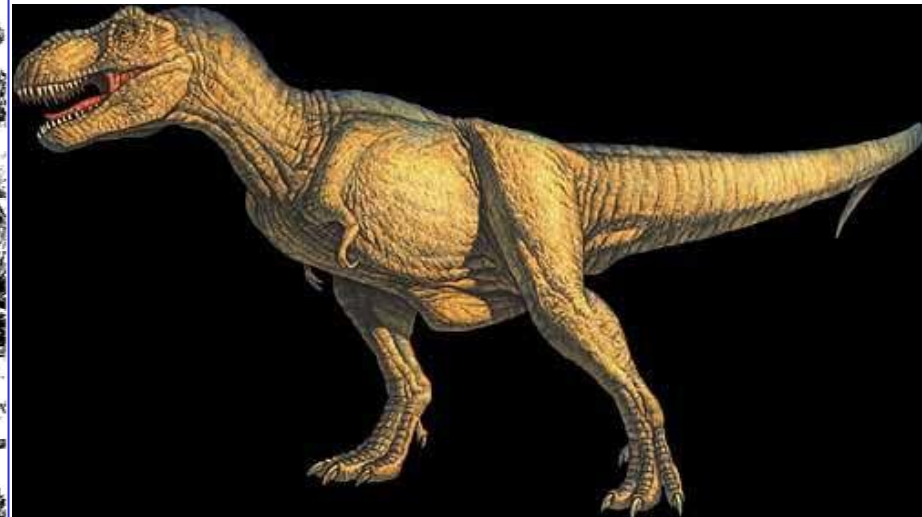
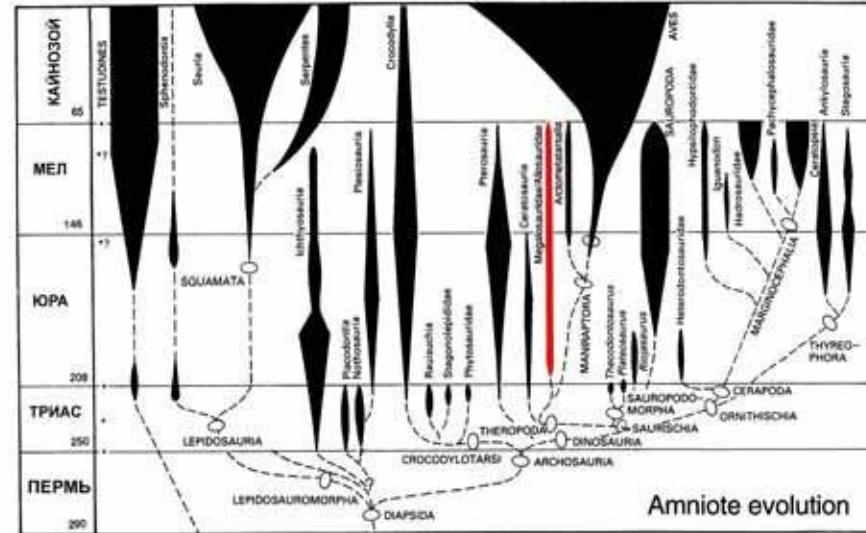


Allosaurus  
34 feet long

Ceratosaurus  
17.5 feet long

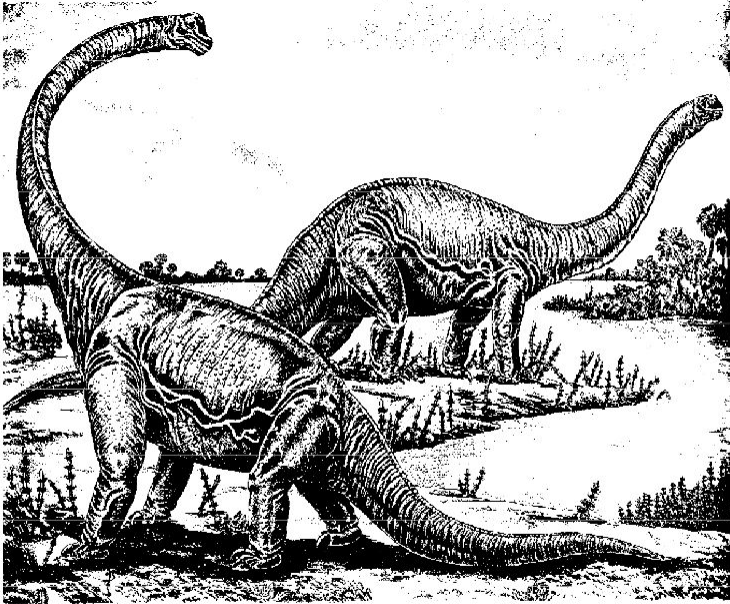
Ornitholestes  
6 feet long

Three carnivorous dinosaurs of Late Jurassic age. They lived in what now is the Rocky Mountains region of the western United States. The largest, Allosaurus, was 34 feet (10.4 m.) long; Ceratosaurus was 17.5 feet (5.3 m.) long; and the smallest, Ornitholestes, was 6 feet (1.8 m.) long



