

# Paleontology



<http://www.biltek.tubitak.gov.tr/bilgipaket/jeolojik/index.htm>

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Department of Geology

**Lecture 10**



**ANKARA UNIVERSITY**

**1.2. Gastropoda**

Selected species

**1.3. Cephalopoda**

General characteristics

Body organisations & related terms

Classification

Selected species

# Topics



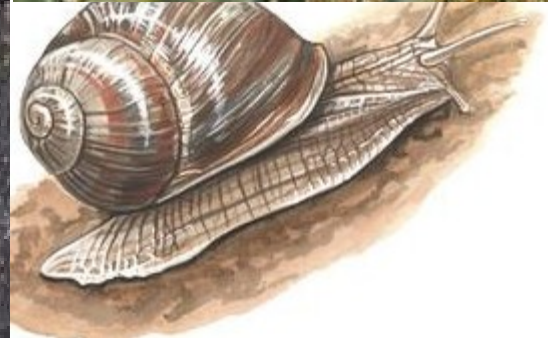
**Terrestrial**



**Freshwater**



**Marine**



# Class Gastropoda

## Classification



*Busycon*

Proso  
branchia



*Murex*



*Charonia*



*Chrysallida*

Opsitho  
branchia



*Hypselodoris*

The Class Gastropoda is divided into three subclasses:

- *PROSOBRANCHIA*
- *OPSITHOBRANCHIA*
- *PULMONATA*



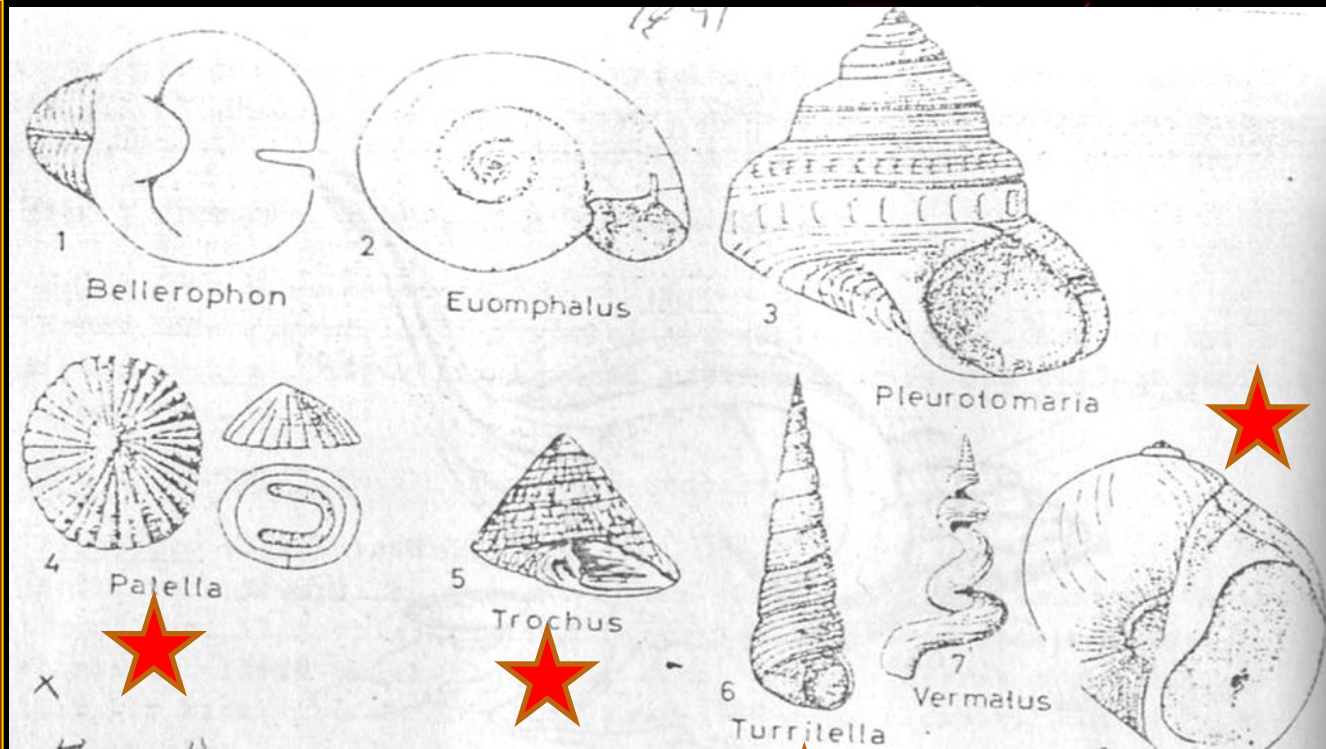
*Helix*



*Albinaria*

**Mollusca**  
Class  
Gastropoda

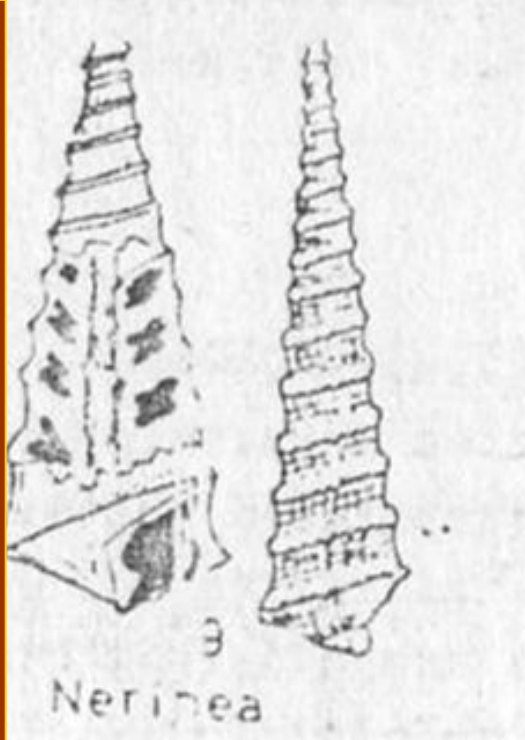
**Selected genera**



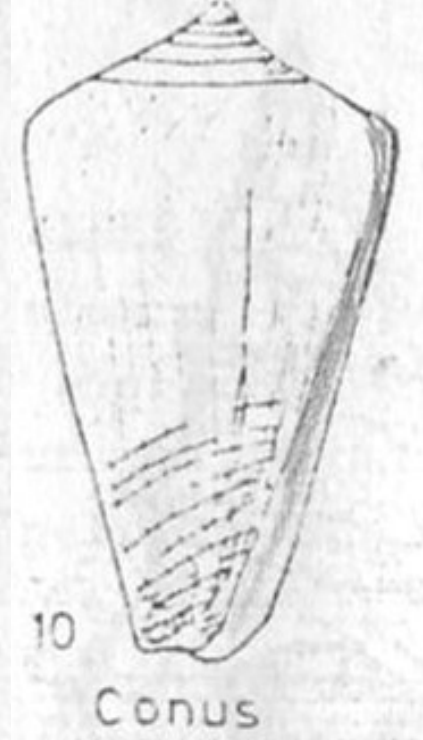
- Bellerophon* (Ord-Early Triassic),
- Euomphalus* (Sil-Middle Perm)
- Pleurotomaria* (Recent)
- Patella* (Eocene-R.)
- Trochus* (Miocene-R.)
- Turritella* (Cretaceous-R.)
- Natica* (Cretaceous-G.)

**Mollusca**  
Class  
Gastropoda

**Selected genera**



Juras-Cretaceous



Late Cretaceous-R.

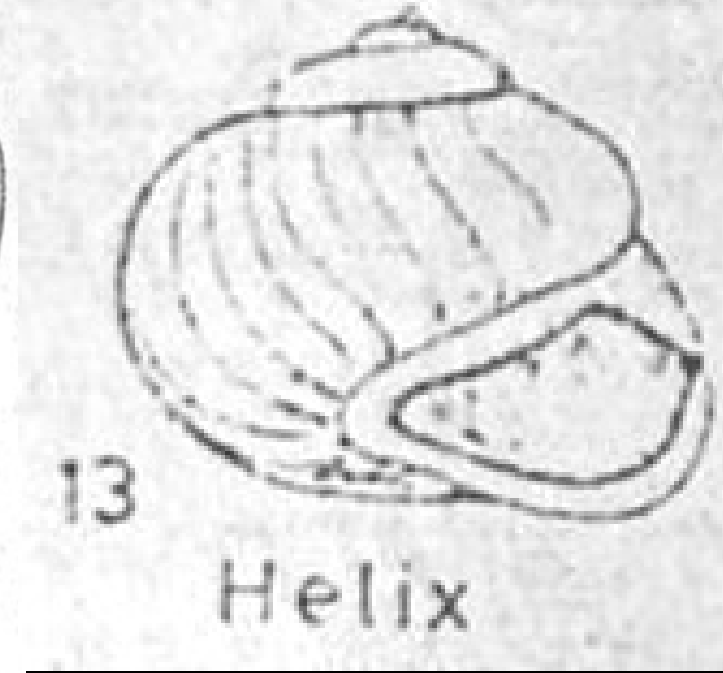
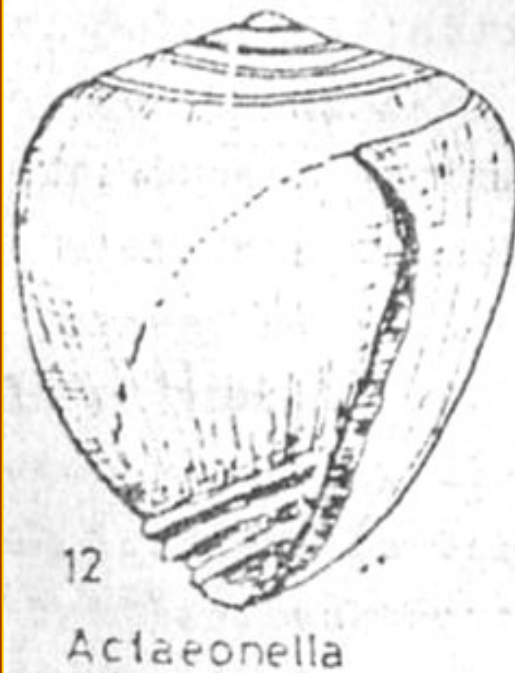


Tertiary-R.



Selected genera

Mollusca  
Class  
Gastropoda



Cretaceous

Cretaceous-R.



Jurassic to R.

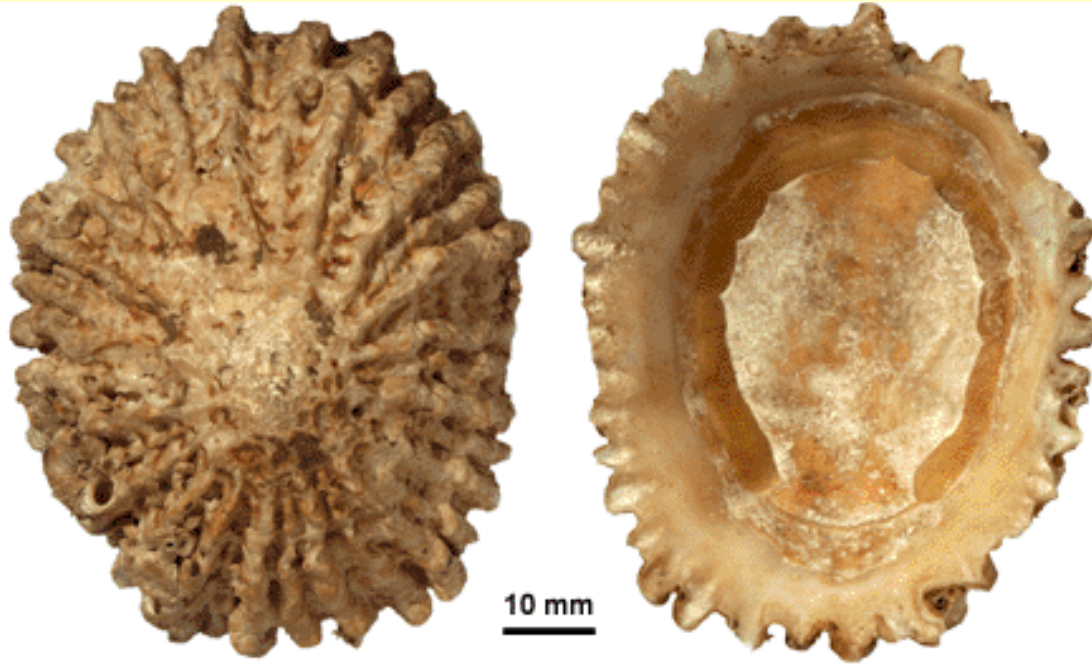


# *Pleurotomaria* sp. (Jurassic to Recent)





# Patella sp. (Eocene to Recent)



© b. e. vaughan, 2002



Pictures from Alkaya (Selçuk Univ.), lecture notes,

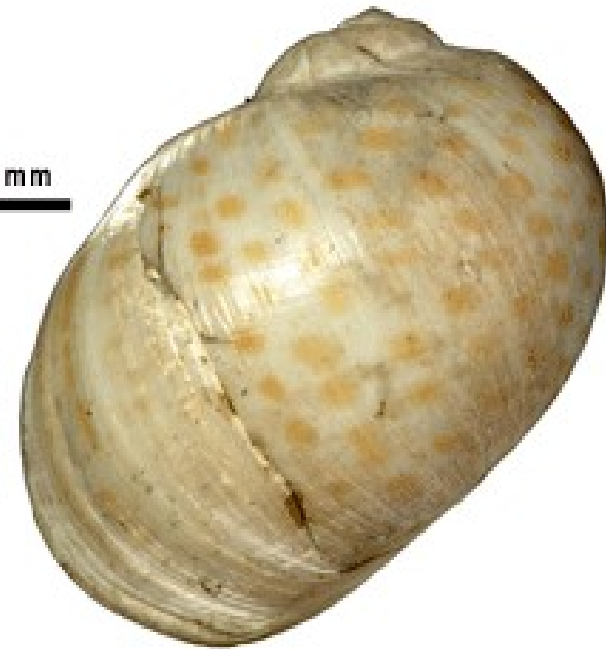
# *Trochus* sp. (Miocene to Recent)



# *Natica* sp. (Cretaceous to Recent)



10 mm



# *Turritella* sp. (Cretaceous to Recent)



**minaret-like**

# *Turritella* sp. (Cretaceous to Recent)



*Alkaya*



*Cerithium* sp.

