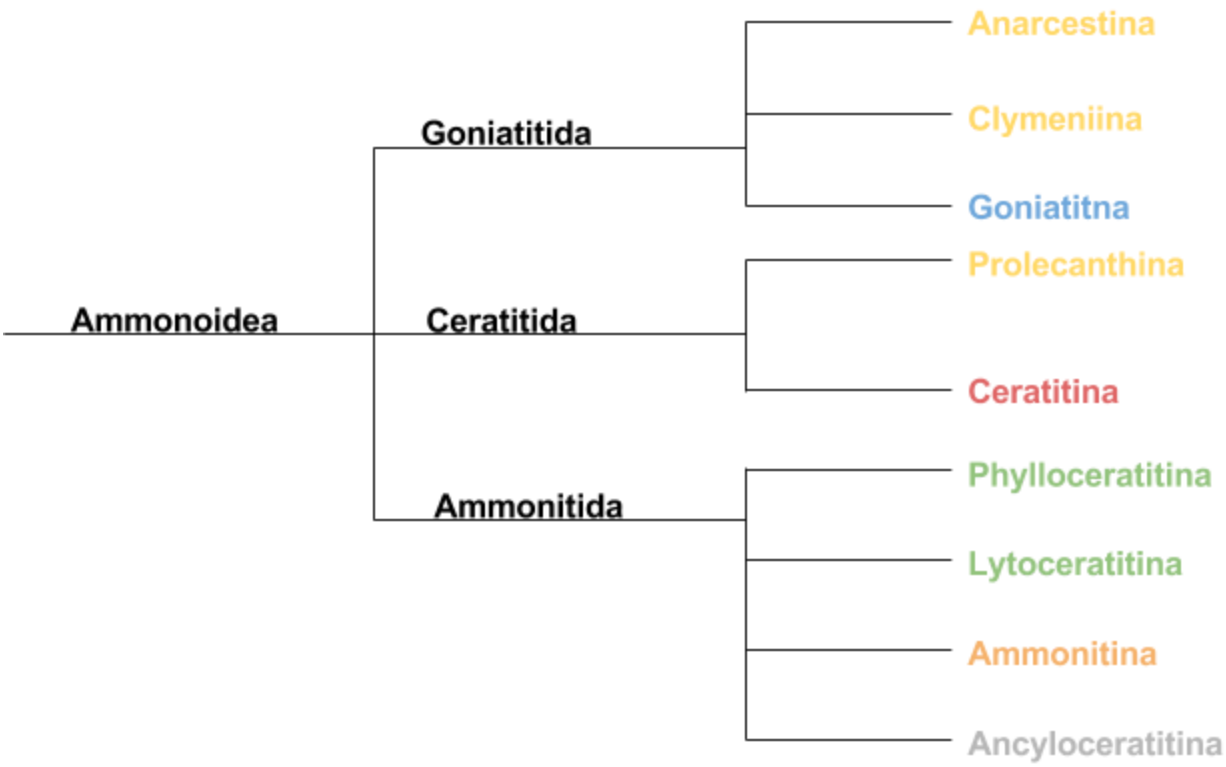
# HELP




## Classification

**Ammonites** are a type of cephalopod mollusk. **Cephalopods** also include squids, octopods, cuttlefish, and the chambered nautilus. **Mollusks** or **Molluscs** are the group that cephalopods are contained in. Clams, snails, and oysters are also mollusks.

**Ammonoidea** is considered to be a subclass. “Subclass” refers to a group that is smaller than a class. There are three orders of ammonoids. **Goniatitda** (GON-ee-uh-TITE-id-uh) is the most primitive one, with most of its members having goniatitc sutures (see *Anatomy*). There were three types of ammonoids in Goniatitida, each being called a suborder. Anarcestina (AN-ark-est-in-uh) is the most primitive of these. Clymeniida (CLY-mee-nee-ih-duh) is the next most primitive order. They were limited to the beginning of ammonite prehistory. The best-known suborder in this group was called Goniatitina (GON-ee-uh-TITE-in-uh). They were more advanced than the other two suborders.