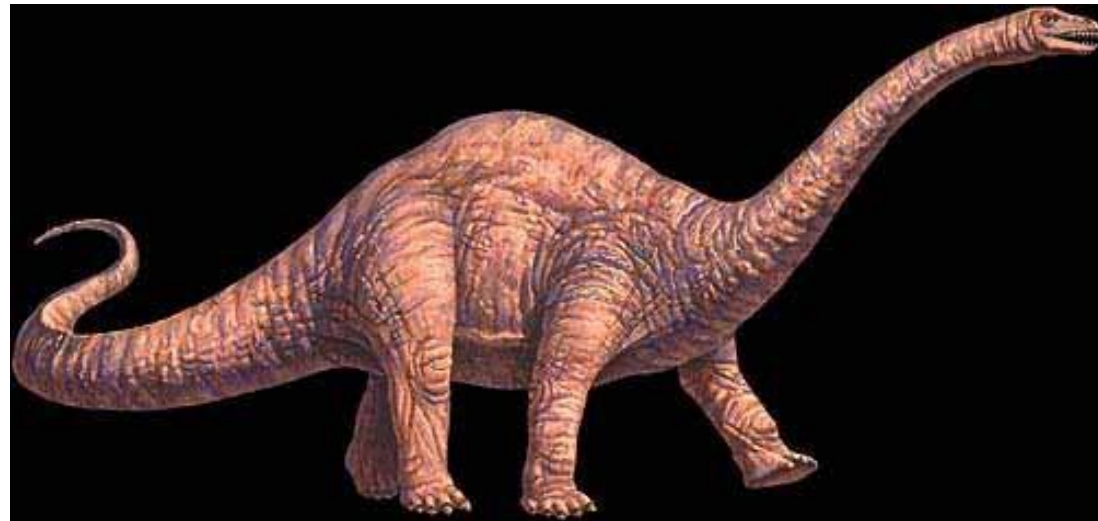
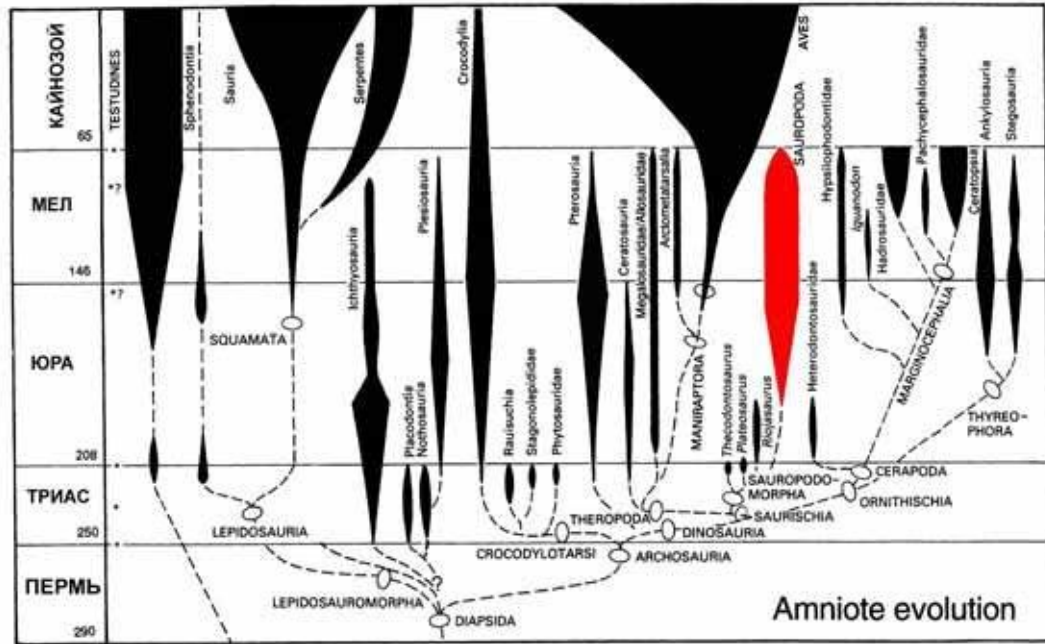
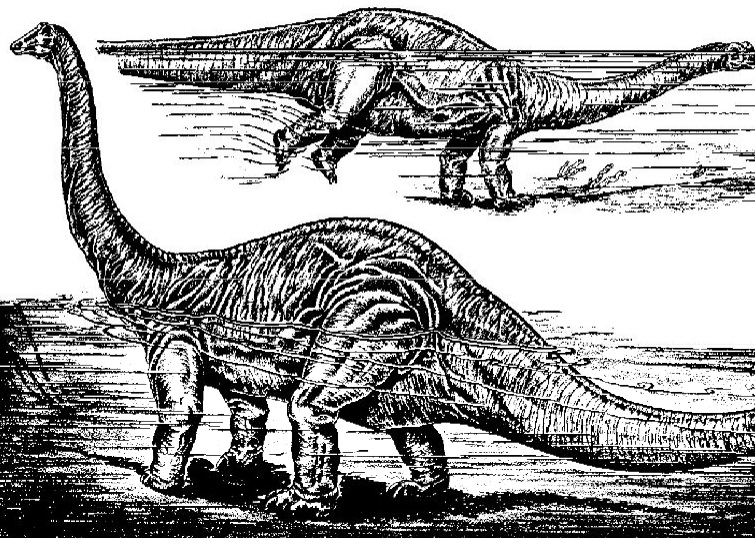
## Megalosauridae и др.

# Saurischia



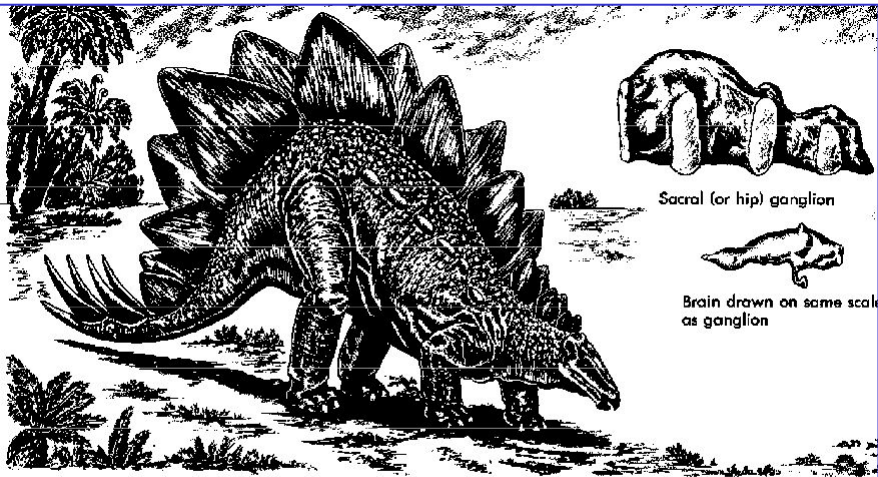
Brachiosaurus (left) and Apatosaurus, the brontosaurus (right), were two of the largest "lizard-hipped" dinosaurs. Both lived in Colorado and adjacent regions during Morrison times. Brachiosaurus also inhabited central Africa. Since this restoration was drawn, it has been learned that the skull of Apatosaurus was actually quite similar to that of Diplodocus, and not Camarasaurus as shown here.

Apatosaurus wading with its forelegs but swimming with its hind legs. Below Apatosaurus is Diplodocus wading in shallow water; its tail is half afloat.