# *Vermatus* sp. (Tertiary to Recent)



# Conus sp. (Late Cretaceous to Recent)

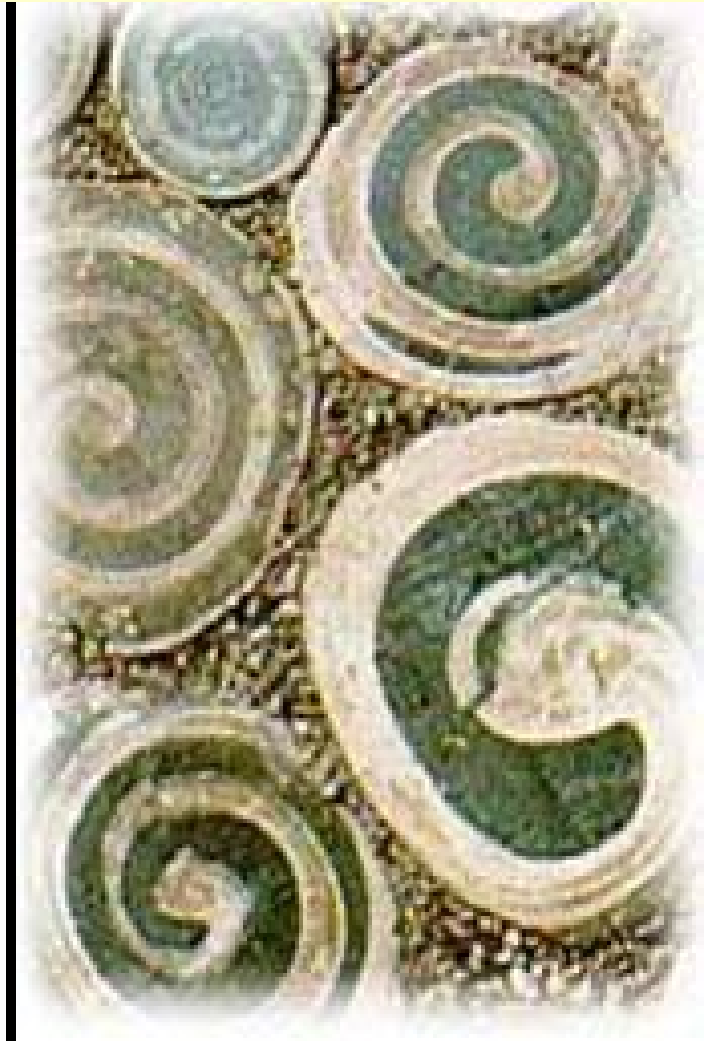
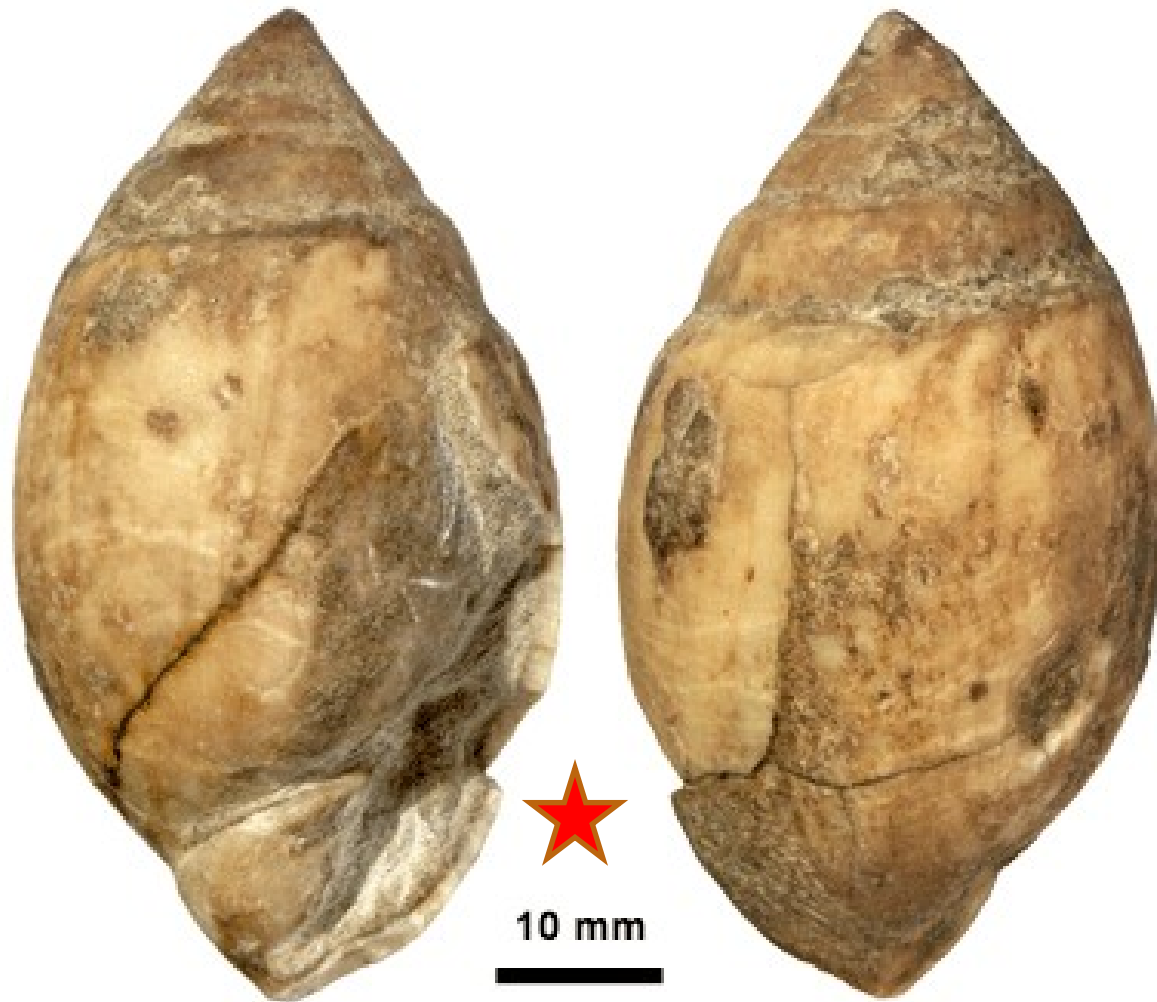




# Conus sp. (Late Cretaceous to Recent)



# *Actaeonella* sp. (Cretaceous)



**Spintop-like**

**sections**

# *Planorbis* sp. (Jurassic to Recent)



**Freshwater, planispiral**

# Murex sp. (Paleogene to Recent) ★



**spines**

Pictures from Alkaya  
(Selçuk Univ.), lecture notes,

# *Murex* sp. (Paleogene to Recent)



Pictures from Alkaya  
(Selçuk Univ.), lecture notes,

# *Helix* sp. (Late Cretaceous to Recent)

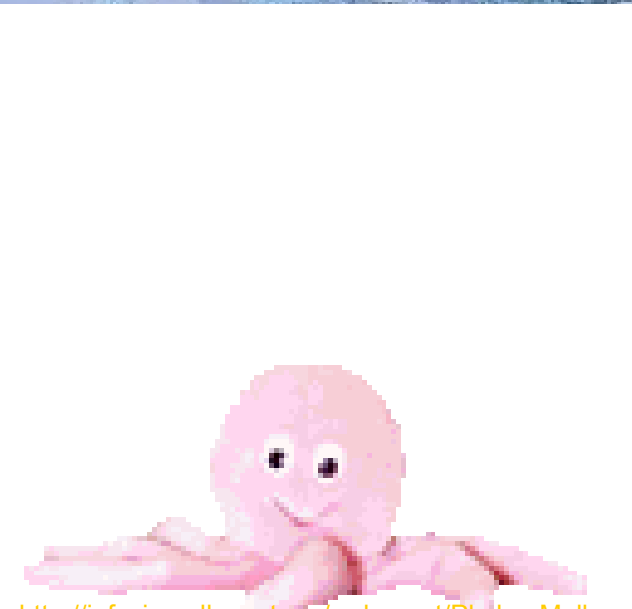


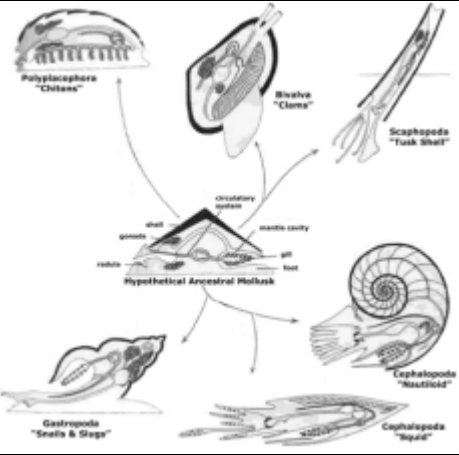
# Class

# Cephalopoda



[http://www.swsd.k12.pa.us/~Todd\\_Barshinger/module/cephelopoda.htm](http://www.swsd.k12.pa.us/~Todd_Barshinger/module/cephelopoda.htm)



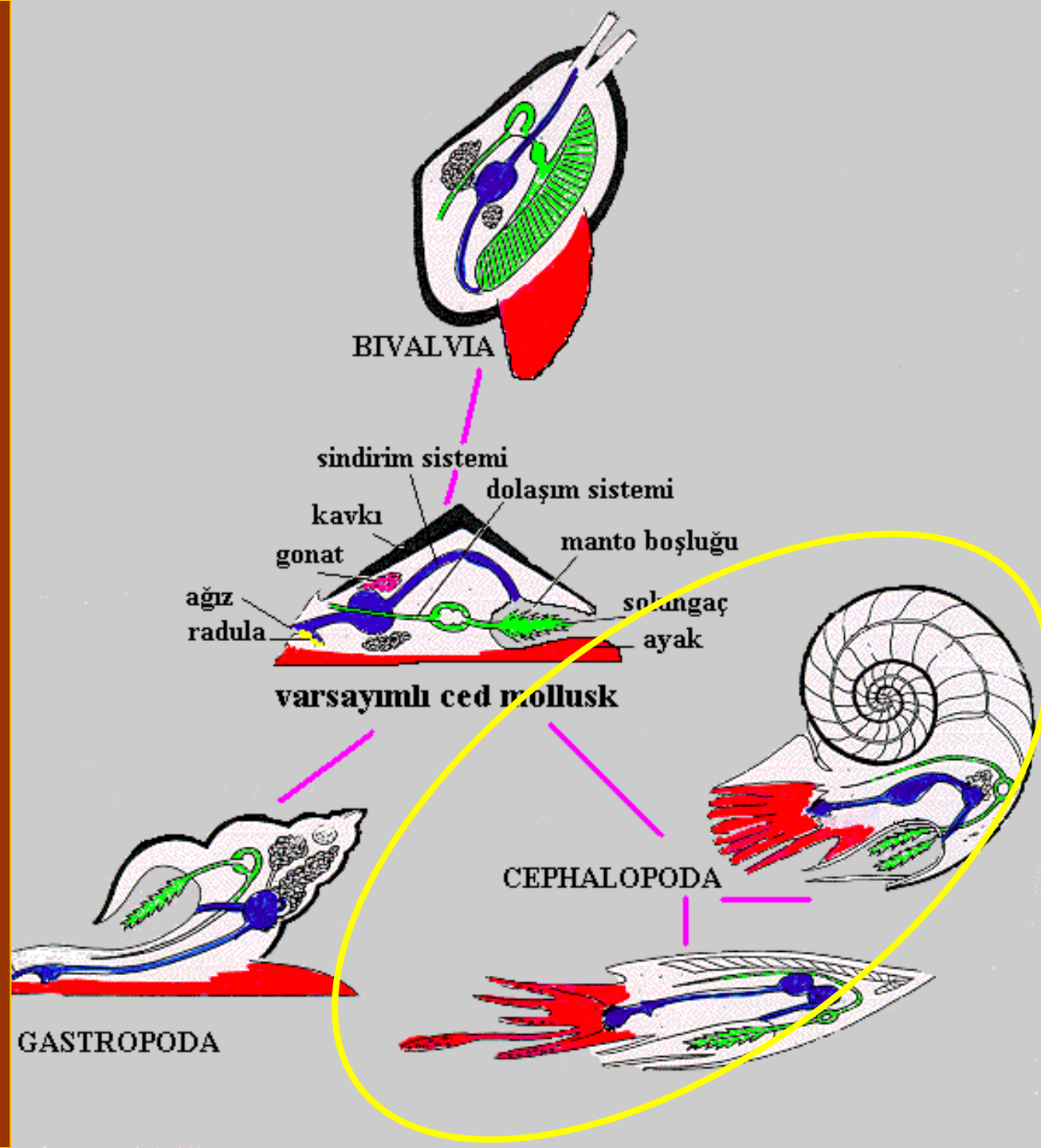


We are here....

# Mollusca

Class:  
Cephalopoda

<http://www.cabrillo.edu/~jcarothers/lab/notes/molluscs/index.html>





What are they?

Mollusca

Class:  
Cephalopoda



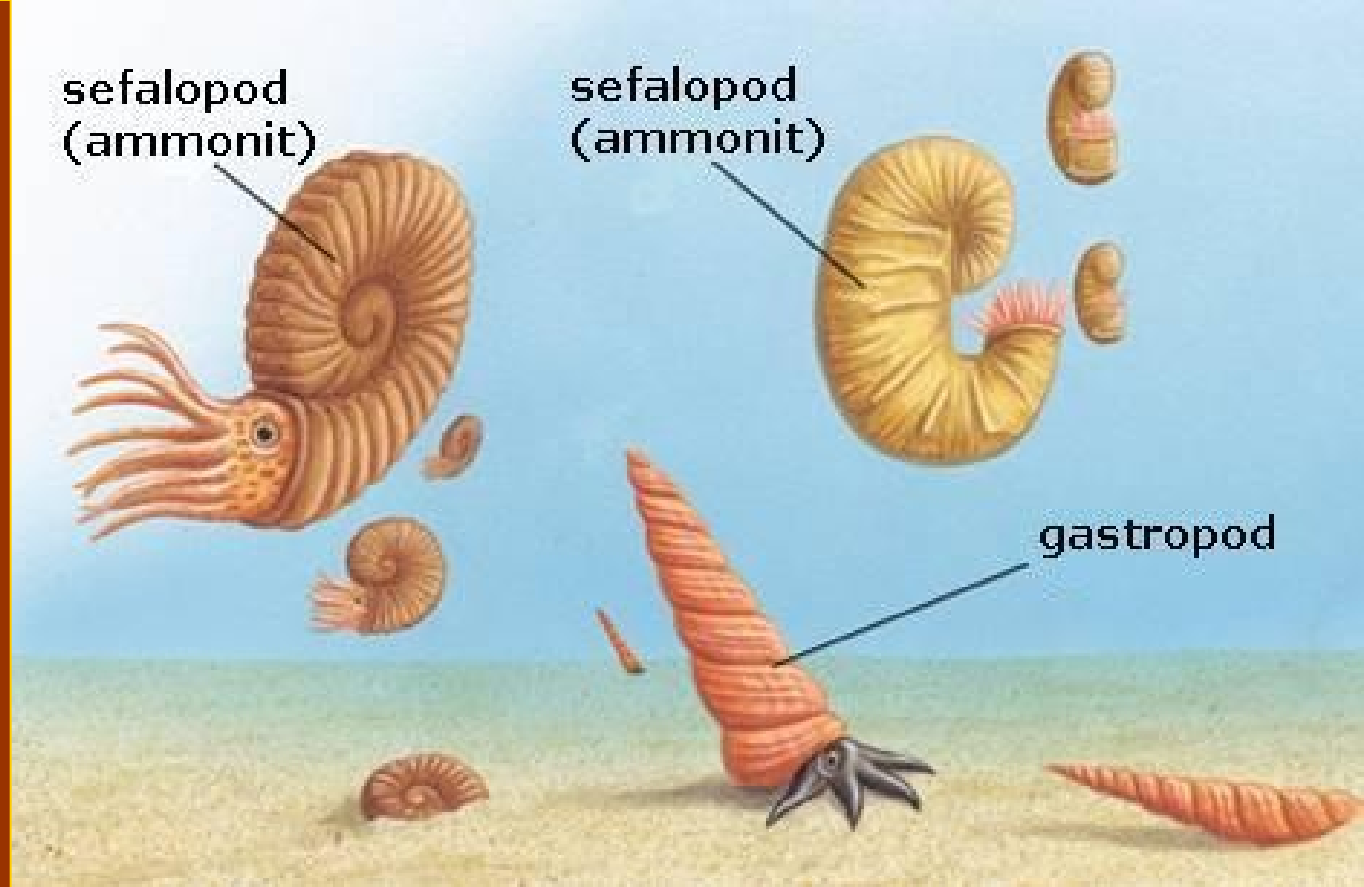
**From the dark abyss to shallow tide pools, research has recently revealed some of the mysterious behaviors of two famed cephalopods, the Giant Squid and the deadly Blue-ringed octopus.**