The second order of ammonoids is called **Ceratitida** (SARE-uh-TITE-ih-duh). They were more advanced than the goniatites. Most ammonoids in Ceratitida had ceratitic sutures. Ceratitida only has two suborders, the more primitive one being

**Prolecanthina** (PRO-leh-CAN-thid-uh). The more advanced suborder was called **Ceratitina** (SARE-uh-TITE-in-uh), which were common around the time when dinosaurs began to evolve.

The most advanced order of ammonoids was **Ammonitida** (AM-uh-NITE-id-uh). There were 4 suborders in this group. **Phylloceratina** and **Lytoceratina** are the two more primitive groups with leaf-like sutural lobes. **Ammonitina** is the more advanced order. There were a wide variety of these ammonites with many different suture and ribbing patterns. **Ancyloceratina** was a group of ammonoids with unusual shapes, also called heteromrophs. They might actually belong in Ammonitina.

# The World of the Ammonites

Ammonites lived in prehistoric oceans. They would have preyed on small fish and other swimming animals, or fed on small planktonic organisms. In turn, they would have been hunted by mosasaurs (marine lizards that looked like monitor lizards with flippers), other marine reptiles, and large fish. Large ammonites like *Schloenbachia* and *Tropaeum* may also have eaten their smaller relatives. Read on for more detail.

## Hunting

Ammonites had tough jaws that could cut through their victims. Their tentacles could easily grasp and probably manipulate items. Ammonites used jet propulsion to move. This would have made them fast, but they would have trouble seeing where they were going.