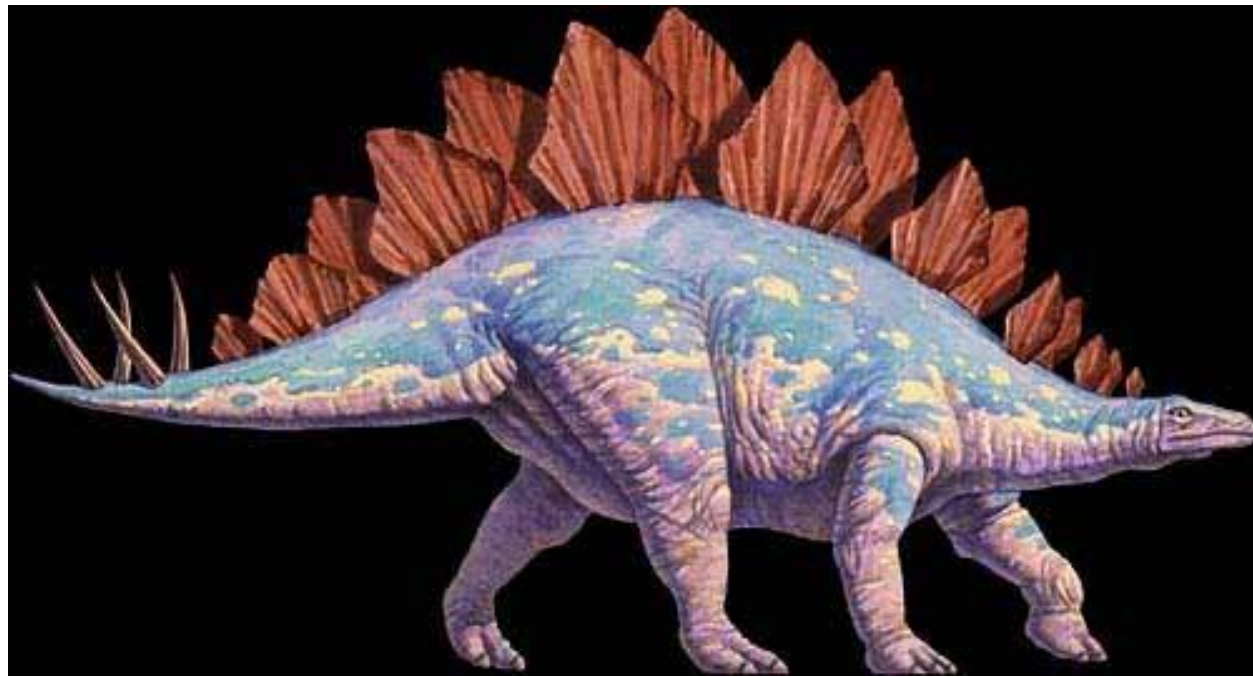
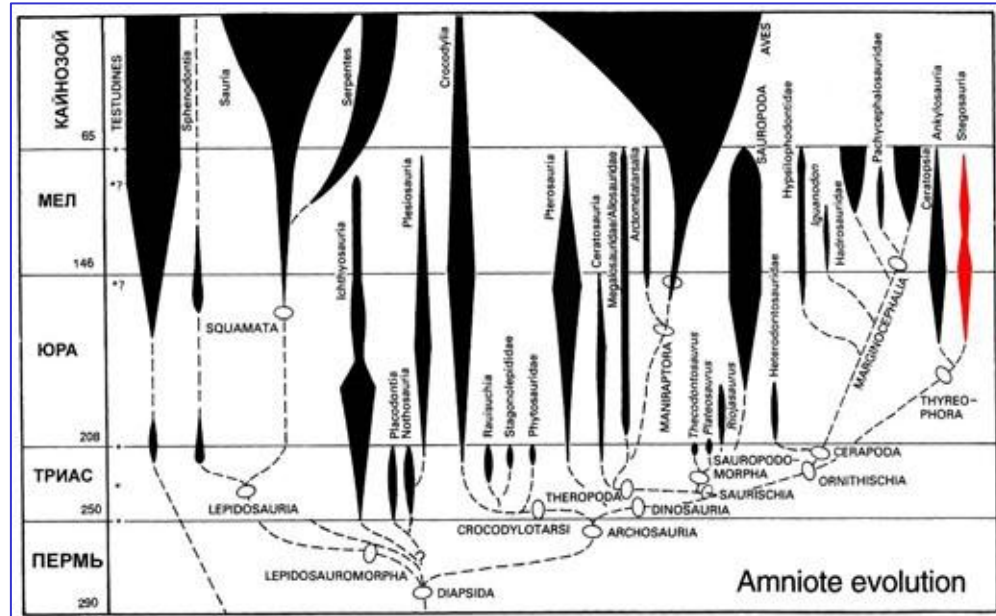


# Sauropoda

# Ornithischia

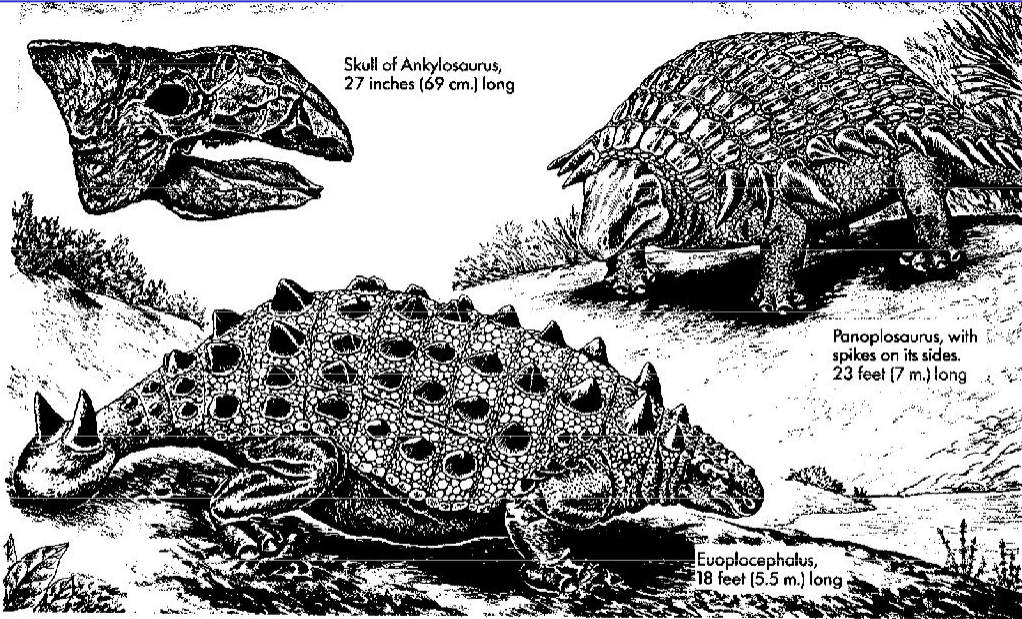


*Stegosaurus, a Jurassic armored dinosaur of western United States; 18 to 25 feet (5.5–7.6 m.) long. This reptile is famous for its sacral ganglion, or "second brain"*