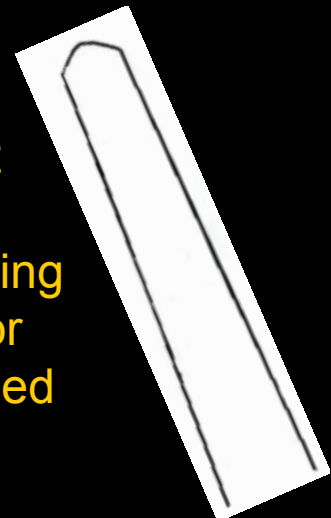
# Mollusca

Class:  
Cephalopoda

## Comparison with gastropods



On the left, test section of cephalopod including numerous chambers filled by gasses

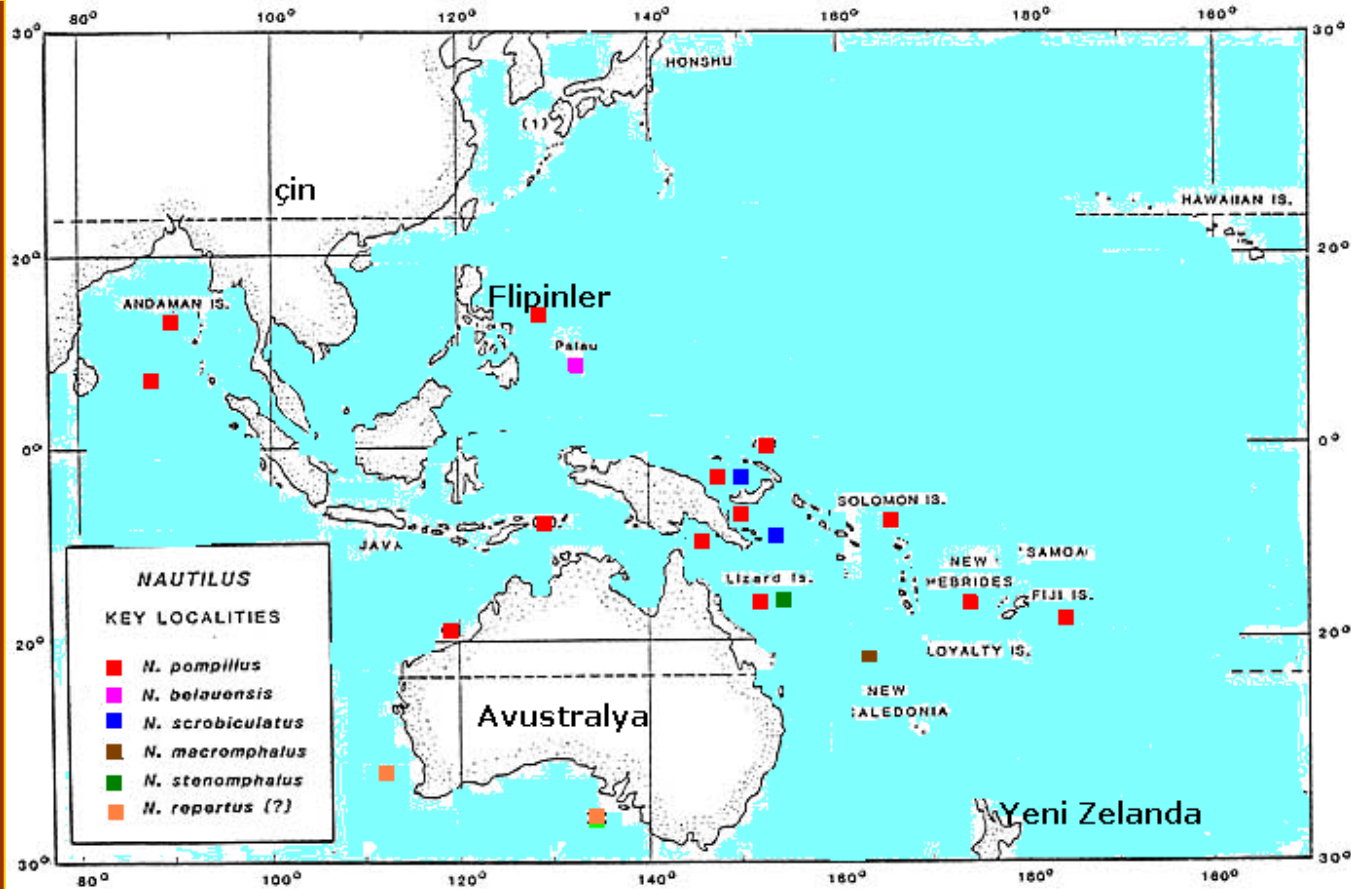


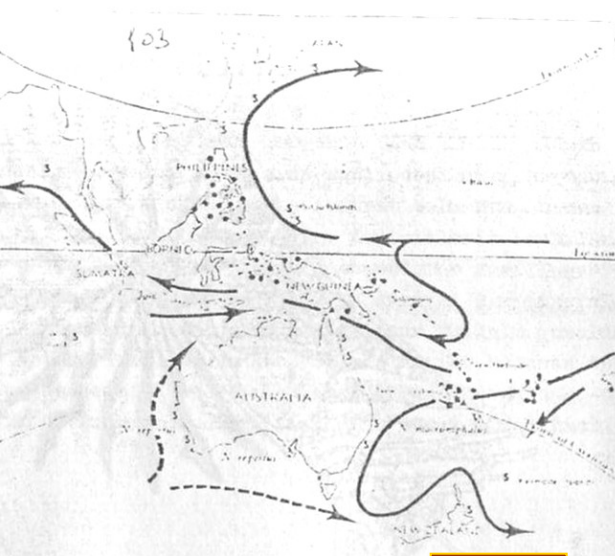
On the right, test section of gastropod including only one conic, or planspiral test filled by soft body