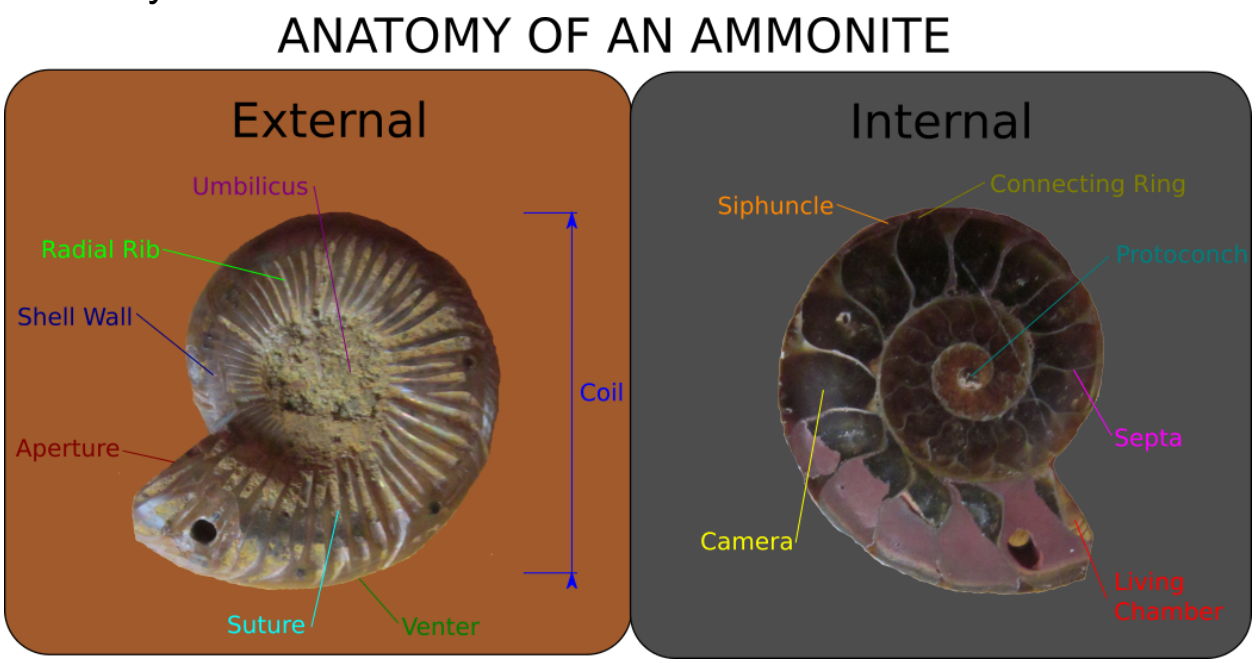
## Being Hunted

Many predators would have had trouble with the hard shells of ammonites, and this served as a deterrent for smaller fish. Ammonites also could move fast. However, there still were a wide range of predators that targeted ammonites. Mosasaurs (discussed above) were known for their frequent predation on ammonites, but their hunting strategies were different. Some, like *Platecarpus* would have bitten the ammonite to stop it, then targeted its soft parts, or just simply keep biting it until it broke. Others like *Globidens* would have just crushed through the hard parts with their powerful jaws.

## Why Did Ammonites Die Out?

Ammonites reproduced by releasing large amounts of planktonic eggs that floated near the surface. Nautiloids, on the other hand, reproduced by laying a few eggs that were left on the seabed. Ammonites definitely had a more effective way of reproduction, but it put them at risk to mass extinction events. When the meteor or comet struck the planet at the end of the Cretaceous, it would have exploded and scattered dust around the world. This would have killed most oceanic organisms in the upper layers of water, but not have affected deep-water swimmers as much. This would have made it much harder for ammonite eggs to survive, but not have affected nautiloids as badly.

## Anatomy

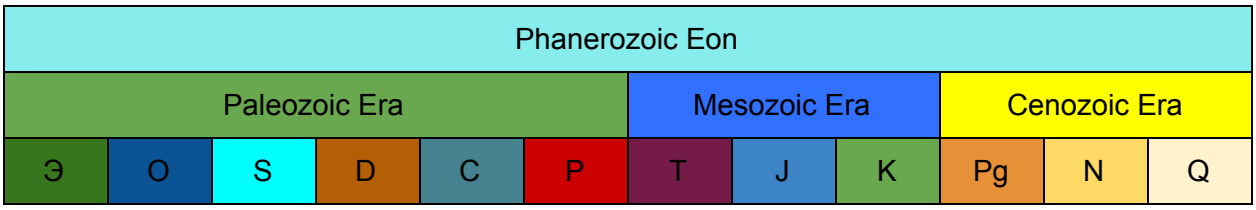



The following list contains hopefully all the confusing terms that you might come across relating to anatomy.

- **Ammonitic Suture:** Complex, frilled suture markings. Compare with: Goniatitc suture, Ceratitic suture.
- **Aperture:** The opening of an ammonite shell.
- **Aptychus:** *(pl. Aptychi)* Ammonite mouthparts, also called ammonite jaws.
- **Camera:** *(pl. Camerae)* A chamber in the ammonite shell.
- **Ceratitic Suture:** Intermediate form of folded suture.
- **Coil:** Spiral-shaped regions of the shell.
- **Connecting Tube:** Thin tube separating the siphuncle from the shell chambers.
- **Convolute:** See *Involute*
- **Discoidal:** Disk-shaped, also called the “typical” coiling pattern. Seen in *Dactylioceras*, *Goniatites*, *Ceratites*, and the ammonite in the image above. Compare with *heteromorphic*.
- **Evolute:** The shell’s coils do not overlap. Compare with *involute*.
- **Flank:** The side of an ammonite.
- **Goniatitic Suture:** Very simple form of folded suture.
- **Helix:** A spiral pattern similar to half a DNA molecule or an RNA molecule. Helical refers to something shaped like a helix.
- **Heteromorphic:** An ammonite with an unusual shape, also used to refer to the suborder Ancyloceratina.