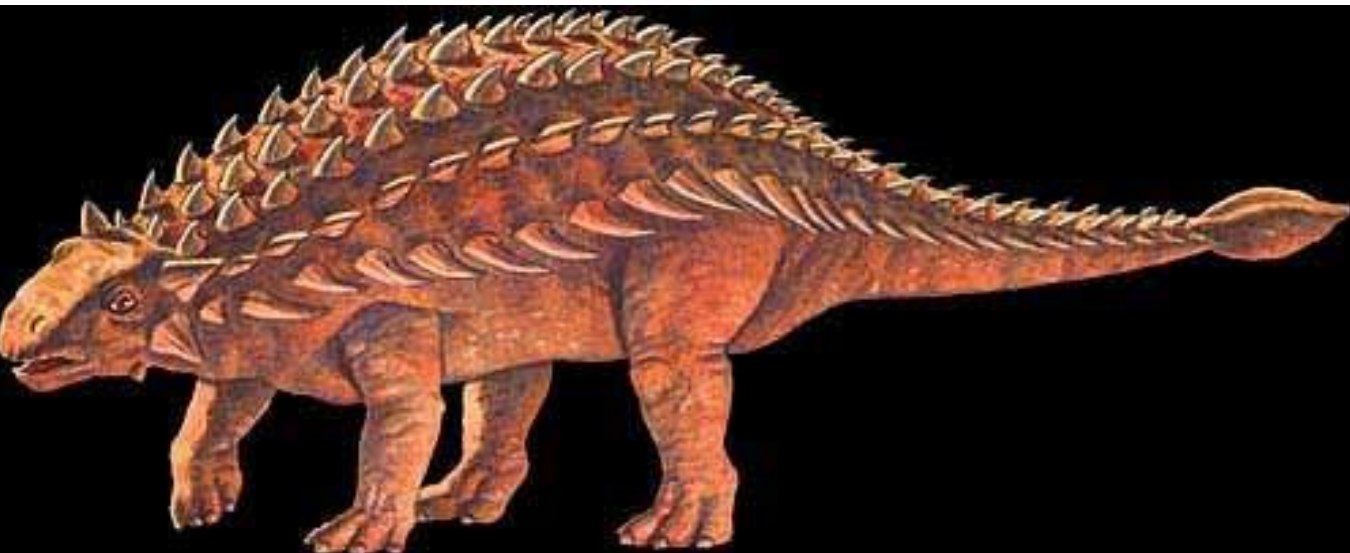
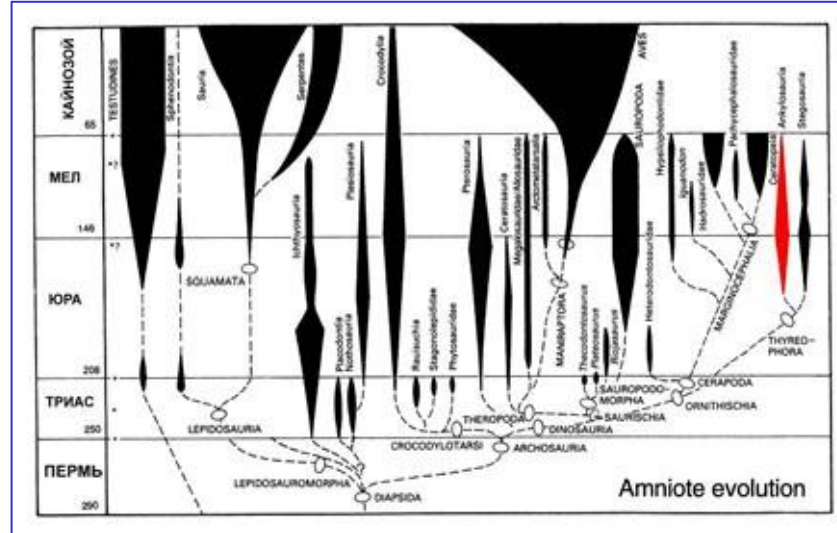