# Mollusca

Class:  
Cephalopoda

## Comparison with gastropods





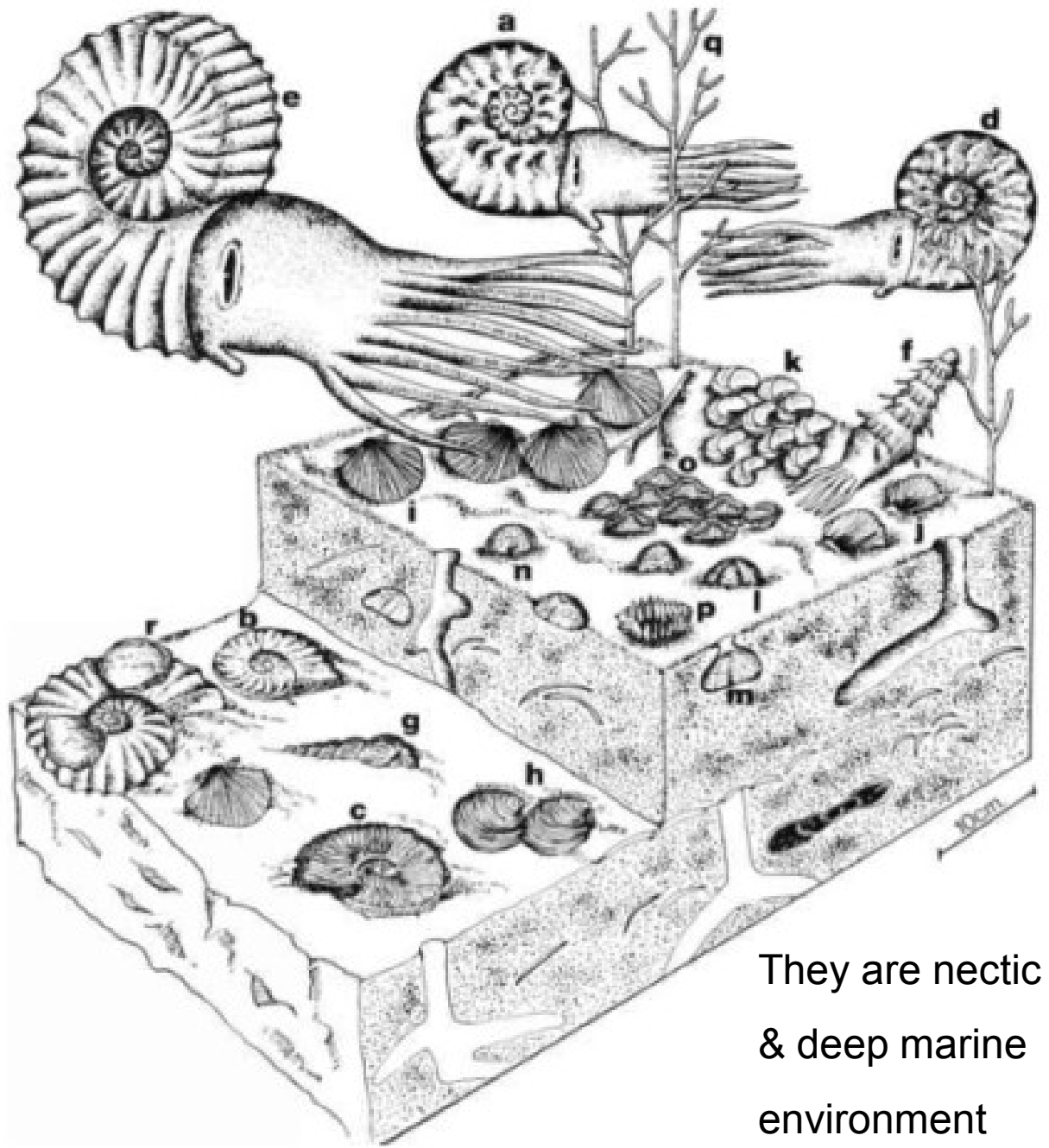
# Mollusca

Class:  
Cephalopoda

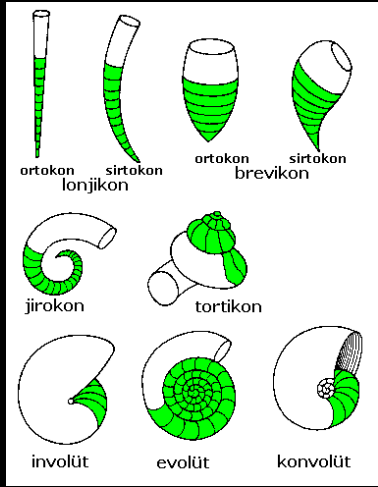
**Environment & life mode**

Submersible was invented by using these organism mechanism

M. Görmüş,  
Ankara University, 2017  
Lecture 10

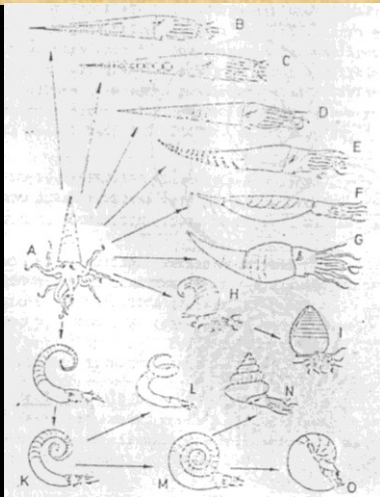


They are nectic & deep marine environment



Test shapes

Mollusca  
Class:  
Cephalopoda



orthoconic cyrtoconic  
longicones



orthoconic cyrtoconic  
brevicones



gyrocone



evolute



convolute



involute

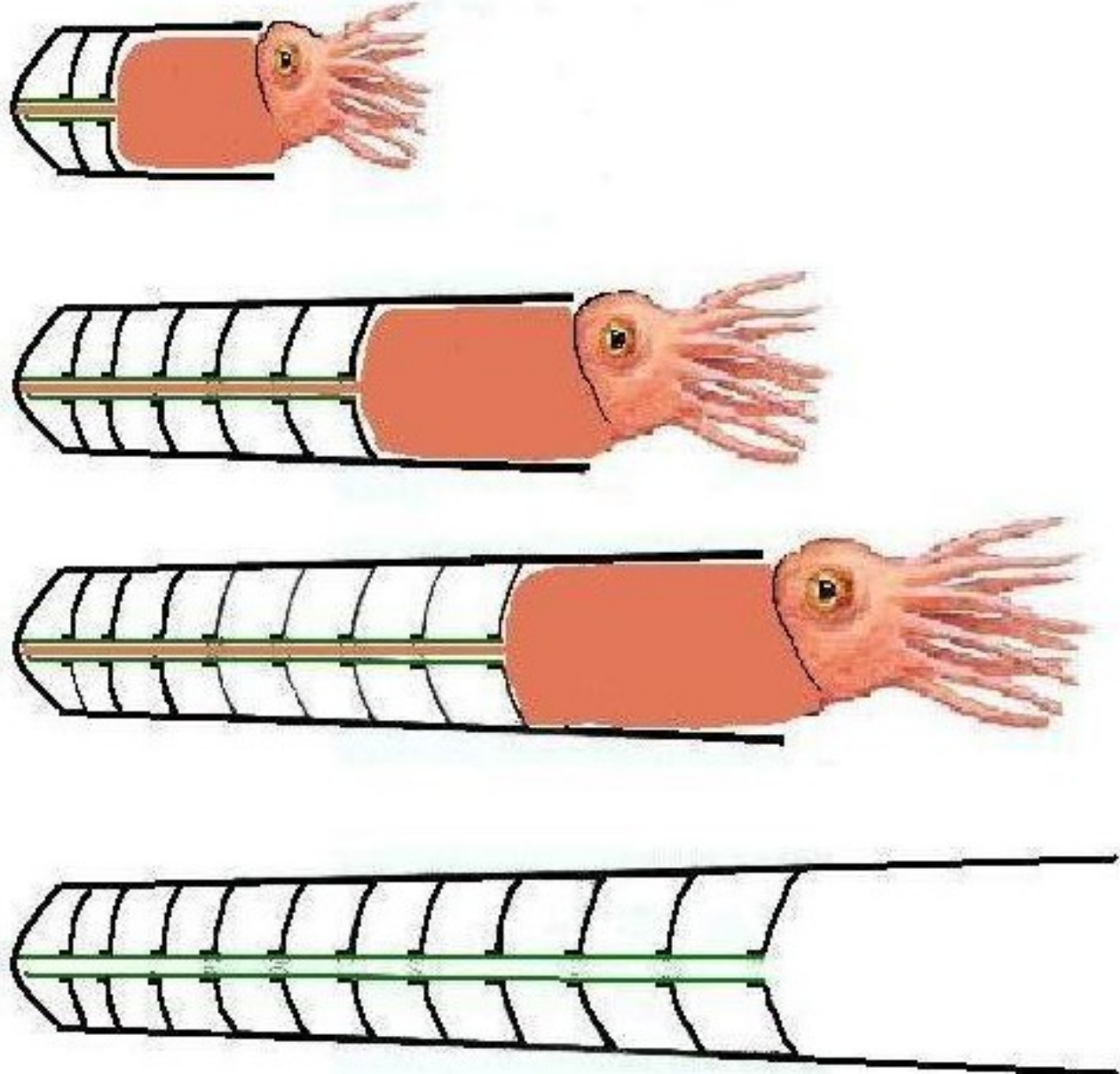


torticone

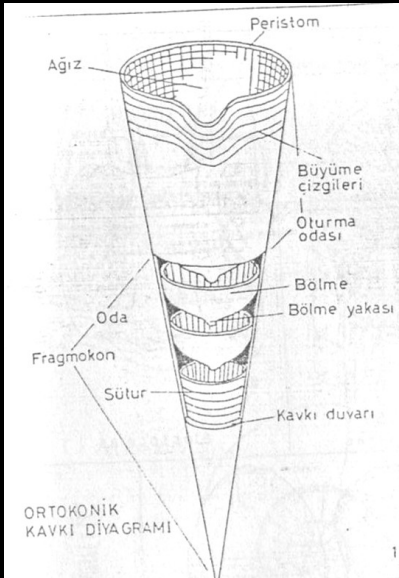
# Mollusca

Class:  
Cephalopoda

## General views

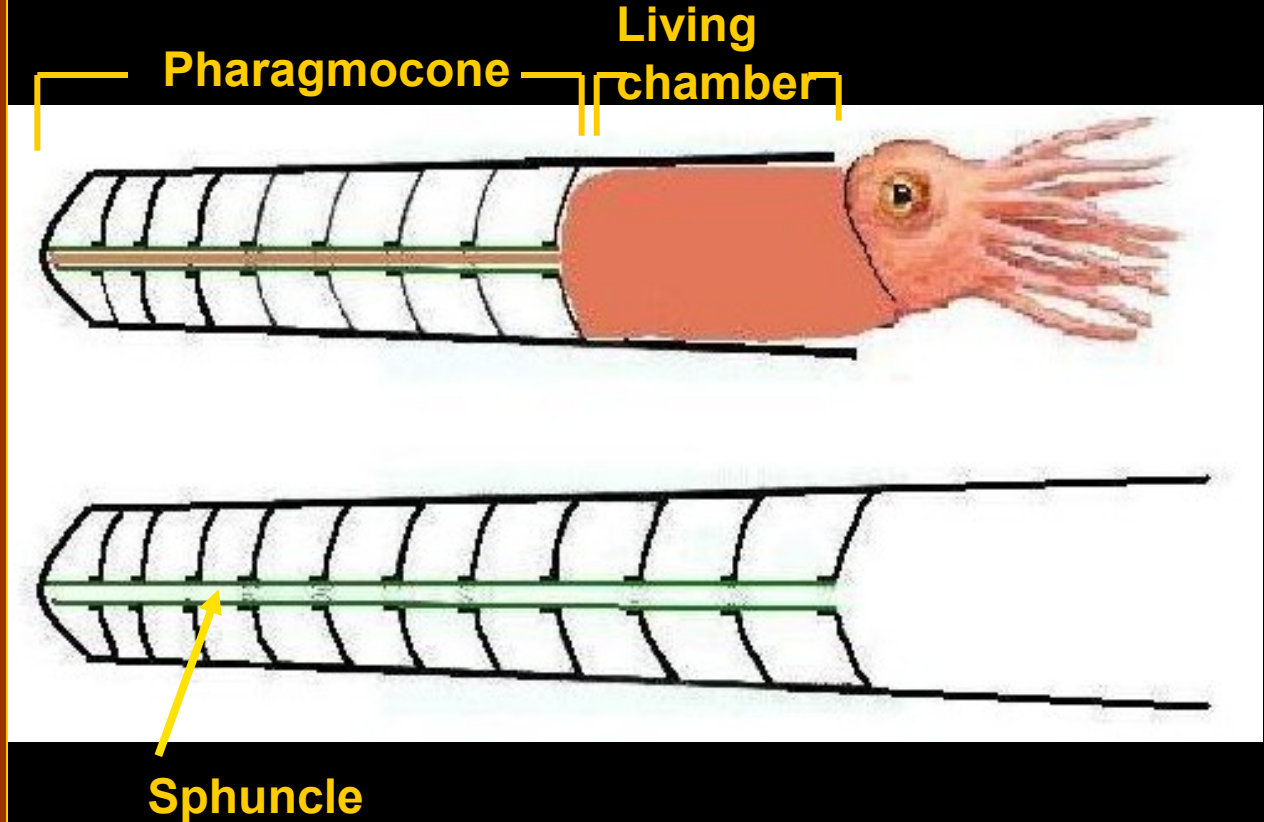


Organism soft body moves to newer chambers when it grows up, relasing the other chambers empty filled by gasses.



General views

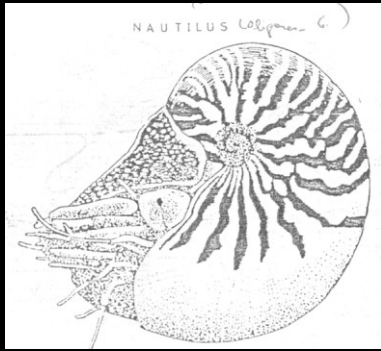
**PHARAGMOCONE:** Numerous chambers filled by gases  
**LIVING CHAMBER:** Undivided chamber where organisms' soft body settles down.  
**SPHUNCLE**



**Mollusca**  
Class:  
Cephalopoda







# Mollusca

Class:  
Cephalopoda



## General characteristics

- Cephalopods are a small class of mollusks.
- The Cephalopoda includes Squids, octopuses, nautilus, and ammonites
- Cephalopods are the most intelligent, most mobile, and the largest of all molluscs.
- They display remarkable diversity in size and lifestyle with adaptations for predation, locomotion, disguise, and communication.
- Cephalopoda (Greek plural Κεφαλόποδα (*kephalópoda*); "head-feet").
- They are exclusively marine animals
- They are characterized by bilateral body symmetry, a prominent head, and a set of arms or tentacles (muscular hydrostats) modified from the primitive molluscan foot.
- Fishermen sometimes call them inkfish, referring to their common ability to squirt ink.
- The study of cephalopods is a branch of malacology known as teuthology.
- About 800 living species of cephalopods have been identified.
- Two important extinct taxa are the Ammonoidea (ammonites) and Belemnnoidea (belemnites)



# Mollusca

Class:  
Cephalopoda

## General characteristics

- There are about 17,000 named species of fossil cephalopods, compared to the 800 identified living species of cephalopods.
- They flourished in Paleozoic oceans between the Ordovician (488 mya) and Triassic periods (200 mya) with shells that, in some species, reached nearly 10 meters in length.
- More familiar to us in the fossil record are the nautiloids, ammonoids, and belemnites.
- **Nautiloids and ammonoids**
  - Nautiloids are Cambrian to Recent in age
  - Ammonoids are Devonian to Cretaceous in age. ★
  - Nautiloids siphuncle is seen in the middle part of test, Ammonoids' at the periphery of the test
  - Ammonoids include various type sutures



## General characteristics

# Mollusca

Class:  
Cephalopoda

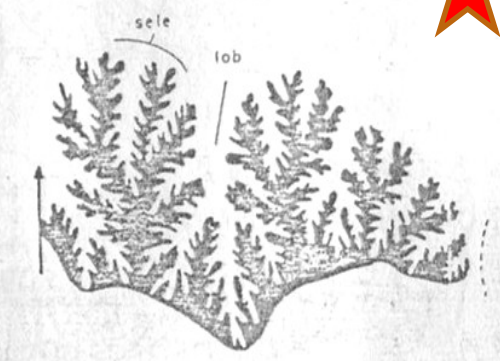
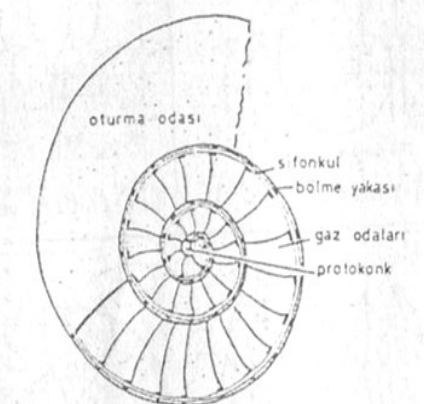
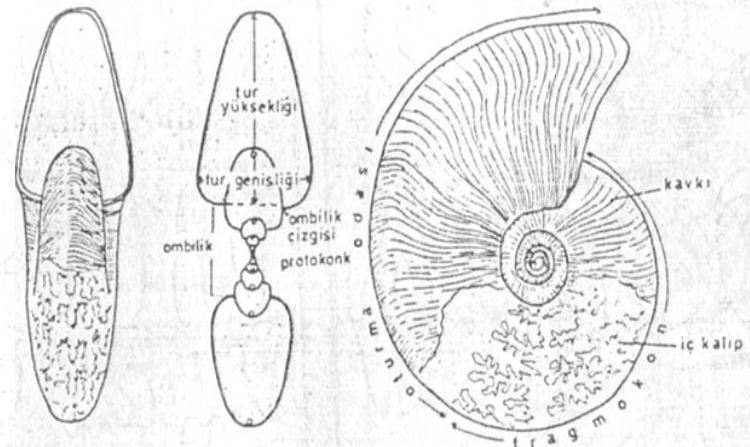
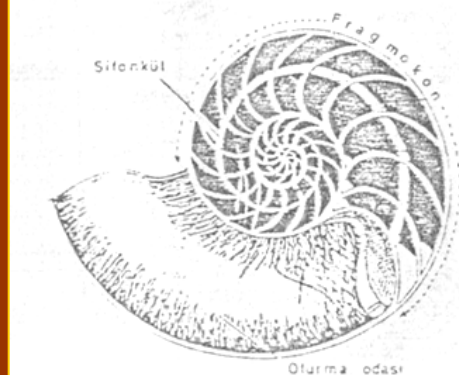
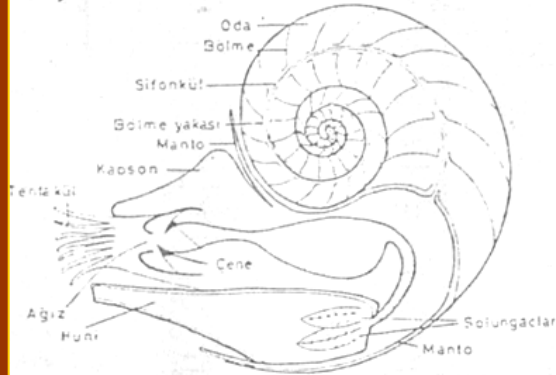
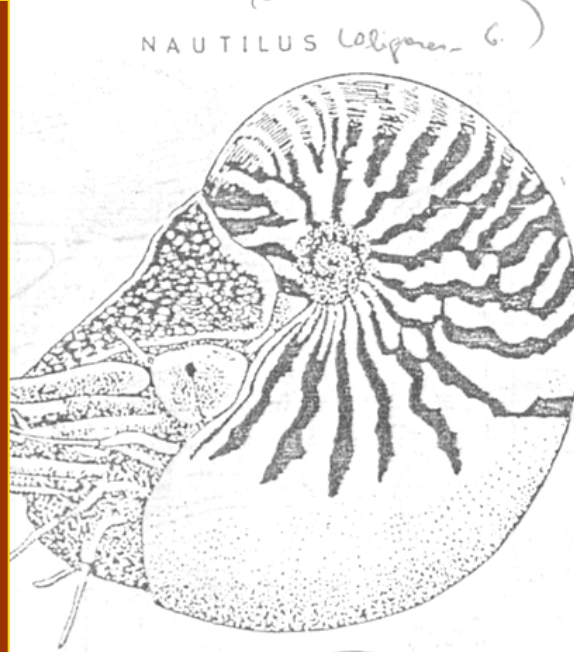
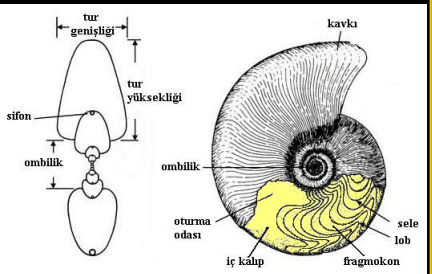
- The siphuncle is an internal tube that runs through and connects the chambers of the shell. In nautiloids, it runs through the center of the shell chambers, while in almost all planispiral ammonoids, it is found along the shell's outer edge. Sutures are contact lines between shell chamber walls (called septa) and the inner shell wall of nautiloid and ammonoid shells. In nautiloids these lines are straight and are called simple sutures. In contrast, ammonoid sutures dip and fold in undulations called lobes and saddles. The most undulated, complex sutures are found in the prolific ammonoids of the Cretaceous, the ammonites.