- **Involute:** The shell's coils overlap. Compare with *evolute*.
- **Living Chamber:** Largest chamber of the shell. This is where the ammonite would have lived.
- **Nautilitic Suture:** Very simple suture with no major folds.
- **Protoconch:** The first and smallest chamber of the shell.
- **Radial Ribs:** Ridges running along the outside of the shell.
- **Rib:** See *Radial Ribs*.
- **Septa:** *(pl. Septae)* Walls separating the camerae.
- **Shell Wall:** The outside of the shell.
- **Siphuncle:** Tube running through the camerae. In life it would have transported gasses around the camerae to control the ammonite's buoyancy.
- **Suture:** Structural lines running around the shell.
- **Tubercle:** Bump.
- **Umbilicus:** Depressions formed by the outer coil. Present on both sides of the shell. Umbilical refers to the umbilicus.
- **Venter:** Bottom of the shell (in coiled ammonites it's the external edge). Ventral refers to the venter.
    - **Ventral Groove:** Groove along the venter.
    - **Ventral Keel:** Ridge along the venter.

# Time




* Based on Wikipedia's time scale chart. Not to scale.

- **Cambrian** Time period spanning 542 to 448.3 million years ago. Major developments occur in animals in a sudden burst of evolution called the Cambrian explosion. Represented by Э.
- **Ordovician** Time period spanning 448.3 to 443.7 million years ago. The first starfish, bivalves, urchins, gastropods, and millipedes appeared. Fish also evolved bones. This period ends with a mass extinction. Represented by O.
- **Silurian** Time period spanning from 443.7 to 416 million years ago. Land plants began to emerge and scorpions evolved. Fish underwent major evolutionary changes, most importantly jaws. It is unclear if ammonites were present. Represented by S.
- **Devonian** Time period spanning from 416 to 359.2 million years ago. Fish diversified in many different directions, and the first tetrapods emerged, along with the first ammonites. Dropping sea levels at its end led to a crisis among the fish and invertebrates. Represented by D.
- **Carboniferous** Time period spanning from 359.2 to 299 million years ago. Rising oxygen levels caused the emergence of giant insects, amphibians, and coal swamps. Represented by C.
    - **Mississippian** Also called the Lower Carboniferous, spanned from 359.2 to 318.1 million years ago. It is considered to be its own period in the US.
    - **Pennsylvanian** Also called the Upper Carboniferous, spanned from 318.1 to 299 million years ago. It is considered to be its own period in the US.
- **Permian** Time period spanning from 299 to 251 million years ago. Pangaea began to form, causing arid regions to spread. Ends with a mass extinction that almost obliterates all life. Represented by P.
- **Triassic** Time period spanning from 251 to 199.6 million years ago. Pangaea closes up and archosaurs explode in diversity, leading to the first dinosaurs. It ends with yet another mass extinction that almost completely kills off the ammonites. Represented by T.

- **Jurassic** Time period spanning from 199.6 to 145.5 million years ago. The squid-like belemnites emerge, and dinosaurs begin to diversify as Pangaea is split into Gondwana and Laurasia. Represented by J.
- **Cretaceous** Time period spanning from 145.5 to 65.5 million years ago. Flowering plants and snakes emerge, and previously important herbivorous dinosaur groups become less common as previously uncommon groups have a big spike in diversity. Ends with a gigantic mass extinction, wiping out the great marine reptiles, flying reptiles, dinosaurs (except birds), and ammonites. Represented by K.
- **Cenozoic** Era spanning from 65.5 million years ago to present. Squid, cuttlefish, octopuses, and nautiloids begin to fill the roles ammonites left vacant, while mammals and birds begin to diversify.
    - **Paleogene** First period of the Cenozoic Era, spanning from 65.5 to 23.03 million years ago. Represented by Pg.
    - **Neogene** Second period of the Cenozoic Era, spanning from 23.03 to 2.588 million years ago. Represented by N.
    - **Quaternary** Third period of the Cenozoic Era, spanning from 2.588 million years ago to present. A mass extinction is currently happening. Represented by Q.