# Stegosauria

# Ornithischia



Three armored dinosaurs of Cretaceous age, from western United States and Canada

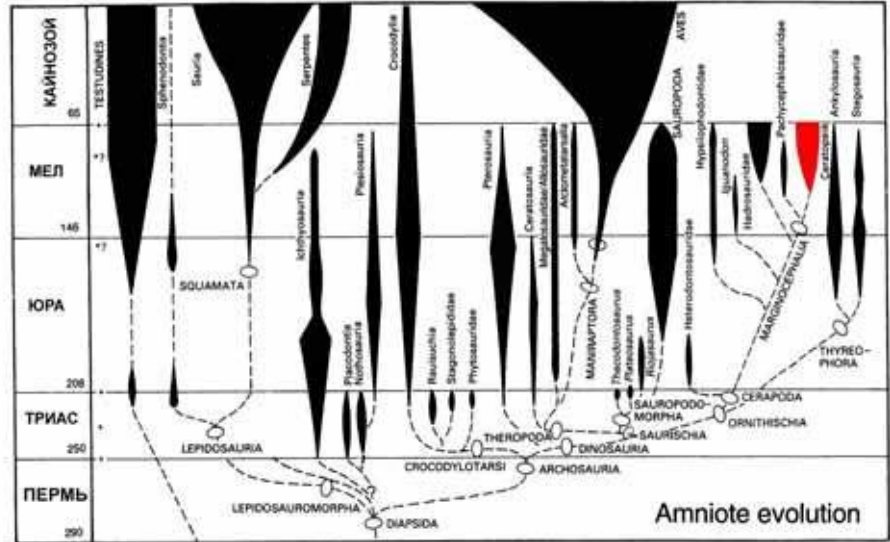


# Ankylosauria

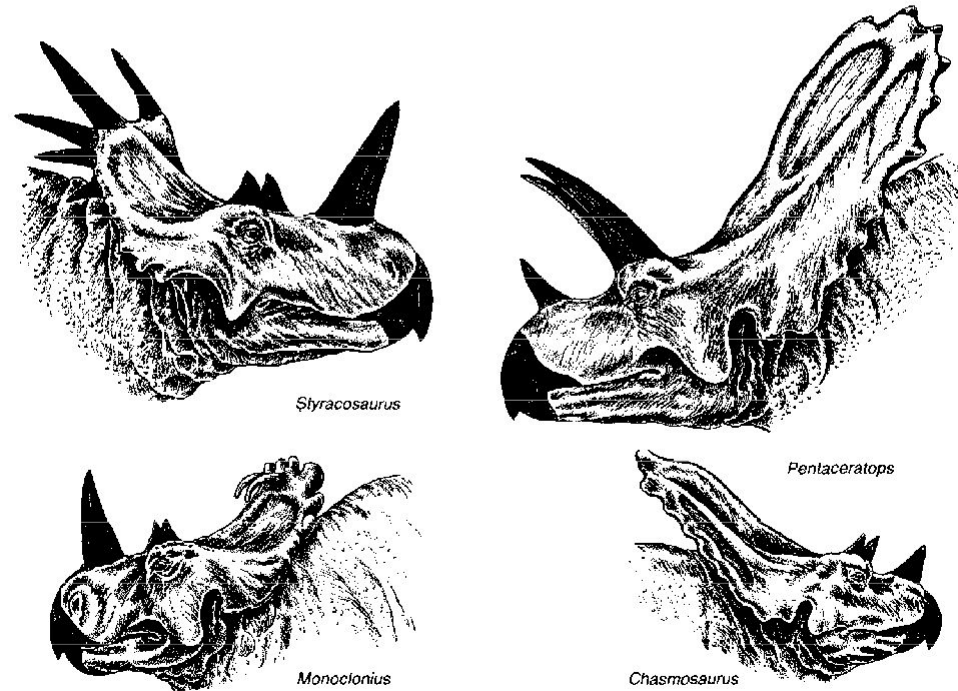
# Ornithischia



(Left) Psittacosaurus, 4 feet (1.2 m.) long, was a very primitive frilled dinosaur.  
 (Right) Protoceratops, 5 to 6 feet (1.5-1.8 m.) long, had a frill but almost no horn



Amniote evolution



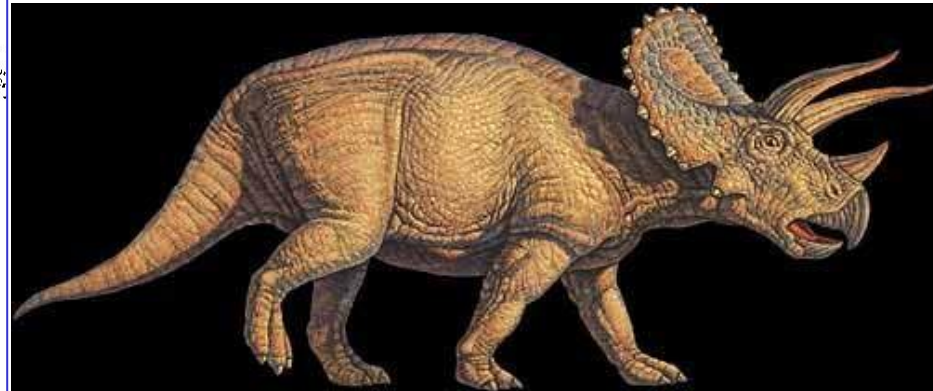
Styracosaurus

Pentaceratops

Monoclonius

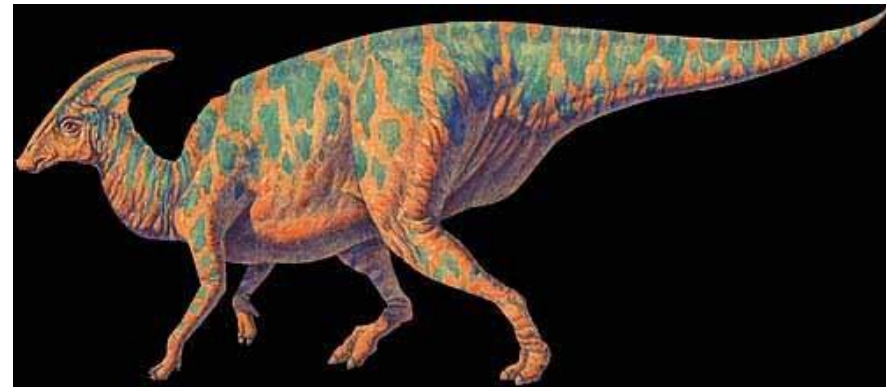
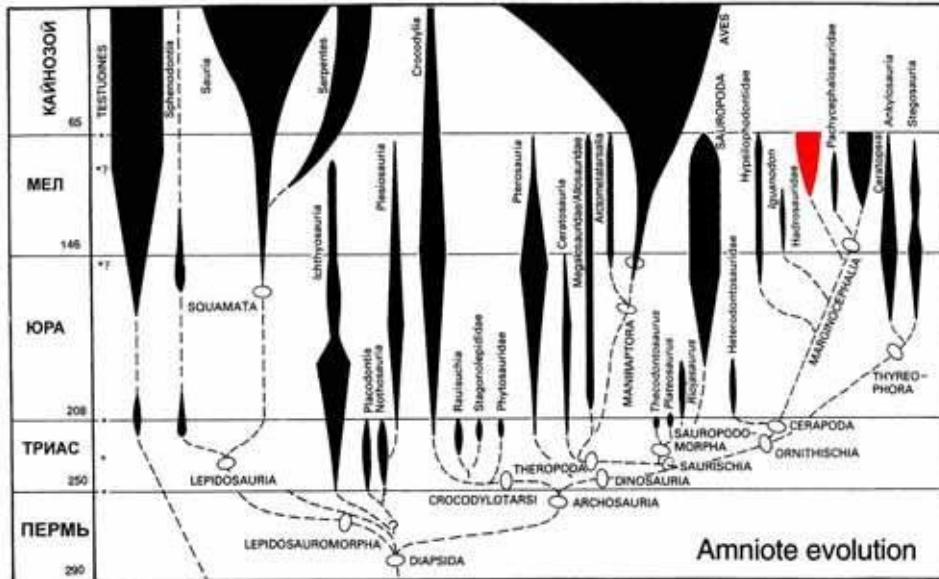
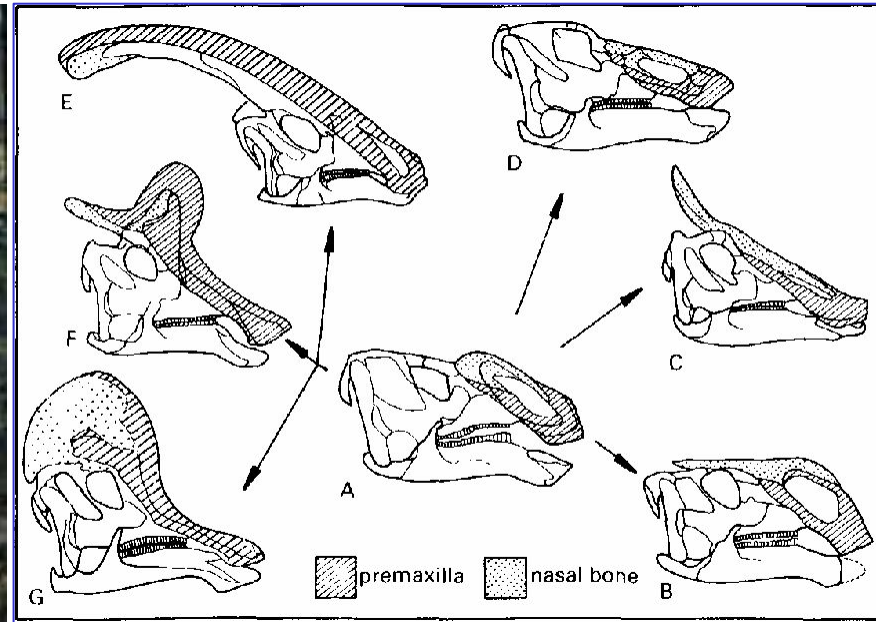
Chasmosaurus