# Mollusca

Class:  
Cephalopoda

## Nautiloid & Ammonoid comparison

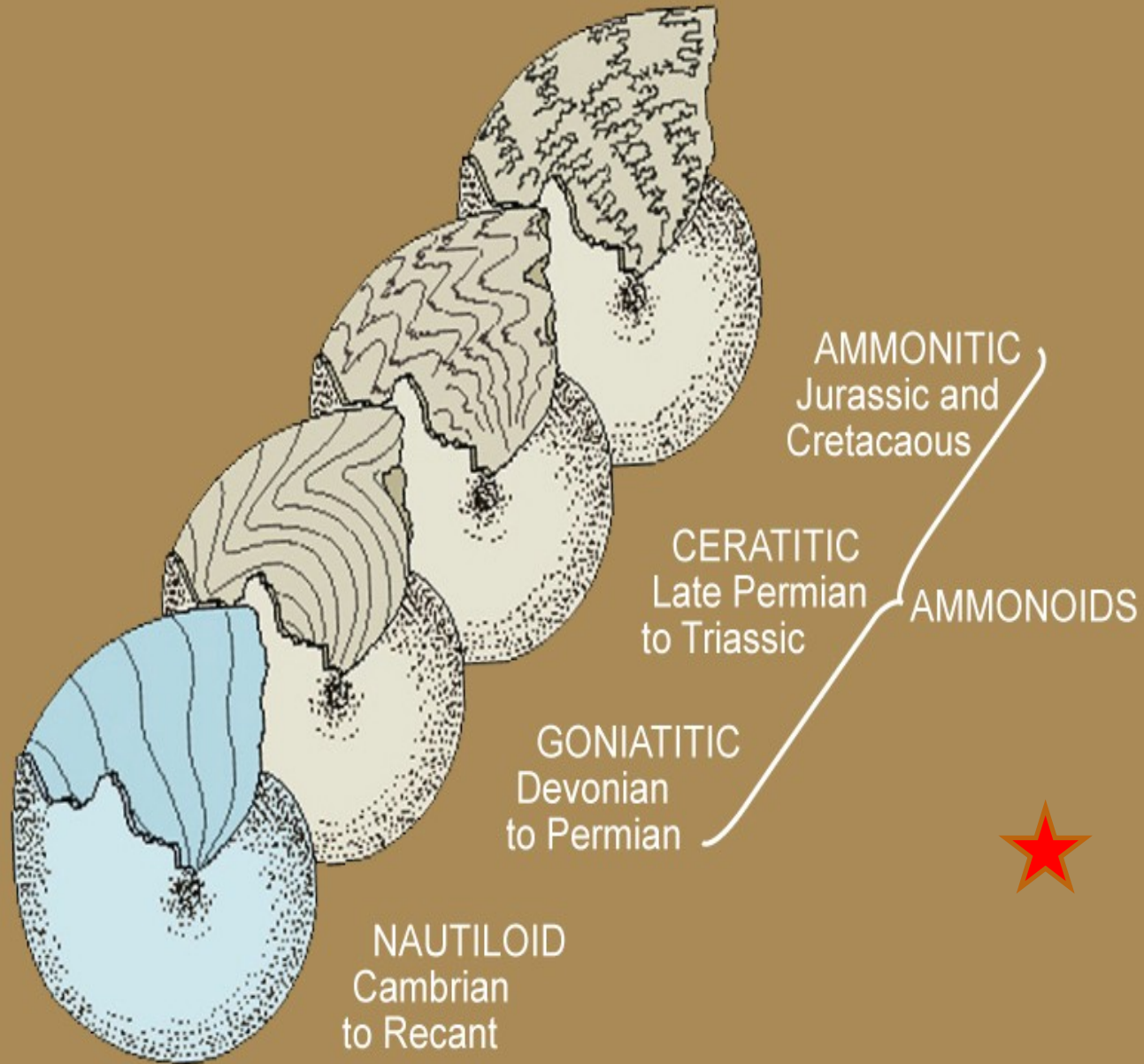


Ammonoid morfolojisi



**Mollusca**  
Class:  
Cephalopoda

**Cephalopoda suture types**



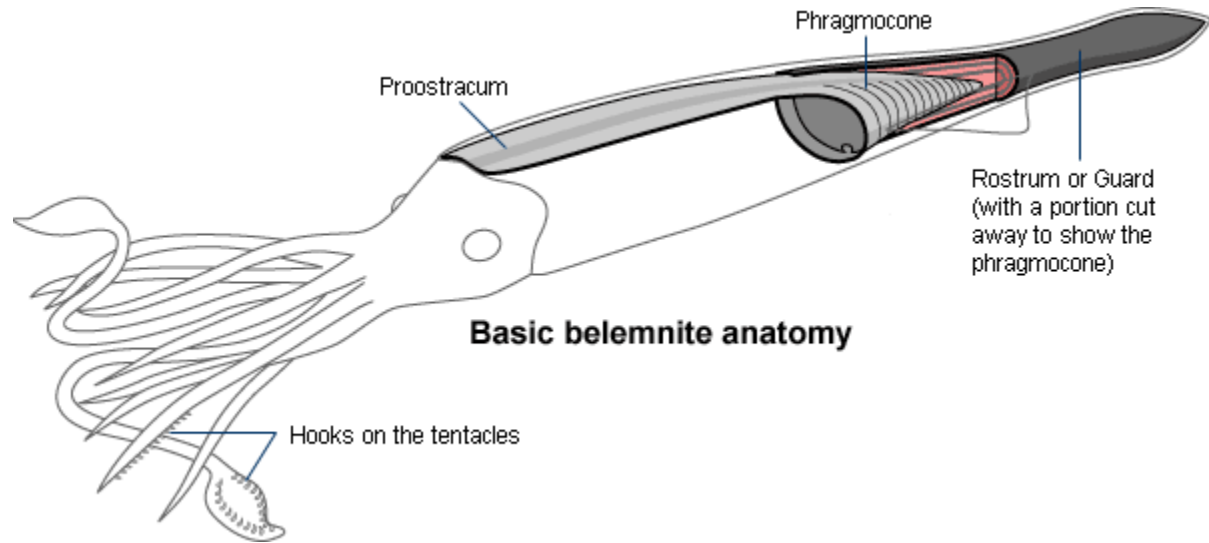


# Mollusca

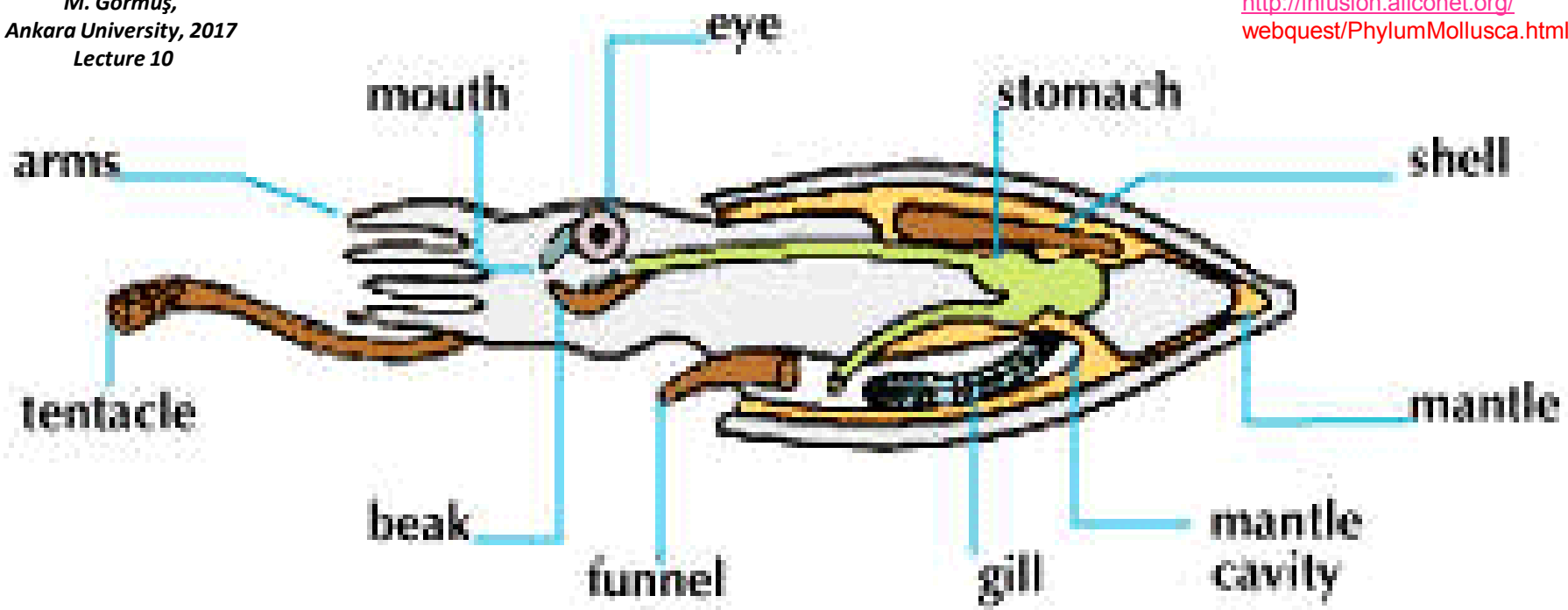
Class:  
Cephalopoda



## General characteristics



- **Belemnites**
- The extinct belemnites are the exception. These squid-like animals swam with ammonoids and nautiloids in oceans of the Triassic, **Jurassic**, and Cretaceous Periods. Like orthocones, belemnites had a straight shell, but it was internal, not external. It was made of three parts, a proostracum and phragmocone followed by a rostrum. Being highly resistant, the posterior bullet-shaped rostrum is most often preserved and can be found in great quantity and concentration in **Mesozoic** marine sediments. Before these bullet-shaped fossils were understood as fossils, early Europeans explained them as the products of lightning hitting the ground and named them "thunderbolts" or "thunderstones."



[http://infusion.allconet.org/  
webquest/PhylumMollusca.html](http://infusion.allconet.org/webquest/PhylumMollusca.html)





# Mollusca

Class:  
Cephalopoda

**FUN FACT:** Ammonoids, like belemnites, have also played a notable role in folklore. During the Middle Ages, their coiled shells were interpreted by the English, who encountered them in Jurassic-aged rocks exposed throughout Great Britain, as lithified snakes (called "snake stones"). Similarly, ammonite fossils encountered by the early Romans were mistaken for horns, and termed "ammonites" for the coiled horns of the Egyptian ram-god Ammon.

**FUN FACT:** The largest cephalopod *Mesonychoteuthis hamiltoni*, called the colossal squid, is longer than a city bus, while the smallest cephalopod, *Idiosepius notoides*, the pygmy squid, could fit on your fingernail.

# Mollusca

Class:  
Cephalopoda

## Classification

### Subclasses:

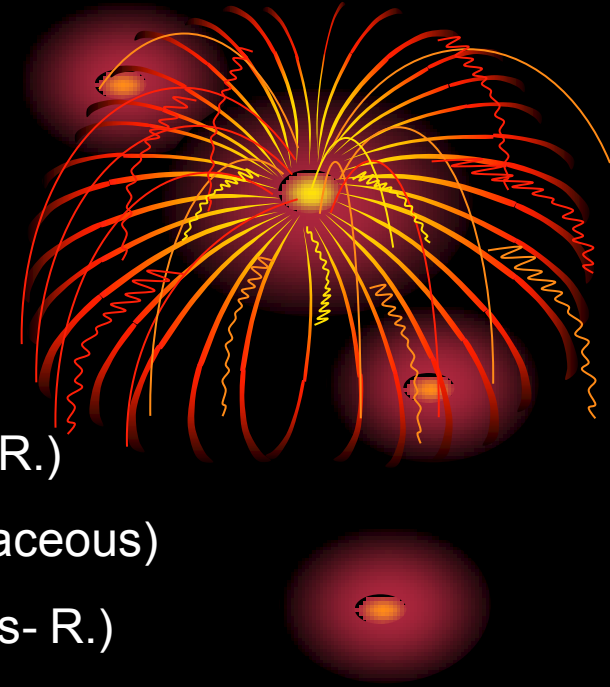
NAUTILOIDEA (Cambrian.-R.)

AMMONOIDEA (Dev.-Cretaceous)

COLEOIDEA (Carboniferous- R.)

ENDOCERATOIDEA (Ord-Sil.)

ACTINOCERATOIDEA (Ord.-Carbonif.)



# Mollusca

Subclass:  
Nautiloidea

## Selected genera

### Genera

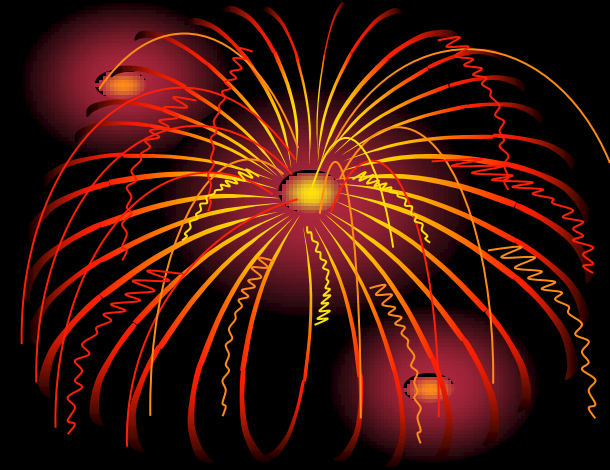
*Nautilus* sp. (Oligocene-Recent)

*Cenoceras* sp. (Late Triassic-Middle Jurassic)

*Michelinoceras* sp. (Ordovician-Triassic)

*Gomphoceras* sp. (Silurian)

*Orthoceras* sp. (Ordovician)



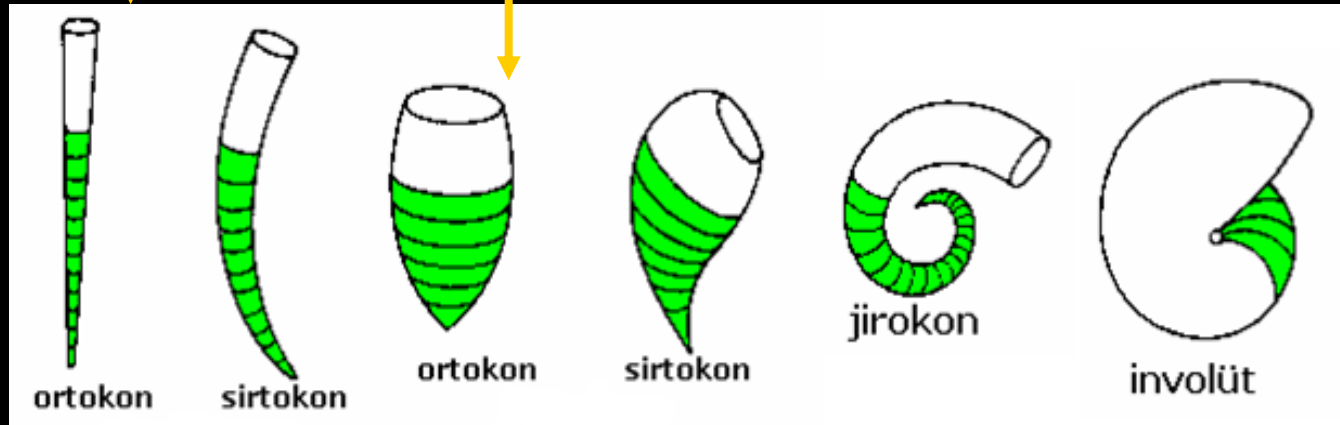


**Orthoceras**  
**Michelinoceras**

**Gomphoceras**

**Mollusca**  
Subclass:  
Nautiloidea

Selected genera



**Cenoceras**  
**Nautilus**

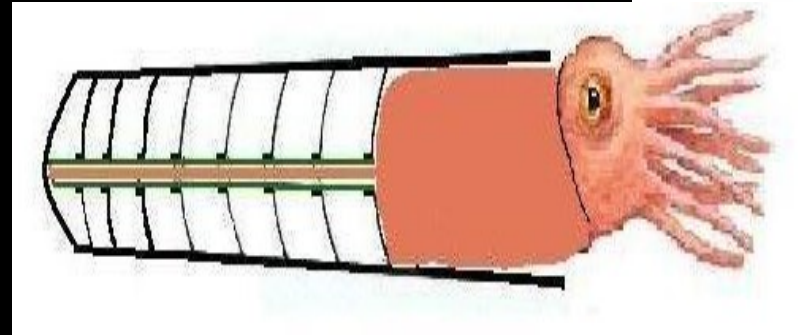
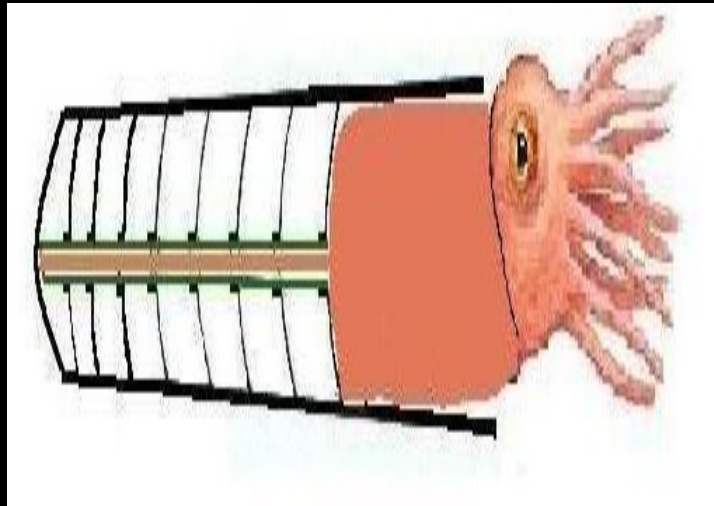
# Orthoceras sp. (Ordovician)



# *Michelinoceras* sp. (Ordovician-Triassic)



# Gomphoceras sp. (Silurian)



Picture from Alkaya  
(Selçuk Univ.), lecture  
notes,

# *Nautilus* sp. (Oligocene to Recent)





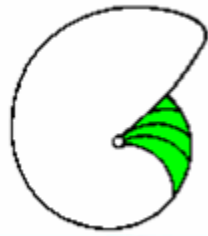


© James B. Wood



**Nautilus**

# *Cenoceras* sp. (Triassic to Jurassic)





## **Subclass AMMONOIDEA**

# Ammonoidea



**Undeveloped primitive communities living in Libya (10.000 BC) were praying to the creator Ammon. Later, it was also a belief for Egyptians.**

**It is said that the Creator called Ammon in Egypt had coach-like horns**

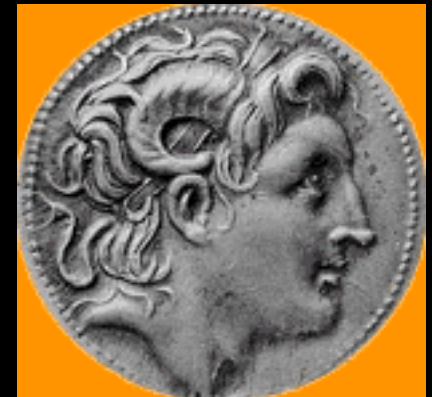
**According to the belief of ancient Greek People, Greek's creator name is Zeus Ammon.**



Original bust  
Vienna, Kunthistorisches Museum  
Length 16.5 cm

**The King Iskender announced that he was the son of Ammon.**

Modified from Alkaya, Selcuk Univ. lecture notes



# Ammonoidea

The ammonoid stones are the holy stones for the some ancient people. Pliny who was a Roman's historian mentioned for the first time on these stones in his book (death: 79 BC). He called these stones as *Cornua Ammonis* .