Head of four large ceratopsians, or dinosaurs with beaks, neck frills, and horns.  
 Late Cretaceous of North America. All about  $\times 1/30$



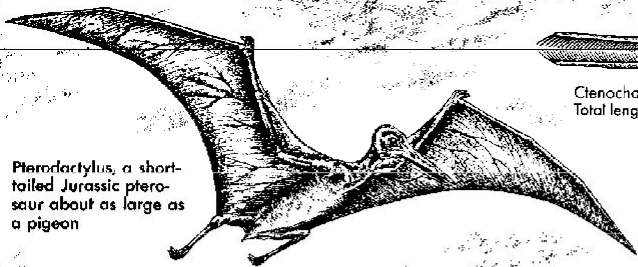
# Ceratopsia

# Ornithischia



## Hadrosauridae

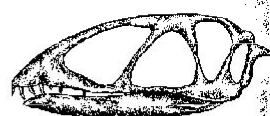
# Pterosauria



*Pterodactylus*, a short-tailed Jurassic pterosaur about as large as a pigeon

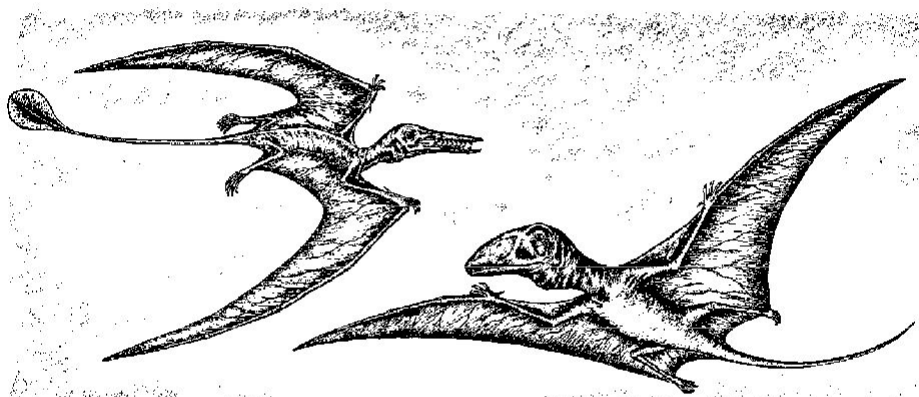


*Ctenochasma* skull, with many long teeth. Total length about 6 inches [15 cm.]

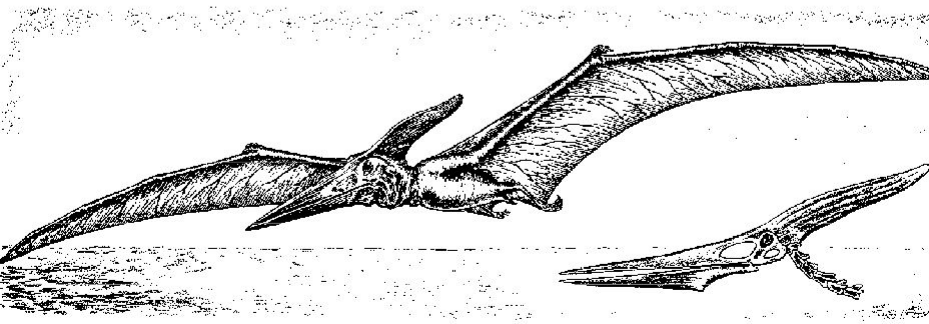


*Dimorphodon* skull, more than 9 inches long

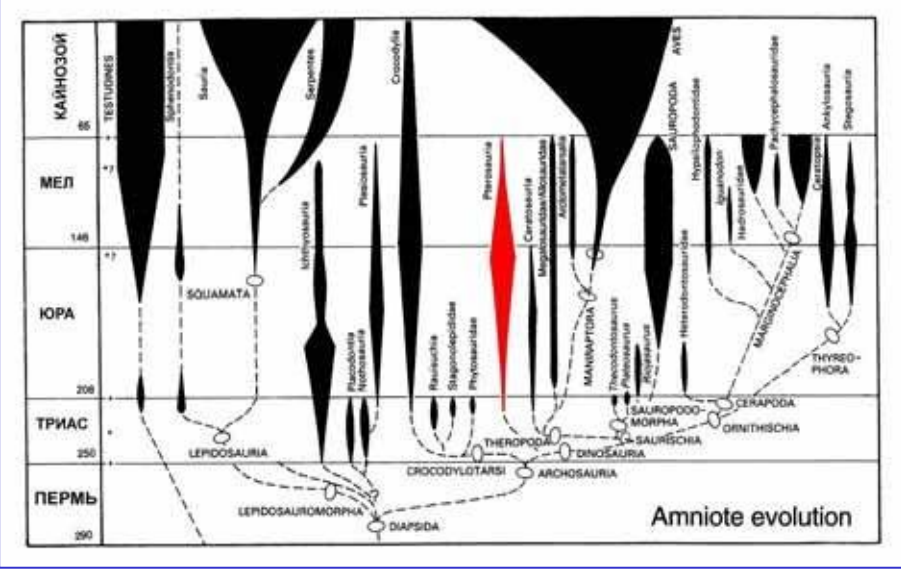
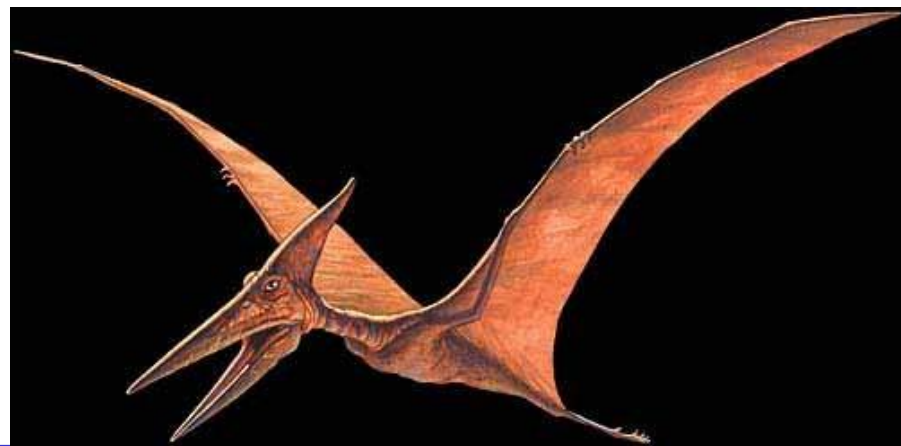
*Flying reptiles with a variety of tooth types*