*“horns of ammon & nice derams”* are the words in ancient relicts, 480 BC.

*"How of thousand snakes each one was changed into a coil of stone when holy Hilda prayed."* **Sir Walter Scott (1808), Marmion**



snakestone

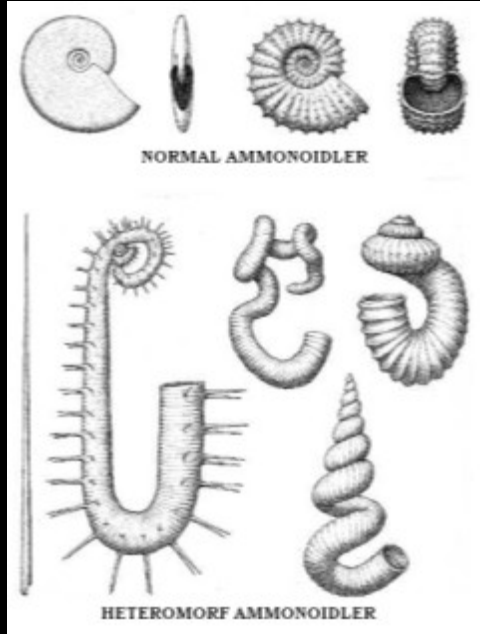


**Hildoceras**



**Ammonit**

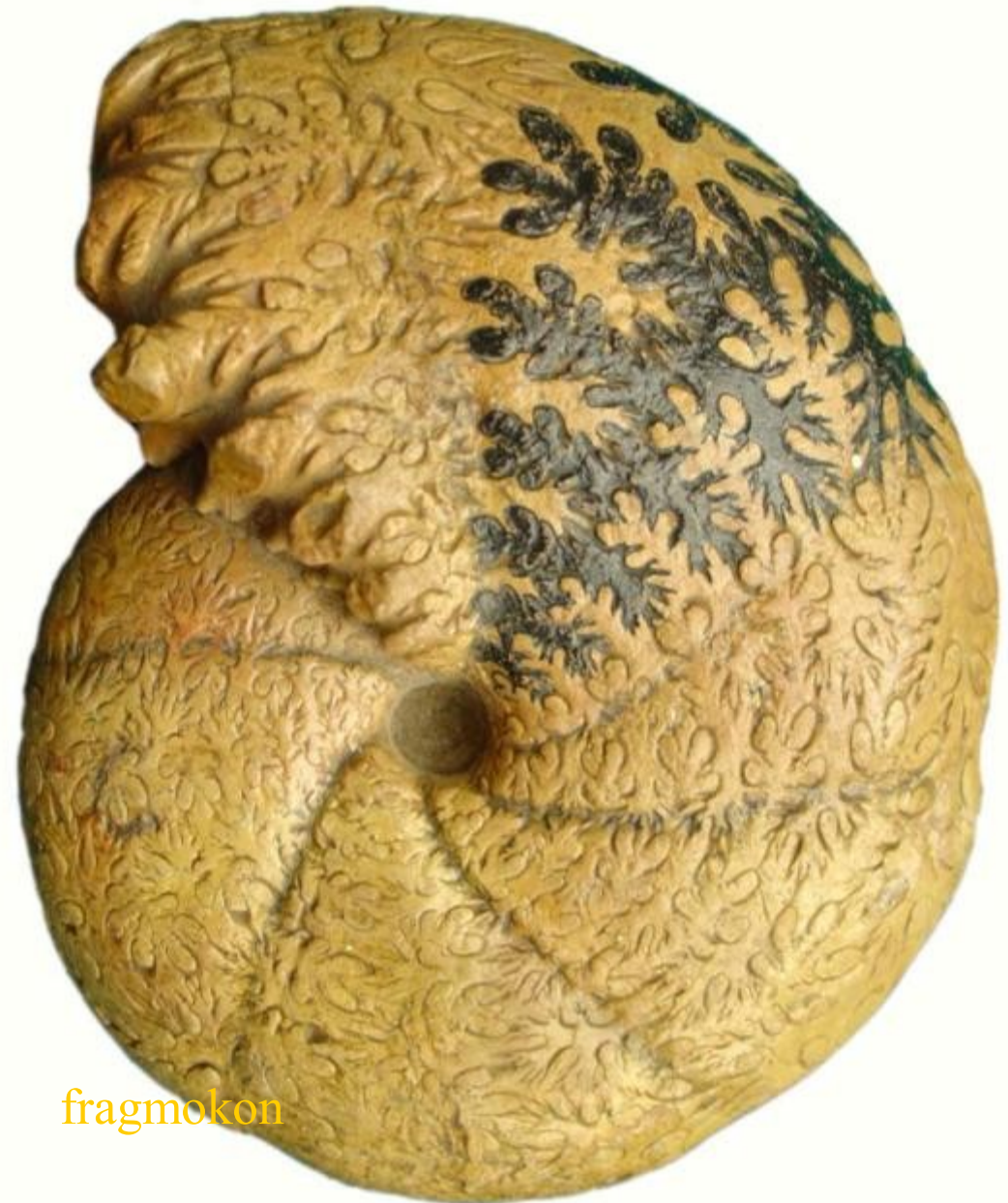
# Ammonoidea



# Ammonoidea

**Commonly test of ammonoids is aragonitic. When it is fossilized, it may be changed into calcite or replaced with other minerals.**

**Septal sutures**



fragmokon



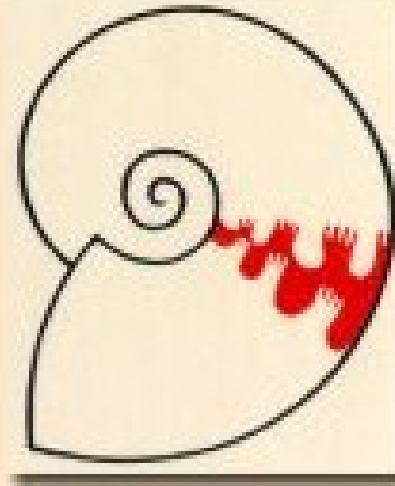
# Mollusca

Class:  
Cephalopoda

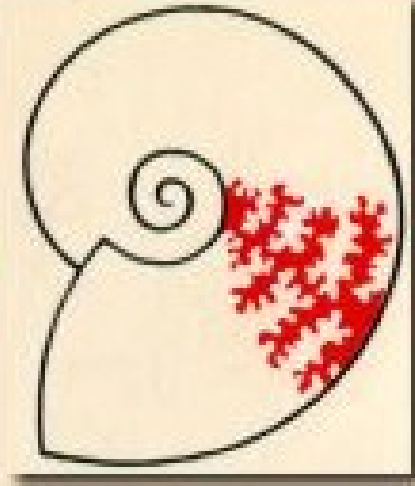
## Cephalopoda suture types



**Goniatitt**

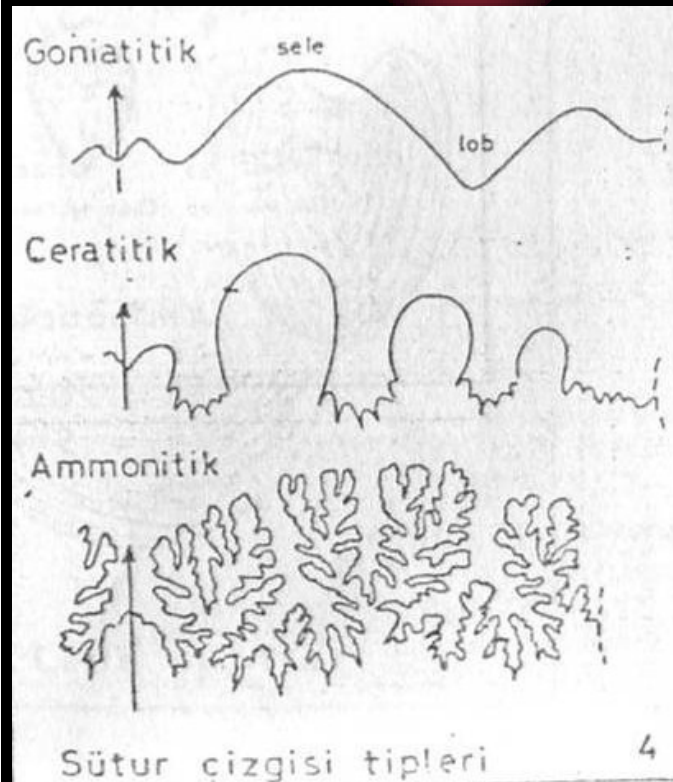
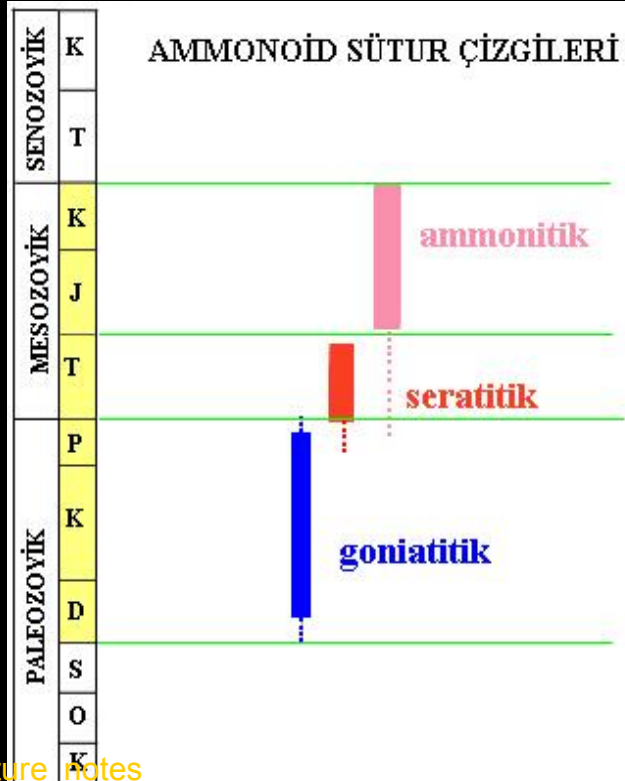


**Ceratitt**



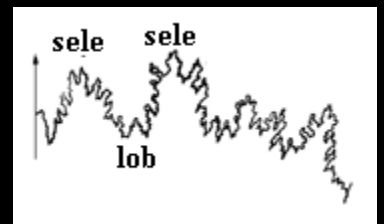
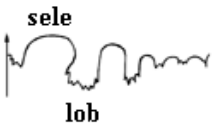
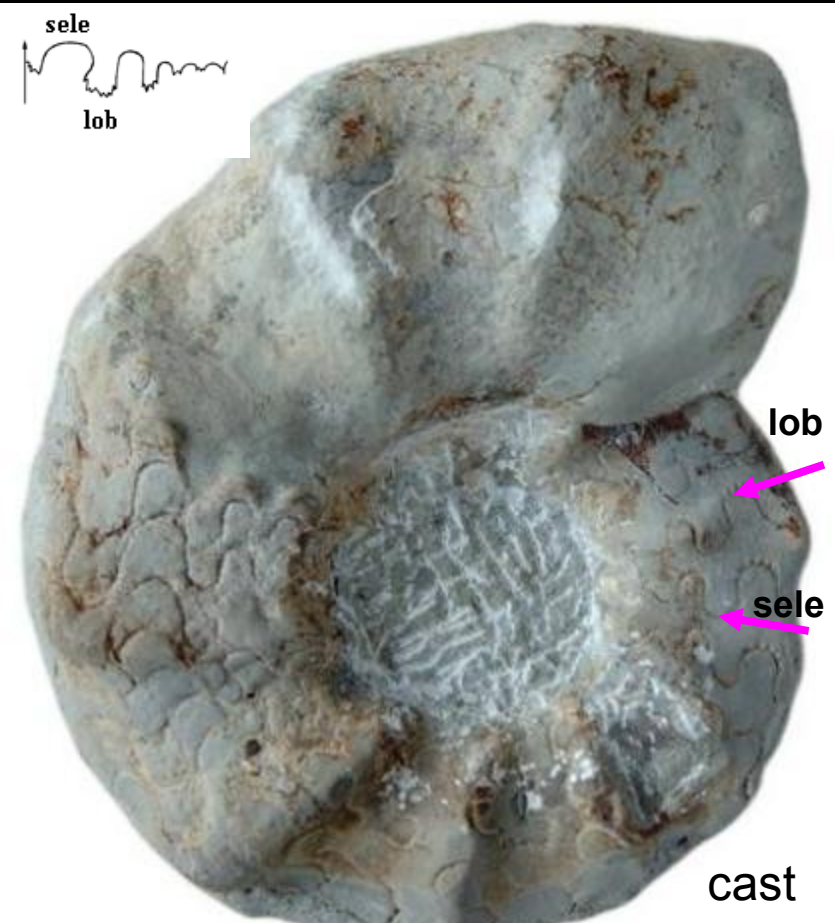
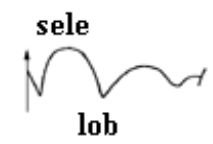
**Ammonitt**

[http://www.toyen.uio.no/palmus/galleri/montre/english/m\\_nautil\\_e.htm](http://www.toyen.uio.no/palmus/galleri/montre/english/m_nautil_e.htm)