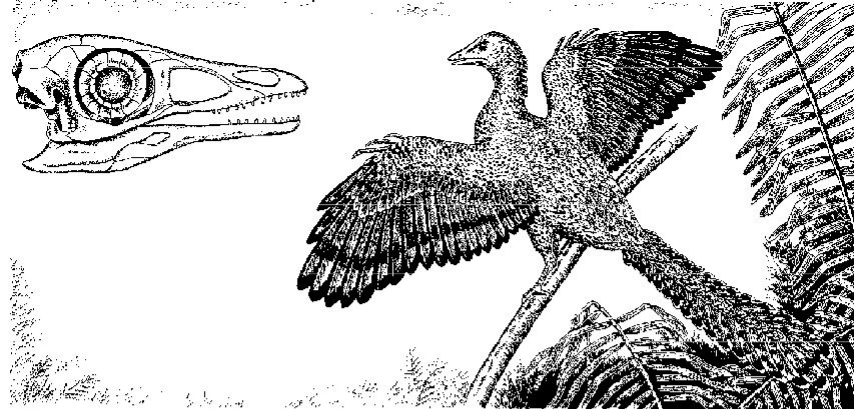
*Rhamphorhynchus* (left) was an advanced long-tailed pterosaur about 24 inches (61 cm.) long. *Dimorphodon* (right) had a deep but very light skull and reached a length of 42 inches (107 cm.). Both lived in Europe during the Jurassic Period



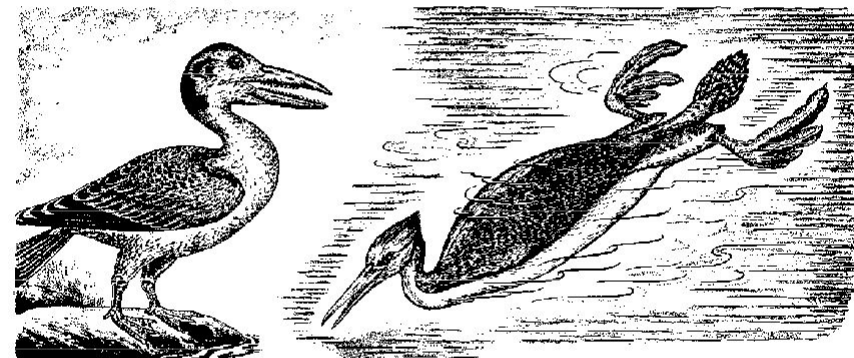
*Pteranodon* and its skull. This short-tailed, toothless Cretaceous pterosaur from Kansas had a wingspread of 22 to 27 feet (6.7–8.2 m.)



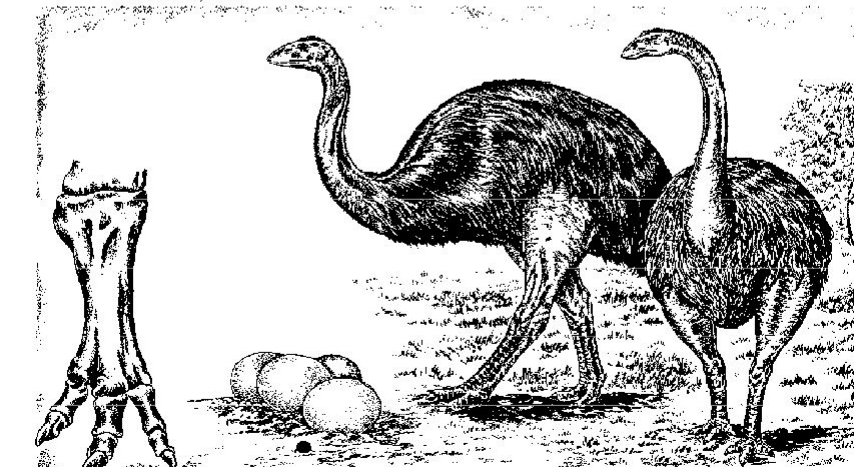
# Развитие жизни в мезозое



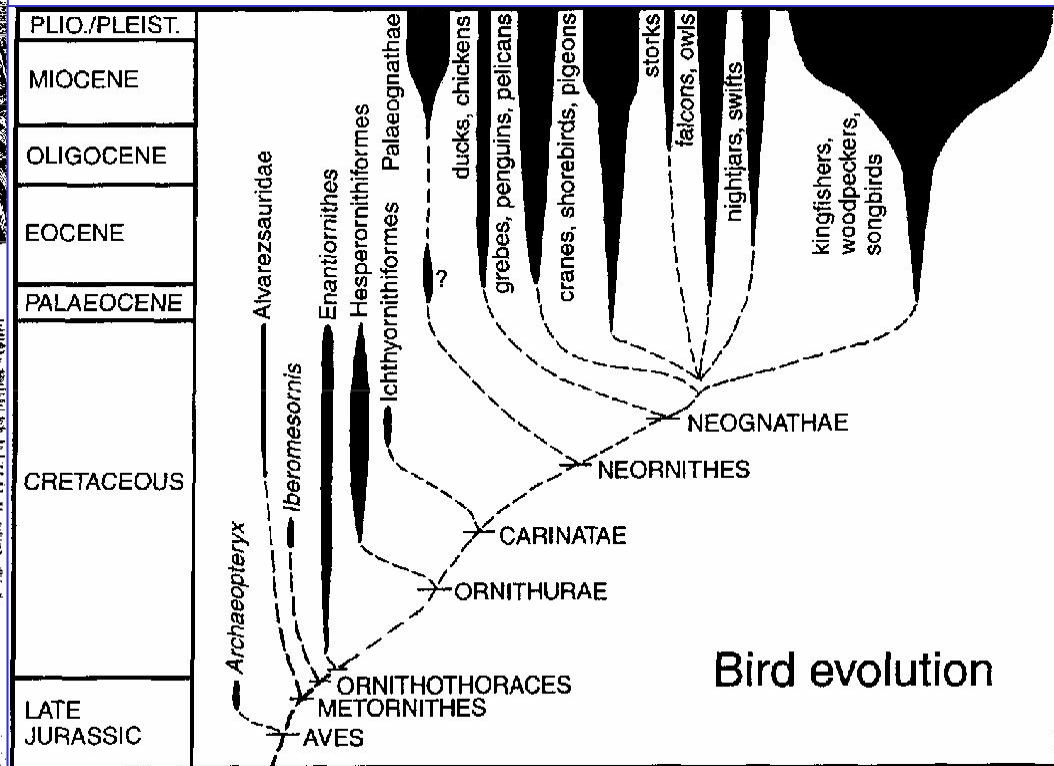
Archaeopteryx preparing to flap its wings and glide from a cycad. Length about 18 inches (46 cm.)