# Ammonoidea



# Ammonoidea

fragmokon  
cast

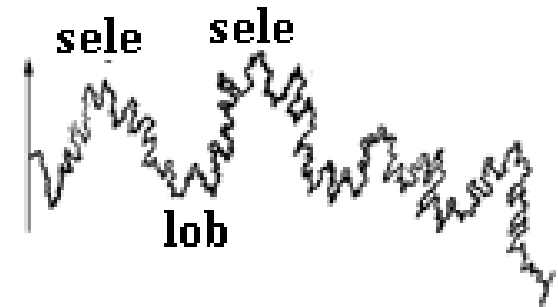


sele

lob



cast

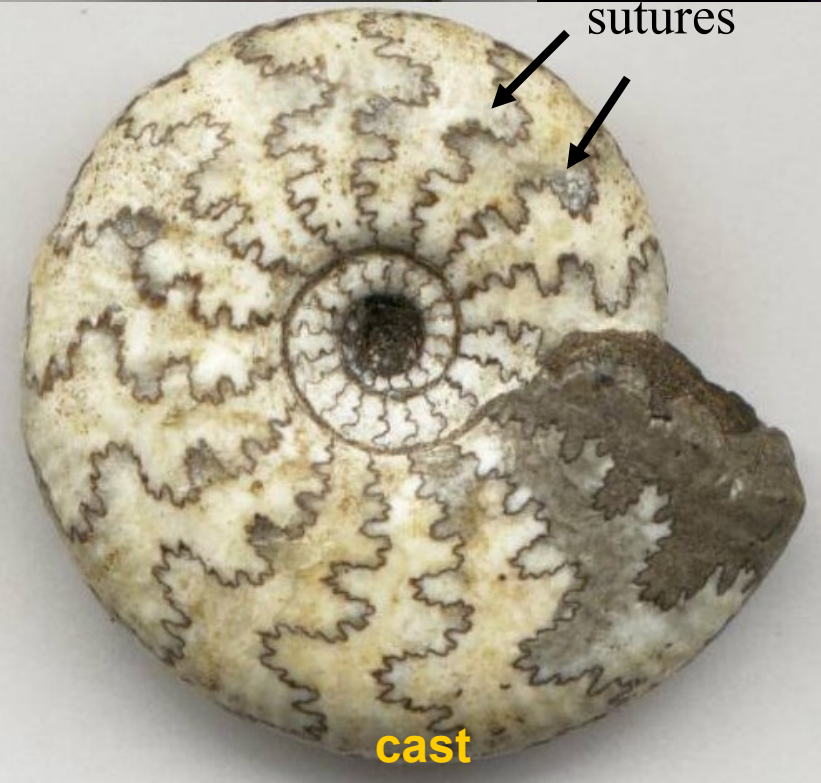


# Ammonoidea

Modified from Alkaya, Selcuk Univ. lecture notes



Well preserved test

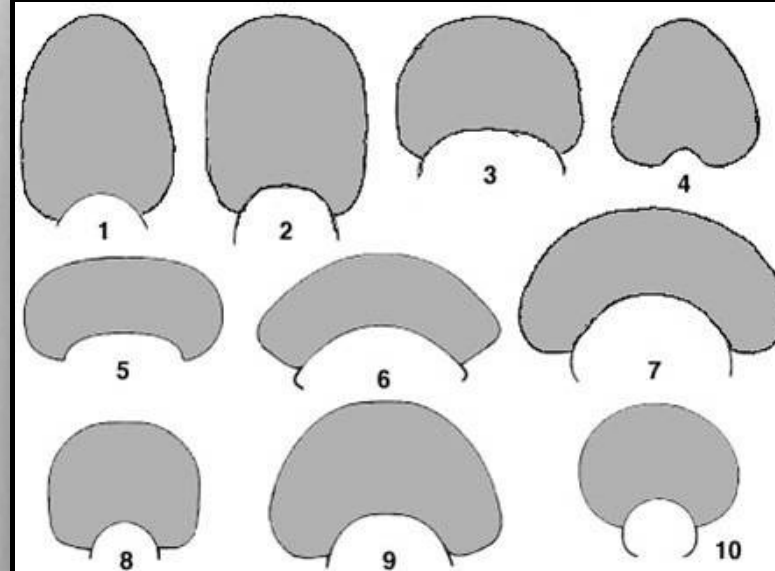
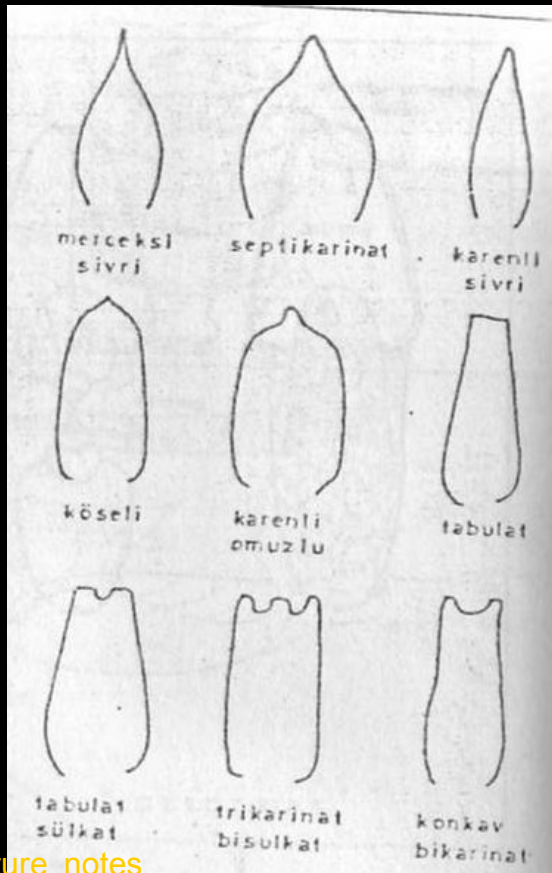
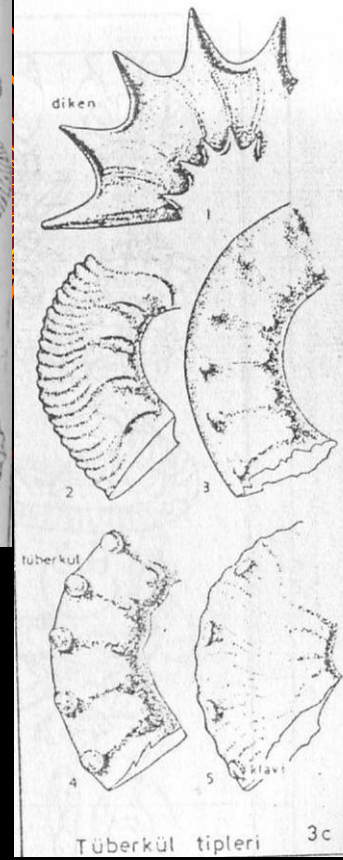
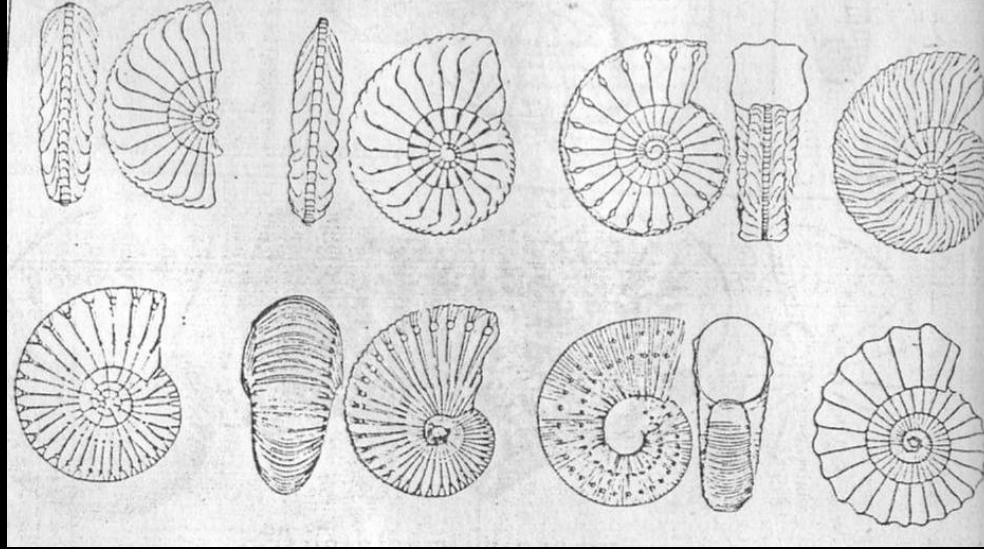


cast



Ornaments & last chamber views

Mollusca  
Class:  
Cephalopoda



# Ammonoidea



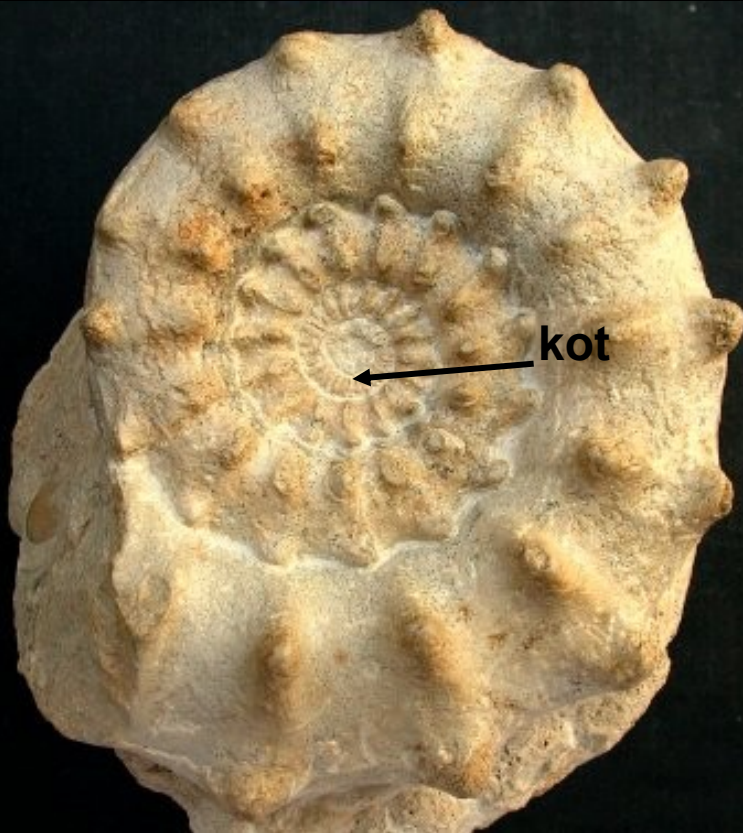
**Side view**

**ventral view Apertural view**

# Ammonoidea

Ornament

TÜBERKÜL



# Ammonoidea



# Ammonoidea



**boğum**



**boğum**



# Ammonoidea

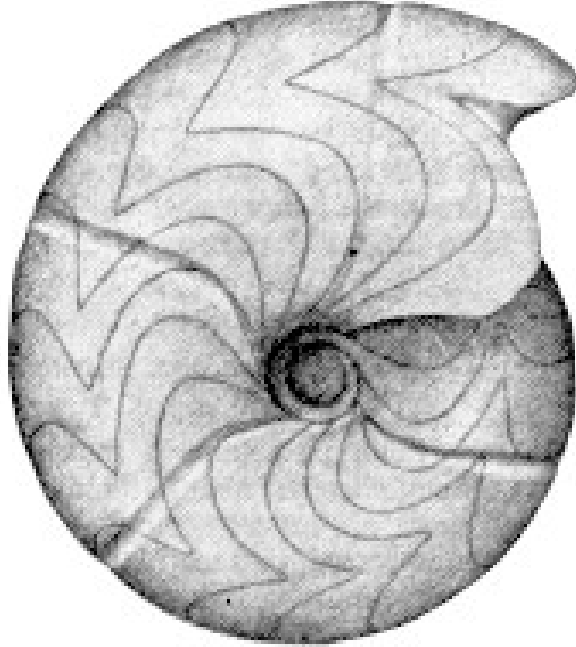
## ÇENE AYGITI - APTİKUS



**ammonoidlerin kavkısı  
aragonitik,  
çene aygıtları kalsitiktir**



# Goniatites sp. (Carboniferous)



<http://www.toyen.uio.no/palmus/galleri/montre/english/a42569.htm>

sele



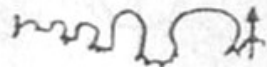
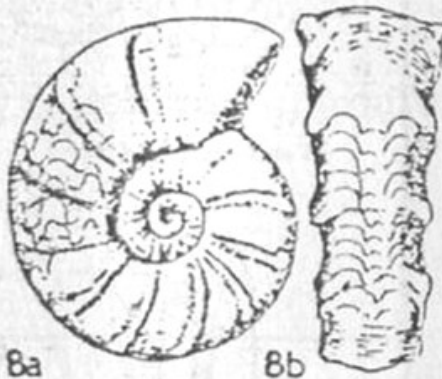
lob



# Ceratites sp. (Triassic)

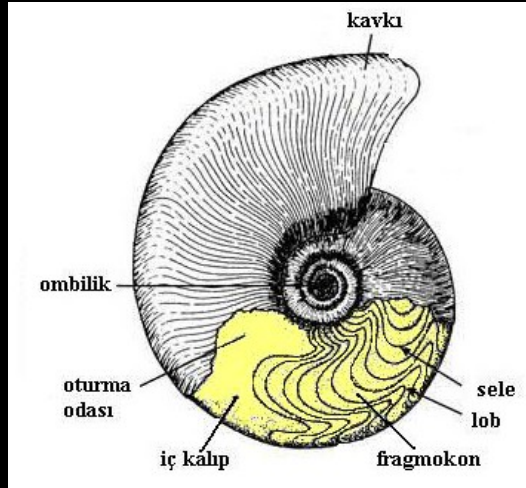


<http://www.toyen.uio.no/palmus/galleri/montre/english/a42570.htm>



Modified from Alkaya,  
Selcuk Univ. lecture  
notes

# Manticoceras sp. (Late Devonian)



<b>CRETACEOUS</b>
<b>JURASSIC</b>
<b>TRIASSIC</b>
<b>PERMIAN</b>
<b>CARBONIFEROUS</b>
<b>DEVONIAN</b>

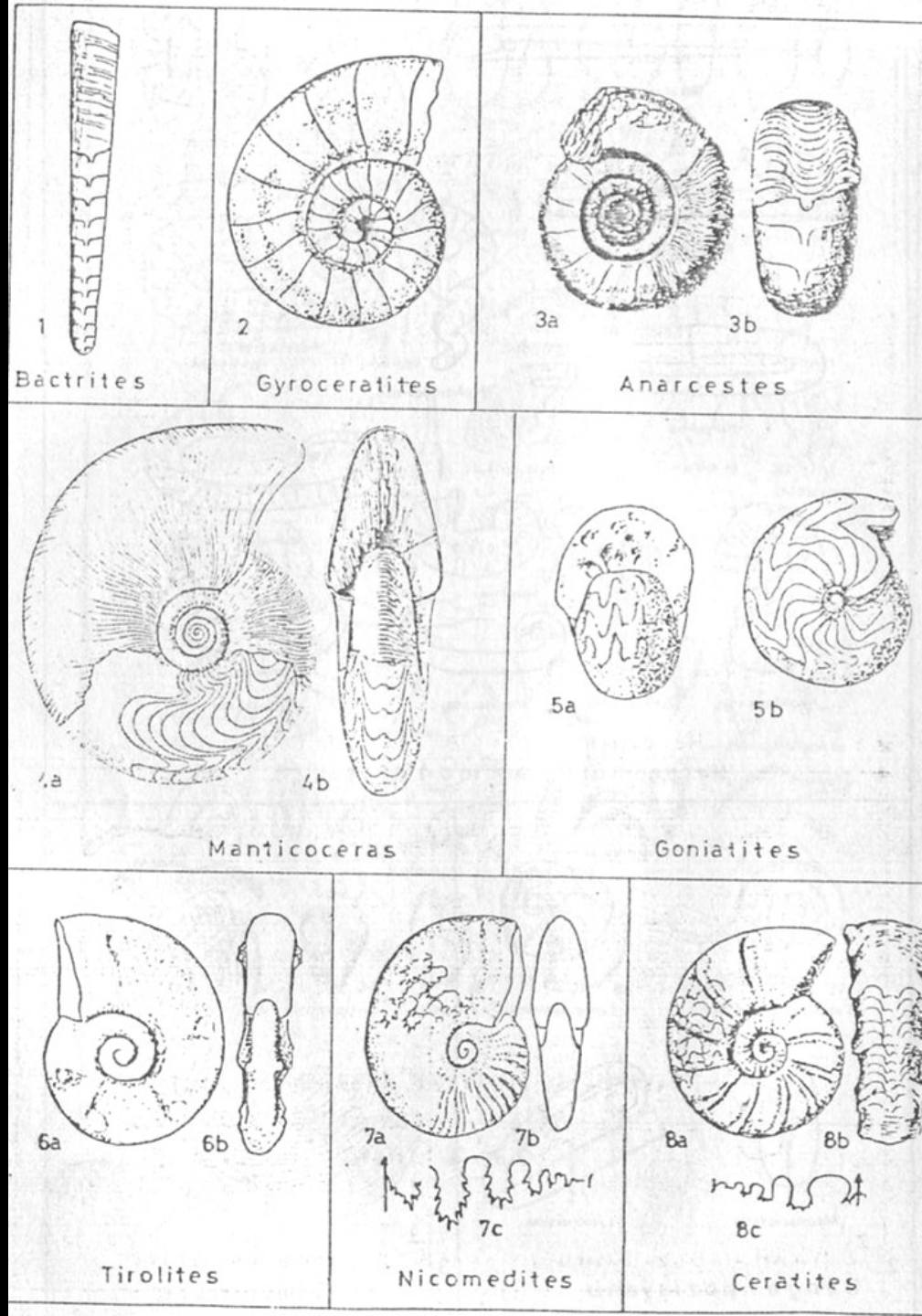
# *Lobites* sp. (Triassic)