Toothed birds of the Late Cretaceous. (Left) Ichthyornis; (right) Hesperornis. Other restorations of Hesperornis depict it as a noncrested form with webbed, rather than lobed, toes



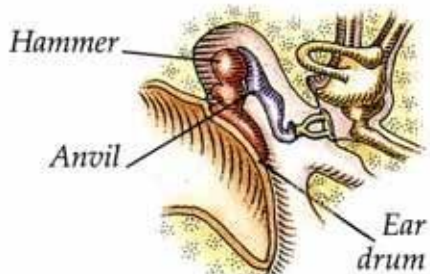
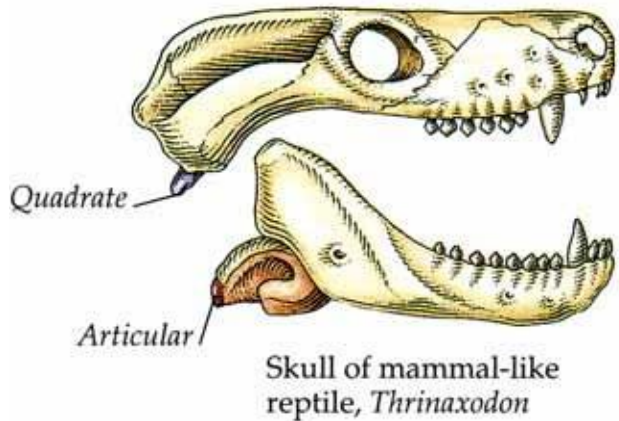
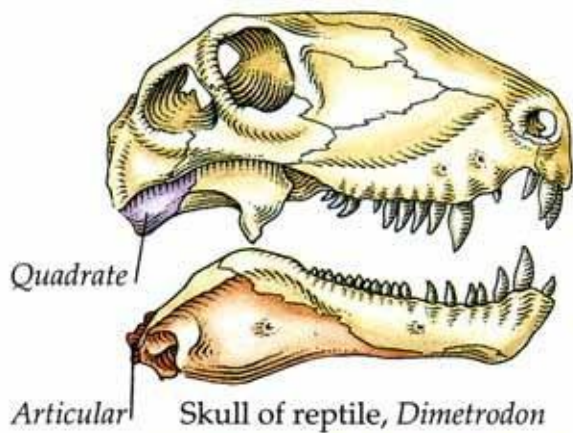
Two species of Aepyornis, 9 to 10 feet (2.7-3 m.) or more high. At the left are foot bones and eggs of the larger species. The black dot is a hen's egg on the same scale.



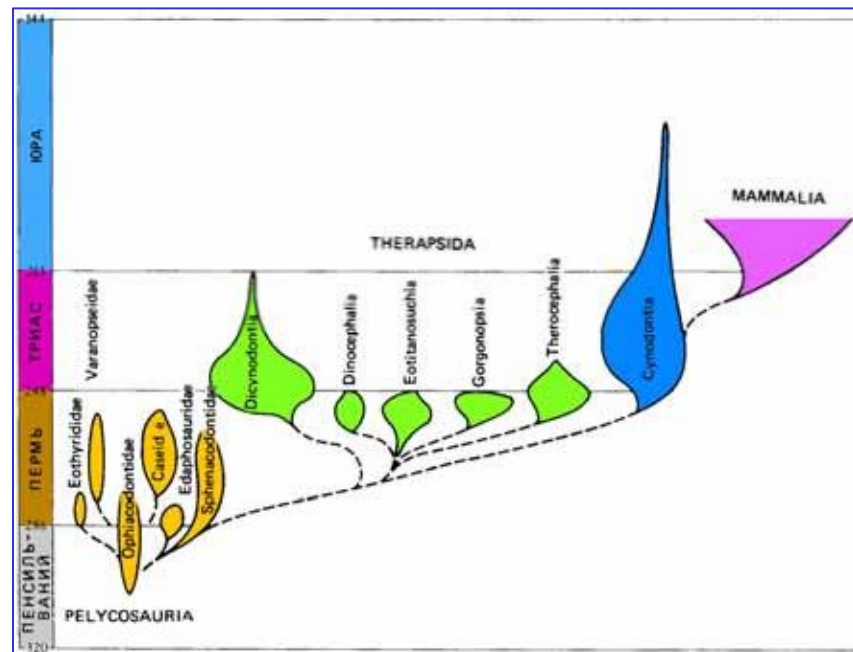
## Птицы



# Развитие жизни в мезозое

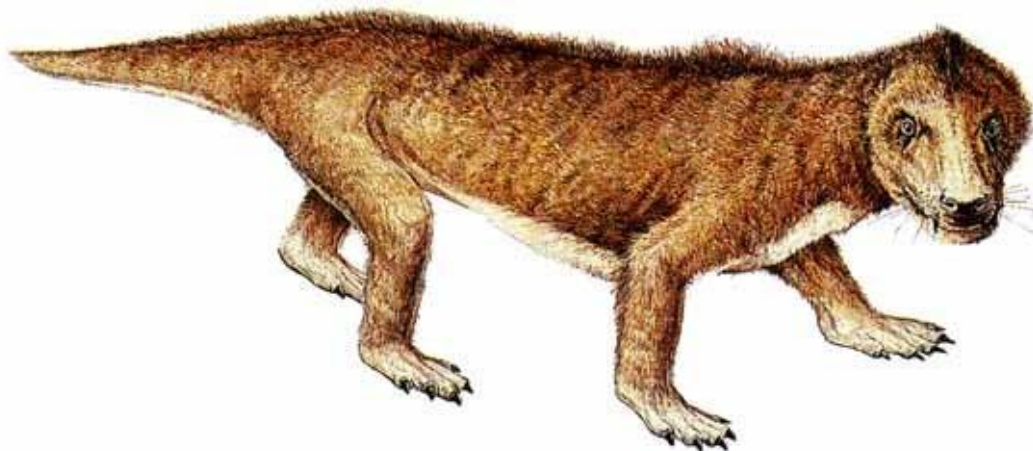


Mammal ear



## Cynodontia (P-T)

*Thrinaxodon*, T<sub>1</sub>, Ю.Африка



# Массовые вымирания