# Mollusca

Subclass:  
Ammonoidea

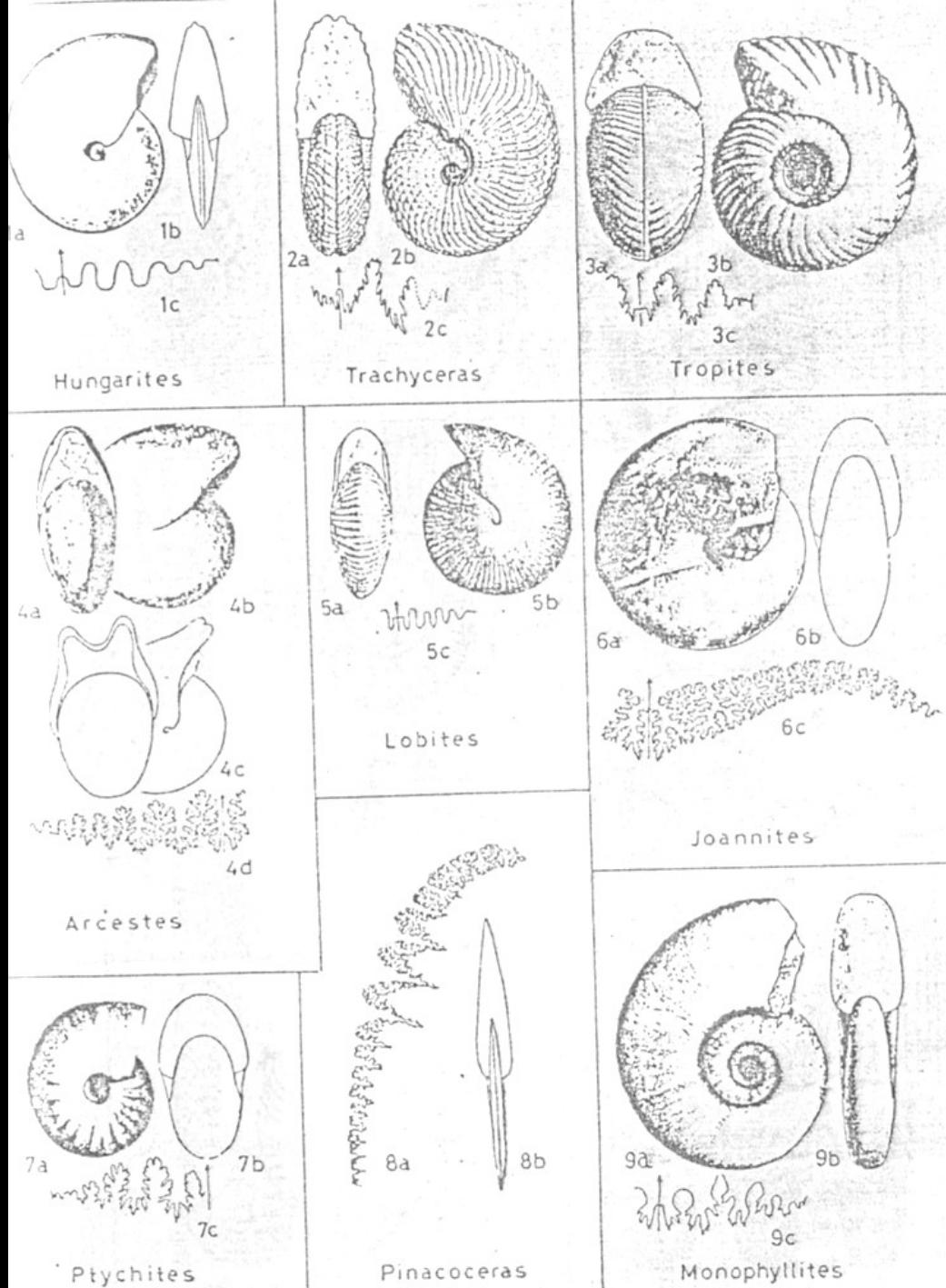
## Selected genera



# Mollusca

Subclass:  
Ammonoidea

## Selected genera



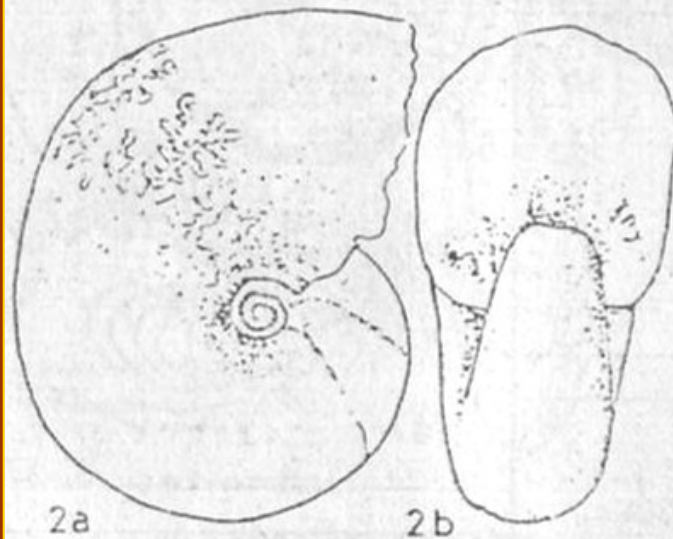
# *Phylloceras* sp. (Jurassic to Early Crt.)





**Mollusca**  
Subclass:  
Ammonoidea

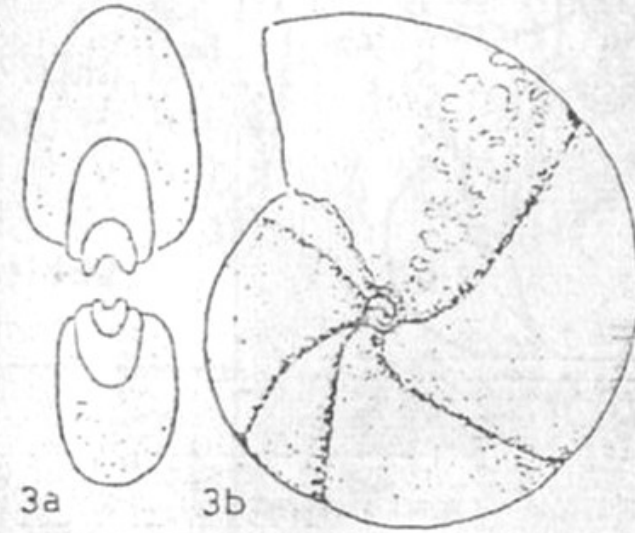
**Selected genera**



2a

2b

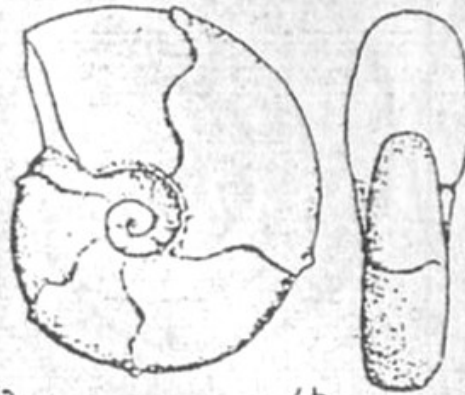
*Hantkeniceras*



3a

3b

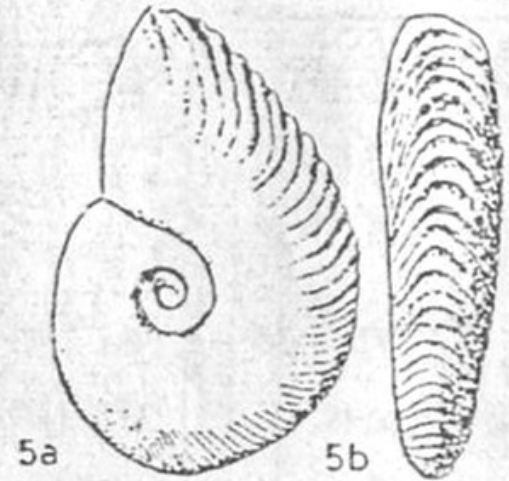
*Calliphylloceras*



4a

4b

*Sowerbyceras*



5a

5b

*Juraphyllites*

# Calliphylloceras sp. (Jur. to Early Crt.)



# Sowerbyceras sp. (Late Jurassic)



# *Juraphyllites* sp. (Early Jurassic)



# *Lytoceras* sp. (Jurassic-Cret.)



# *Crioceratites* sp. (Early Cretaceous)



# *Turrilites* sp. (Late Cretaceous)

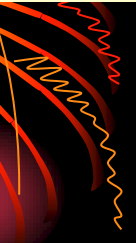


# *Paltechioceras* sp. (Early Jurassic)





# *Dactyloceras* sp. (Early Jurassic)



# *Perisphinctes* sp. (Late Jurassic)



# *Hoplites* sp. (Early Cretaceous)



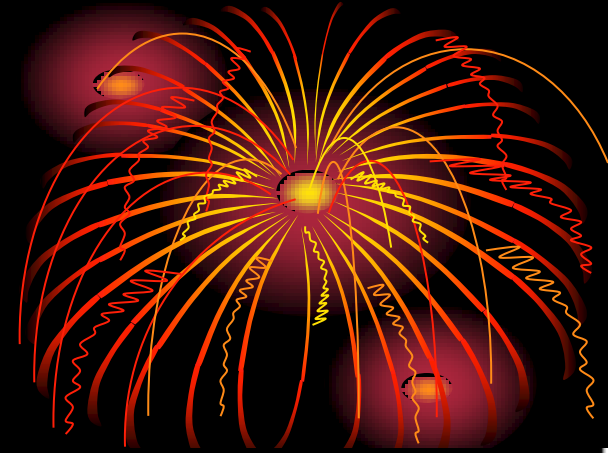
37mm



Jim Craig 2000



• <http://tolweb.org/Cephalopoda>





Helix

Terrestrial

Back reef

Reef

Fore reef

Open sea

Planorbis  
Unio



Mactra



Cephalopods



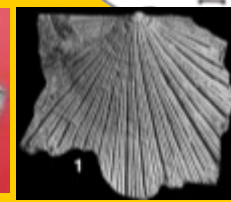
Ostrea RUDIST



Inoceramus  
Megaladon

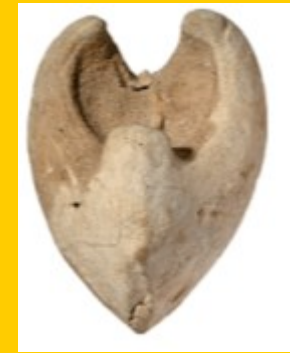


Halobia



Cephelopods PELAGIC NECTIC

Others BENTIC, IN OR EPIFAUNAL

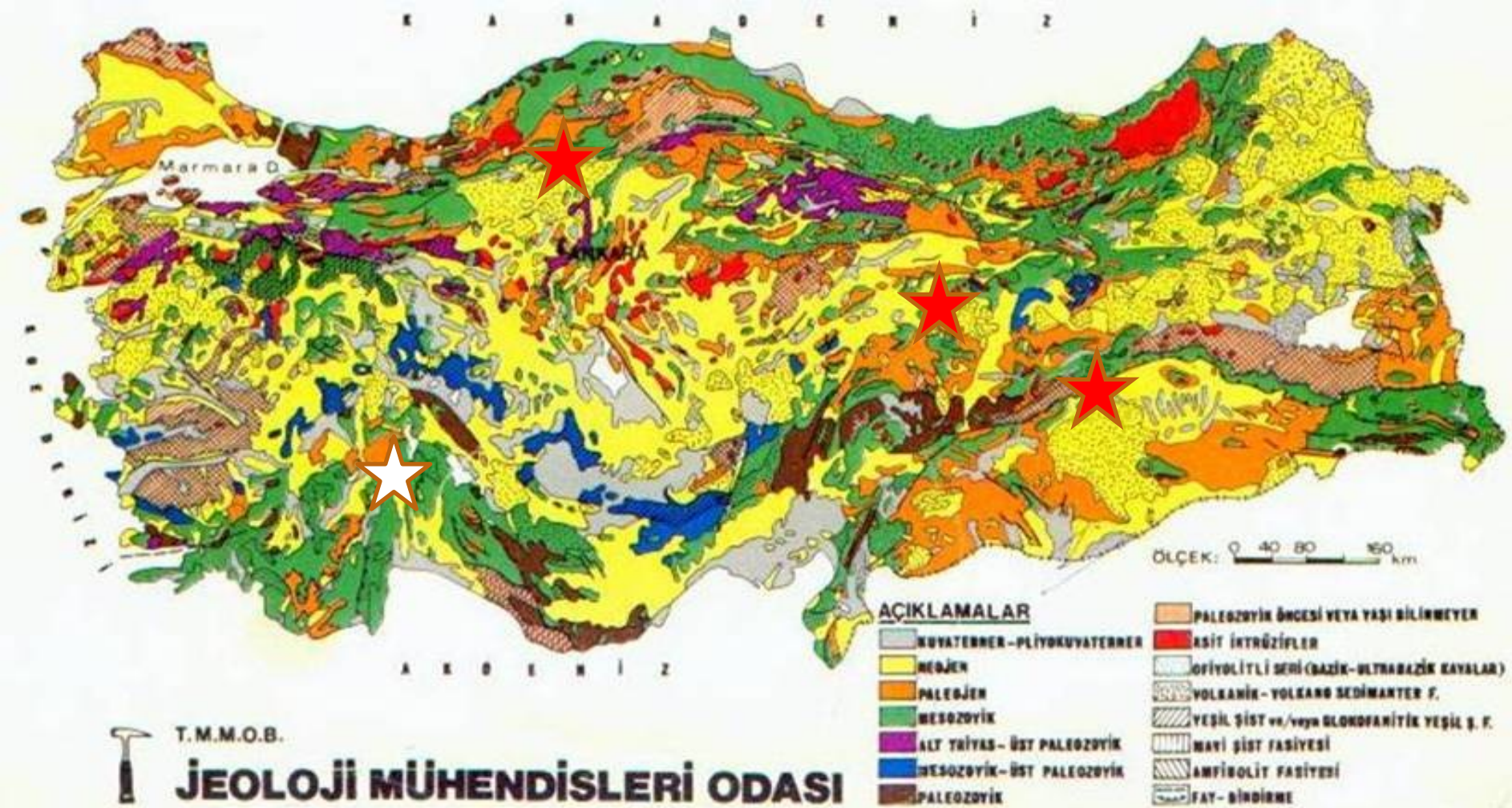
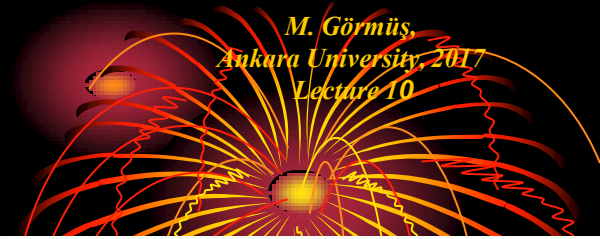


Afew localities



RUDIST/*Inoceramus* Çayırhan, Hekimhan,  
Şereflikoğhisar, GD Anadolu (rich)

M. Görmüş,  
Ankara University, 2017  
Lecture 10



Afew localities



*Halobia* /*Neomegaladon* (Sütcüler, Aksu)



# Homework

Please get a stratigraphical range chart of the genera of Gastropoda & Cephalopoda mentioned in the Lecture 10.

